

**A Soft Systems Methodology based  
Theoretical Model for the Communication  
of Design Research**

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## **Abstract**

The aim of this thesis is to improve communication between design researchers and in particular to develop and formulate a theoretical communication and information model that will enable more efficient and effective communication of design research results between design researchers. Although research in recent decades has indicated the importance of communication of design research knowledge, it would seem that there is still room for improvement. This research therefore employs a Soft Systems Methodology (SSM) in order to formulate a root definition and to develop a conceptual model concerning the communication of design research results. Input from design researchers was obtained via a questionnaire and used to compare this conceptual model to the perceived real world in order to identify feasible changes in the real world. These findings along with a literature review led to the development and formulation of a theoretical communication and information model to enable design research results to be more efficiently and effectively communicated between design researchers. Together with Human Computer Interaction considerations, a specification framework was then formulated. Structured interviews regarding this framework with five experts from within the design research field then lead to the development of an experimental on-line working prototype which could then be used as a tool to test the theoretical communication and information model. This formed the basis of an evaluation study to assess the efficacy of the real world working prototype. However it was primarily aimed at assessing the validity of the proposed theoretical communication and information model in terms of its efficiency and effectiveness. The evaluation exercises related to the efficacy of the prototype involved one-to-one evaluation reviews with five experts in the area of content design and technical matters, user group based evaluations with fifteen end-users and a comparison of features with other similar systems to ensure that the prototype was a unique, accurate and functional manifestation of the proposed theoretical model. Based on this prototype, one-to-one evaluation reviews with five experts in the area of design research issues were then employed to assess the validity of the theoretical model in terms of its effectiveness and efficiency. These results indicated that the prototype and thus the model represented an improvement in the way design research results are communicated between design researchers. Finally, the transferability of the proposed theoretical should be emphasised. Although this model has been formulated for improving the communication within the design research community the model is a generic theoretical communication model which could equally be applied or adapted to other disciplines.



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with gratitude,

Nikolaos Bessis

## **Author Declarations**

1. During the period of registered study in which this thesis was prepared the author has not been registered for any other academic award or qualification.

2. The material included in this thesis has not been submitted wholly or partially for any academic award or qualification other than that for which it is now submitted.

3. The Ph.D. programme of which this thesis is part has consisted of:

- Independent Study
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All the above were held in the School of Design and Manufacture, Faculty of Art and Design, De Montfort University, Leicester, United Kingdom.

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## Chapter 1: Introduction

This thesis is concerned with the aim of improving communication within design research disciplines, and specifically, with how design research results can more effectively and efficiently be communicated between design researchers. This chapter presents an overview of the research work conducted, and also a chapter-by-chapter introduction as a guide to the structure of the thesis.

In general, research is “understood as the process whereby new knowledge is generated” (Newbury, 1996, p. 8). In relation to good practice for research enquiry, Archer (1995, p. 10) refers to the post - Popperian paradigm that is adopted in science research: the research enquiry must be recorded and its findings published so as to be exposed to critical appraisal and to be checkable by later observers and other investigators. On this basis, “the scientific knowledge growth lies on the basis of the evidence currently available” since, “far from being conclusively proven, scientific knowledge is much more like a report on progress so far, which future investigators will accept, modify or contradict” (Wenham’s, 1998, p. 63).

However as recently as 1995 it has been claimed that “design research lacks evidence” (Cooper, 1995, p. 14). It has also been argued that design is still characterised as “a relatively new endeavour” (Allison, 1992). This is a concern that is supported by numerous others involved in design research (Korvenmaa and James, 1993, p. 23, Walker and Dagger, 1995, p. 2, Owen, 1998, p. 9). Demonstrating design research immaturity, Allison referred back to the Polytechnic and College Funding Council (PCFC) report in which “research in the PCFC sector, (1990) shows that the volume of research in art and design was the lowest of all the nine programme areas in the sector”. On this basis, Allison in 1991 argued: “if the PCFC picture of research was inaccurate, then it would seem that researchers in the field need to be more communicative about their work”.

More recently the Research Assessment Exercise has pointed out that “across the UK as a whole, research quality in general, as measured by their rating system, has improved dramatically over the last decade” (RAE, 2001). An examination of the RAE outcomes carried out by the author, which involved a comparison of the number of top rating



scores achieved in RAE 92, RAE 96 and RAE 2001 indicates that the Art and Design Unit of Assessment (UoA) is positioned at the bottom end of the list (See Appendix VIII). However, further examination in terms of the volume of design research output clearly demonstrates an improvement in the Art and Design UoA having been placed 23rd out of 72 in RAE 92, 22nd out of 69 in RAE 1996 and 18th out of 69 in the most recent RAE 2001. The results indicate that there has been a steady increase in terms of the quantity of art and design research output. Findings from this examination also indicate that increased funding has come into the Art and Design sector for research, in many cases for the first time. Added to this has been the wider range of the design research key areas involved in the most recent RAE compared to the previous RAE's resulting in a growth in the number of researchers. All these factors, growth in research output and the number of researchers, increases in research funding and the breadth, depth and complexity of the design research activity itself have generated a need to improve the ways in which this research is communicated.

Communication within research in general and design research in particular has been the focus of much research. In particular, Meadows (1974, p. 91) in relation to scientific research argued that "communication in one form or another usually takes up a significant fraction of a scientist's working life". Also Pechura and Martin (1991, p. 84) wrote: "the scientific enterprise is composed of people who generate ideas, design ways to test those ideas, collect data, and communicate the ideas and data in a variety of ways. The communication of ideas and results is as important to the growth of knowledge as the data themselves". On this basis, Wulf (1989) coined the metaphoric phrase 'collaboratory' in order to represent new modes of communication, cooperation and collaboration ('c-cubed') that would improve the efficiency and effectiveness of the scientific enterprise. Wulf (1993) also wrote that "a collaboratory represented a centre without walls, in which the nation's (referring to the United States of America) researchers can perform their research without regard to physical location - interacting with colleagues, accessing instrumentation, sharing data and computational resources, and accessing information in digital libraries".

Within the design research discipline, Alexander in 1964 argued that "enabling communication, enabling the processing of information, formulating methods and models, and capturing knowledge" are some of the problems within the field. Some years later, communication is still recognised as an important issue within the design research since, "knowledge and information are useless if they are never communicated, transferred or applied" (Young, 1989, p. 320). Within this context, the need for



available and accessible design work has been identified by Parnas and Clements (1986). Sonnenwald (1996, p. 279) also states that "an important aspect of knowledge exploration is communication". This concern with the design research endeavour is also highlighted by Allison, (1993, p. 6) Archer, (1995, p. 6) Cooper, (1995, p. 17) Press, (1995, p. 38) Bessis and Robertson (1995), and Newbury (1996, p. 9) since, they argue that design research should be "communicable" and its outcomes "be accessible" and "transferable" to others.

Current discussions within the design research discipline, therefore recognise the need for the communication of design research results. In particular, Friedman (1997) points out that: "the fact that design is young poses challenges to the development of a rich theoretical framework. In order to develop this framework, a community of researchers must identify themselves and enter into dialogue". Vakkari (1996, p. 169) in relation to the development of this professional research community argued: "discussion about the scope and content of a young field of research helps to form the identity of its scientific community".

In addressing this need, current developments in information and communication technologies must be examined as they have revolutionised the way people communicate. Marchionini (1995, p. 162) pointed out that "as more information becomes available in electronic form, more systems are developed to support electronic information seeking". These developments of electronic environments have also influenced "the information process, involving changes in the volume of information available, remote access, transfer speed and behavioural action of users" (Marchionini, 1995, p. 162) and therefore, "there is a need for research on search systems" (p. 188). However, the failure of information systems development methodologies to deliver what is required (Lucas, 1975, Galliers, 1987 and Mingers, 1995, p. 19) and the novelty of the current communication and information technologies (Committee of Scottish Universities Principals, 1992) form the need for further research.

This is the basis for this research which explores all the problems mentioned above. In order to do this, the following five step methodology is proposed which aims to develop a theoretical communication and information model, as a basis for a system, in which design research results can more effectively and efficiently communicated between its peers:



- stage 1** To review the background area of Information Systems Development Methodologies (ISDMs), including Soft Systems Methodology (SSM) in order to identify methodological approaches potentially applicable to support the achievement of the aim of this research study
- stage 2** To explore and understand the nature of the problem by using SSM, i.e.. to draw a rich picture, examine the interventions, the cultural and political aspects of the problem situation, identify relevant conceptual systems and describe a root definition in relation to communicating design research results, as well as, the identification and formulation of a conceptual model.  
The need for a questionnaire as the primary research tool suitable for further understanding within the area of the investigation is identified
- stage 3** To acquire respondents input through the questionnaire which will be used to establish how design research knowledge is currently communicated, as well as to identify what methods, systems and networks for communication are currently employed or needed. These results along with literature review will be used to make a comparison of the conceptual model identified in stage 2 against the perceived real world and to suggest feasible changes in the form of a new rich picture and a refined version of a root definition. These findings along with the literature review and the conceptual model are used to propose a new theoretical communication and information model concerned with how design research results can be more effectively efficiently communicated between its peers
- stage 4** To further analyse the questionnaire along with stages 2 and 3 findings and Human Computer Interaction (HCI) literature based considerations in order to produce a specification framework. Structured interviews will be performed to evaluate the initial specification framework prior to the formulation of the prototype which will stand as the manifestation of the proposed theoretical communication and information model which will be tested in stage 5 to determine the model's validity
- stage 5** To perform evaluation studies employing Formative and Summative exercises in order to test the working prototype, and thereby, the validity of the proposed theoretical communication and information model in terms of its effectiveness and efficiency

It is suggested that the proposed theoretical communication and information model resulting from the above proposed five step methodology could provide a more effective



and efficient means of communicating design research results amongst design researchers.

This SSM approach was evaluated through an empirical study in order to assess the validity of such a theoretical model. To do this, the proposed theoretical communication and information model which was based on the integration of literature review with primary research was used to formulate a specification framework. Structured interviews regarding this framework with five experts from within the design research field then led to the development of an experimental working prototype which was evaluated as to its efficacy (does the means work?) both at intervals during the development and at the conclusion. This formative evaluation was employed to assess the usability and the functionality of the prototype in terms of supporting the primary task and ensure its working order. These evaluation strategies were informed by Kerr and Hiltz (1982, p.162), Dix, Finlay, Abowd and Beale (1993, p. 375), Shneiderman (1992, p. 478), Wilcox (1994, p. 18), and, Newman and Lamming (1995, p. 190). They included:

- one-to-one expert evaluation review with five participants in content, design and technical matters
- user group based evaluation with fifteen prospective end-users to assess the efficiency of the prototype in a user environment
- a comparison of features with other similar systems to ensure that the prototype is an accurate manifestation of the the proposed theoretical model

Subsequent to the final revisions of the prototype design, the primary evaluation exercise in the form of a summative evaluation was undertaken in order to assess the effectiveness and efficiency, as well as, to assess the validity of the underlying thinking of the proposed theoretical model. Summative evaluation was conducted using Kerr and Hiltz (1982, p.162), Dix, Finlay, Abowd and Beale (1993, p. 375), and, Newman and Lamming (1995, p. 190) evaluation strategies. This evaluation method included:

- one-to-one evaluation reviews with five experts in design research issues employed to assess the validity of the theoretical model in terms of its effectiveness and efficiency

The results from this summative evaluation indicate improvements in terms of communicating design research results between design researchers. Thus, the proposed theoretical model may indeed provide an improvement to the communication of design research results. These are further discussed, presented and documented throughout



Chapter 6. Although these results are of interest in their own right, suggestions for further research and recommendations are documented in the final chapter of this thesis (Chapter 7).

The whole thesis consists of seven chapters and eight appendices and the following paragraphs provide a chapter by chapter guide to the structure of the thesis.

Chapter 2 presents a review of the literature and examines existing research within the undertaken subject area. It starts with definitions of the terms design, research and communication. In addition to this, the meaning of information and media within the context of the communication process is described in a way that demonstrates how these qualities are required for the act of communication. It also presents new media as an enhanced method for successful information transfer based on cutting edge Information Technology. The issue of communication within the design research is then explored. Within this context, the chapter presents the needs and benefits of communicating design research between design researchers and in particular it identifies and examines the nature of the problem with which this research is concerned, that is, to identify how design research results can be more effectively and efficiently communicated between design researchers.

Chapter 3 is concerned with stage 1 of the proposed five step methodology presented in this chapter and in particular with the amalgam of techniques used to investigate the problem identified in Chapter 2. It starts by proposing a five step methodology aimed at identifying how design researchers can more effectively and efficiently communicate based on the communication of current design research outcomes. Next, it presents Soft Systems Methodology (SSM) in greater detail and explains its suitability as the undertaken methodology. The Chapter presents the process through which the results of the literature review and primary research can be integrated into the development of a theoretical model aimed at improving communication within design research disciplines. It also presents the process through which a specification framework and an experimental working prototype can become the manifestation of this model in order for it to be evaluated in terms of its effectiveness and efficiency.

Chapter 4 is concerned with stages 2 and 3 of the proposed five step methodology presented in Chapter 3 and describes how the cultural and logic based streams analyses of Soft Systems Methodology (SSM) are used to investigate the problem situation and lead to the development of a conceptual model. The need for a primary research tool, a



questionnaire addressed mainly at the design research community, is also identified. This questionnaire's results are then integrated with the conceptual model and the data from literature review to formulate a theoretical communication and information model concerned with how design research results can more effectively and efficiently communicated between design researchers.

Chapter 5 is concerned with stage 4 of the proposed five step methodology presented in Chapter 3. It presents further examination of the primary research tool which together with human computer interaction considerations, stage 2 and stage 3 findings and the literature review, are used to formulate a specification framework. It also describes an evaluation using structured interviews in order to assess the validity of this framework and the subsequent development of the final version of the specification framework.

Chapter 6 is concerned with stage 5 of the proposed five step methodology presented in Chapter 3. It presents the process in which an appropriate prototype based on the theoretical model and the specification framework is formulated. It also presents the evaluation study in the form of both the formative and summative approaches as secondary and primary exercises respectively. The secondary evaluation exercise describes the iterative development of the experimental on-line working prototype and its testing, in terms of efficacy as well as functionality and usability. The primary evaluation exercise describes the testing of the validity of the underlying thinking of the proposed theoretical communication and information model in terms of whether the model mentioned can provide a more effective and efficient communication means for design research results between design researchers.

Chapter 7 presents the conclusion of the thesis by summarising the main achievements of the undertaken research. It provides a critical evaluation of the research undertaken, as well as, recommending areas for further research and development.

In addition to these, the thesis includes eight appendices providing detailed documentation of the primary and secondary findings as follows:

Appendix I consists of the instruments used in the questionnaire, its accompanying letters and the list of participating bodies and organisations. In addition to this, it documents the questionnaire responses and provides a statistical description of the data.

Appendix II consists of the instrument used for the evaluation of the specification

framework, the structured interview questionnaire. It also provides a list of the participants and detail of the participants' responses.

Appendix III consists of the instruments used for the secondary evaluation exercises, that is the formative evaluation approach. It also provides a list of the participants and details of the participants' responses.

Appendix IV consists of the instrument used for the primary evaluation exercise, the summative evaluation questionnaire. It also provides a list of the participants and details of the participants' responses.

Appendix V documents the screens of the prototype and the programming script.

Appendix VI serves as the dictionary of the computer based terms used throughout the thesis.

Appendix VII serves as a dictionary of all abbreviations used throughout the thesis.

Finally, Appendix VIII provides an examination of the Art and Design UoA based on RAE ratings.



## **Chapter 2: Design Research and its Communication**

### **2.1 Introduction**

Chapter 2 presents a review of the literature and examines existing research within the undertaken subject area. It starts with definitions of the terms design, research and communication. In addition to this, the meaning of information and media within the context of the communication process is described in a way that demonstrates how these qualities are required for the act of communication. It also presents new media as an enhanced method for successful information transfer based on cutting edge Information Technology. The issue of communication within the design research is then explored. Within this context, the chapter presents the needs and benefits of communicating design research between design researchers and in particular it identifies and examines the nature of the problem with which this research is concerned, that is, to identify how design research results can more effectively and efficiently communicated between design researchers. (See Appendices VI and VII for documentation of any computer based terms and abbreviations used throughout this thesis).

### **2.2 Design, Research and Communication Definitions**

"We must understand nature before we can control it". Francis Bacon (cited in Copp and Zanella, 1993, p. 378) argued this point more than three hundred years ago in an effort to try and justify scientific study. However, it can be interpreted that Bacon's deeper meaning was to understand the undertaken term, 'nature' being the case in point, before attempting to control it. Although this research is not aimed in trying to justify science, Bacon's statement may still apply to this research endeavour.

Design, research and communication are terms whose definitions offer several alternative interpretations. Therefore, the following sections are dedicated to the provision of literature based interpretations as a provision for understanding of these terms as they are the three key issues for this research: to improve the communication within design research.



### 2.2.1 Design

Eder (1995, p. 117) argued that "the highest human achievement is creating something new that is of some potential benefit to mankind. That something new may include artistic works (aesthetic expression), processes and products (designing or engineering), or knowledge (research)". This view of design as a 'process and product creation' as Eder pointed out, is also supported by others. For instance, Banathy (1994) stated that design "focuses on solution finding and creating objects and systems that do not yet exist", while Woodward (1982, p. 180) argued that "to many people design is concerned with material objects only, but it applies equally to non-material things such as organisational structures, operating methods and educational courses". On the other hand, Nobel laureate Hebert Simon (1982, p. 129) described the definition of design in the following way: to design is to "devise courses of action aimed at changing existing situations into preferred ones".

Although the aim of this research is not to try to identify the truth or falsehood of the given definitions, it may be argued that Simon's definition of design applies to many activities such as for example to an open-heart surgery situation. Without arguing as to whether open-heart surgery is or is not a design goal or situation, it may be argued that during open-heart surgery the team of doctors perform a by-pass utilising a method aimed at changing the existing situation of the sufferer's blocked arteries into the preferred situation of cleared arteries. Assuming that Simon's definition applies to the design goals of a graphic designer experience, it can be argued according to the example described above, that his definition applies equally to different goals and / or situations. Therefore, all that may distinguish between these goals, is the particular subject areas that the design may refer to. Friedman (1997) argued that Simon's definition applies to the "professions we identify by using the word 'design', including graphic design, information design and industrial design". He also added: "in this context, design management is also a form of design". However, the question is raised about other forms of design since, there are a vast number of Universities and Colleges around the world that include additional forms of design to those mentioned above. In order to provide an explanation for this, it may be worth drawing a parallel with the concept of 'system' in which the word according to Rosen (1986) "is almost never used by itself, it is generally accompanied by an adjective or other modifier: physical system; biological system; social system; economic system; axiom system; religious system; and even 'general' system". Rosen also added: "the adjective describes what is special or particular; i.e. it refers to the specific 'thing-hood' of the system, the 'system' describes



those properties which are independent of this specific thing-hood". Therefore, after drawing a parallel between the word 'system' with the word 'design', it may be argued that design is the 'thing-hood' for an adjective, in which the adjectives for the noun 'design' may be the following: graphic, architectural, software, engineering, and even heart operation design. Interior, fashion, textiles, three-dimensional, ceramics, glass, jewellery, communication, product and furniture, exhibition, automotive, media, graphic, information, industrial and management and newer areas such as multimedia and environmental are other forms of design and are therefore other adjectives for the noun design.

In Simon's definition one interesting arrangement may also be observed. Simon refers to design as 'to devise courses of action' so it seems clear that he refers to design as a verb. Verbs are intentional, active and goal orientated. This is also supported by Archer (1983) who stated the "design activity is based on the formulation of a prescription or model which represents the intention to create some artefact, and the activity must include some creative step".

Additionally, what may also be argued from both Simon's and Archer's definitions is that design contains a process. The argument is further supported since, design can be viewed "as a total process" (Cooper and Press, 1995, p. 7) in which, throughout design history there have been "many attempts to draw up models of the design process" (Cross, 1996, p. 19). Further accounts are given by Dorst and Dijkhuis (1995, p. 261) in which they also state that "over the years, many systems for describing design processes have been developed".

According to Cross (1996, p. 19) "some of these models simply describe the sequences of activities that typically occur in designing", while "other models attempt to prescribe a better or more appropriate pattern of activities". Although the aim of this research is not to criticise available design process models, two of them are provided in order to portray the main classification type.

As an example of a descriptive model, French's (1985) model is given. In this model the structure is based on the following activities: i. analysis of a problem, ii. conceptual design, iii. embodiment of schemes and, iv. detailing. A schematic approach of French's model is illustrated in the following figure 2.1, in which the circles represent stages reached, or outputs, and the rectangles represent decisions:



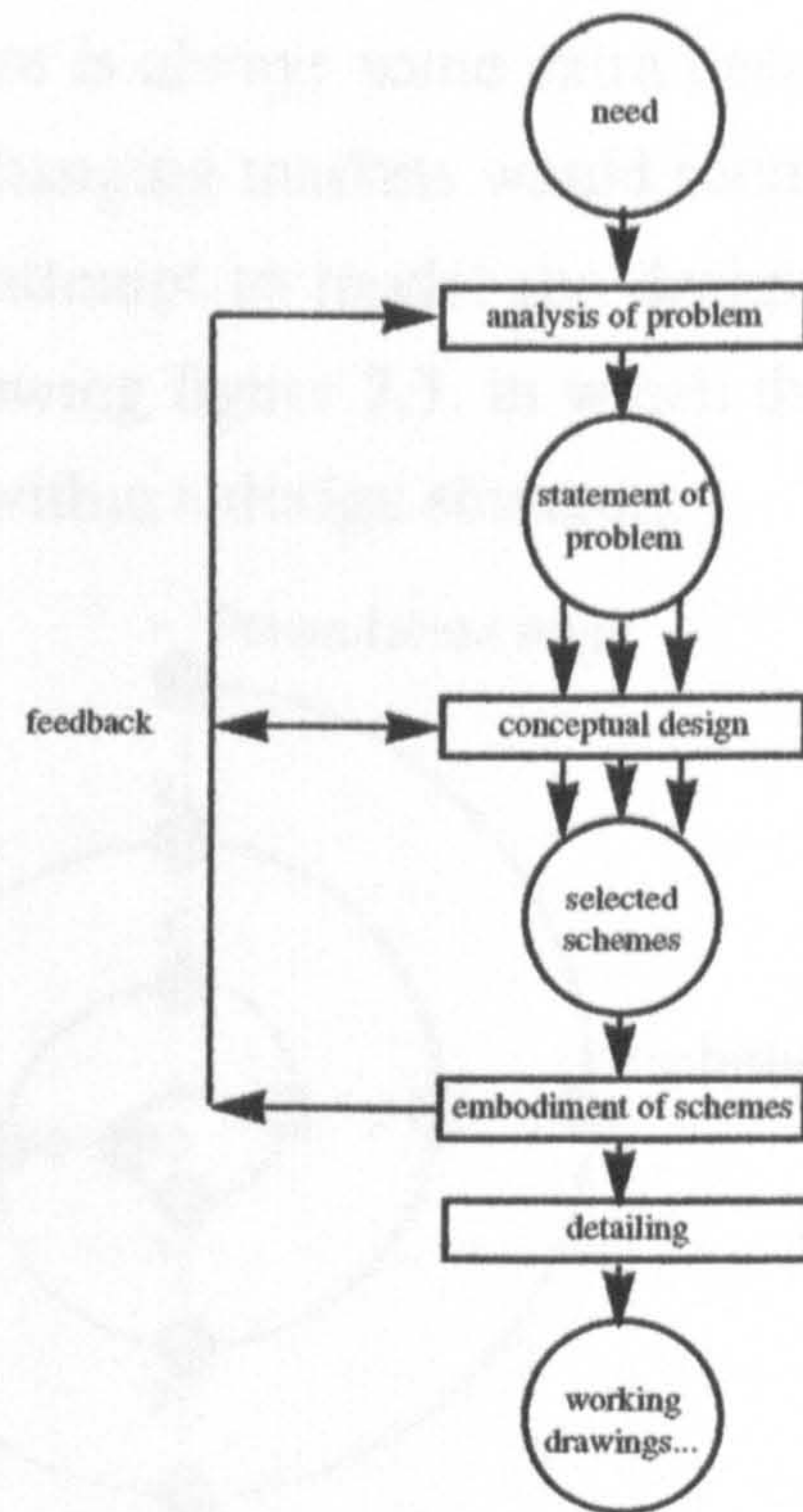


Figure 2.1: Descriptive Model. French's Model of the Design Process, 1985,  
(source: N. Cross, 1996, p.21)

Alternatively, there are prescriptive models which emphasise the need for more analytical work to precede the generation of a design solution. These models' structures are based on "stages defined by Jones in an early example of a systematic design methodology" (Cross, N. 1996, p. 24) and these are: i. analysis, ii. synthesis and, iii. evaluation. A more detailed approach for a prescriptive model was developed by Archer (1983, p. 5) and this is illustrated in figure 2.2. Archer summarised this process as dividing into three broad phases: analytical, creative and executive:

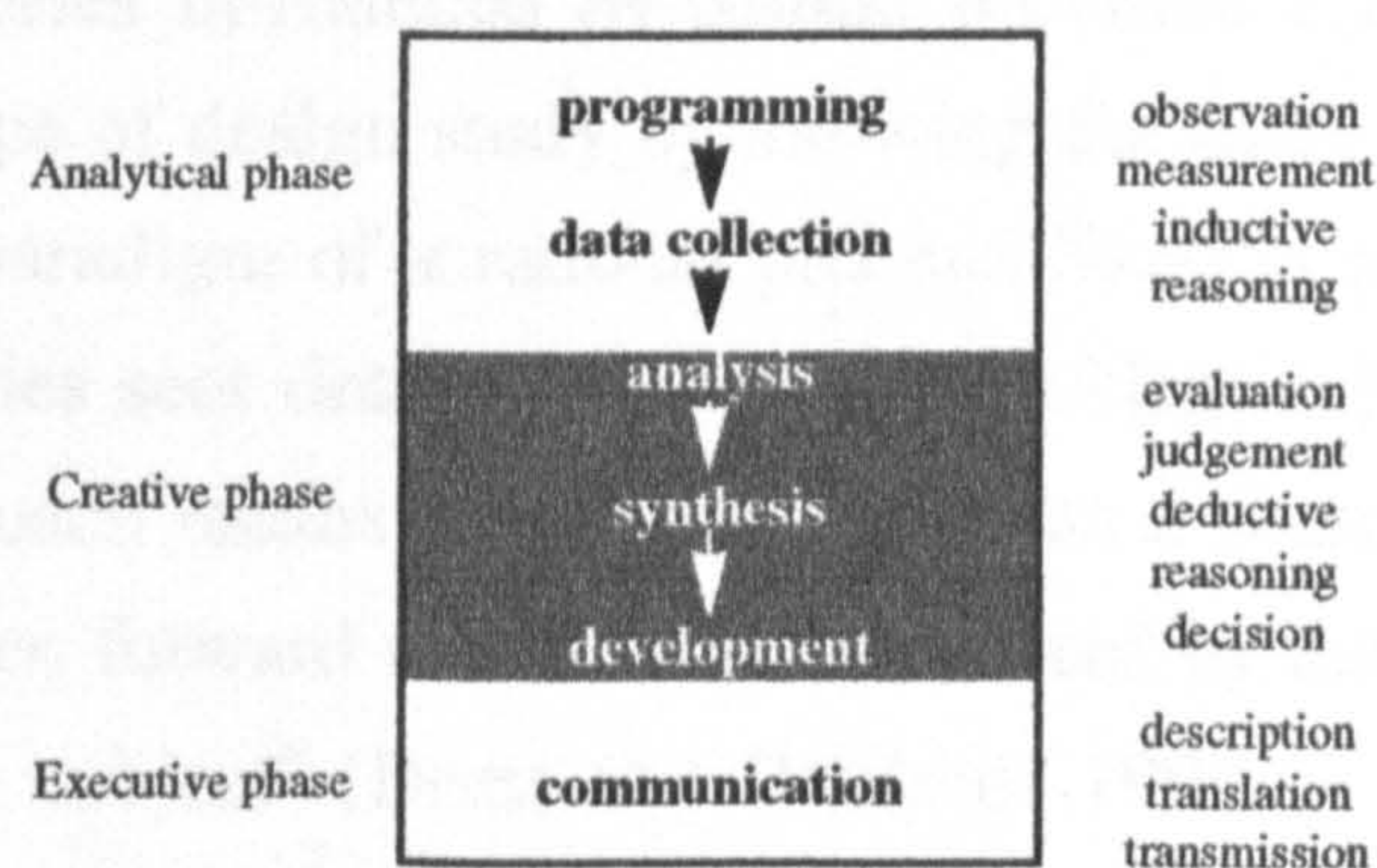


Figure 2.2: Prescriptive Model. Archer's three-phase summary model of the design process, 1983, (source: B. Archer, 1983, p. 5)

However, according to Oakley, (1990, p. 10) "most design process models have a clear end point beyond which no further work is required". He argued that: "designs are



never perfect and there is always some extra benefit to be found. Even if this were not the case, constantly changing markets would soon create a need for some further design attention". Oakley's attempt to model the design process in a circular spiral form is illustrated in the following figure 2.3, in which the numbers refer to subsequent design attempts undertaken within a design situation:

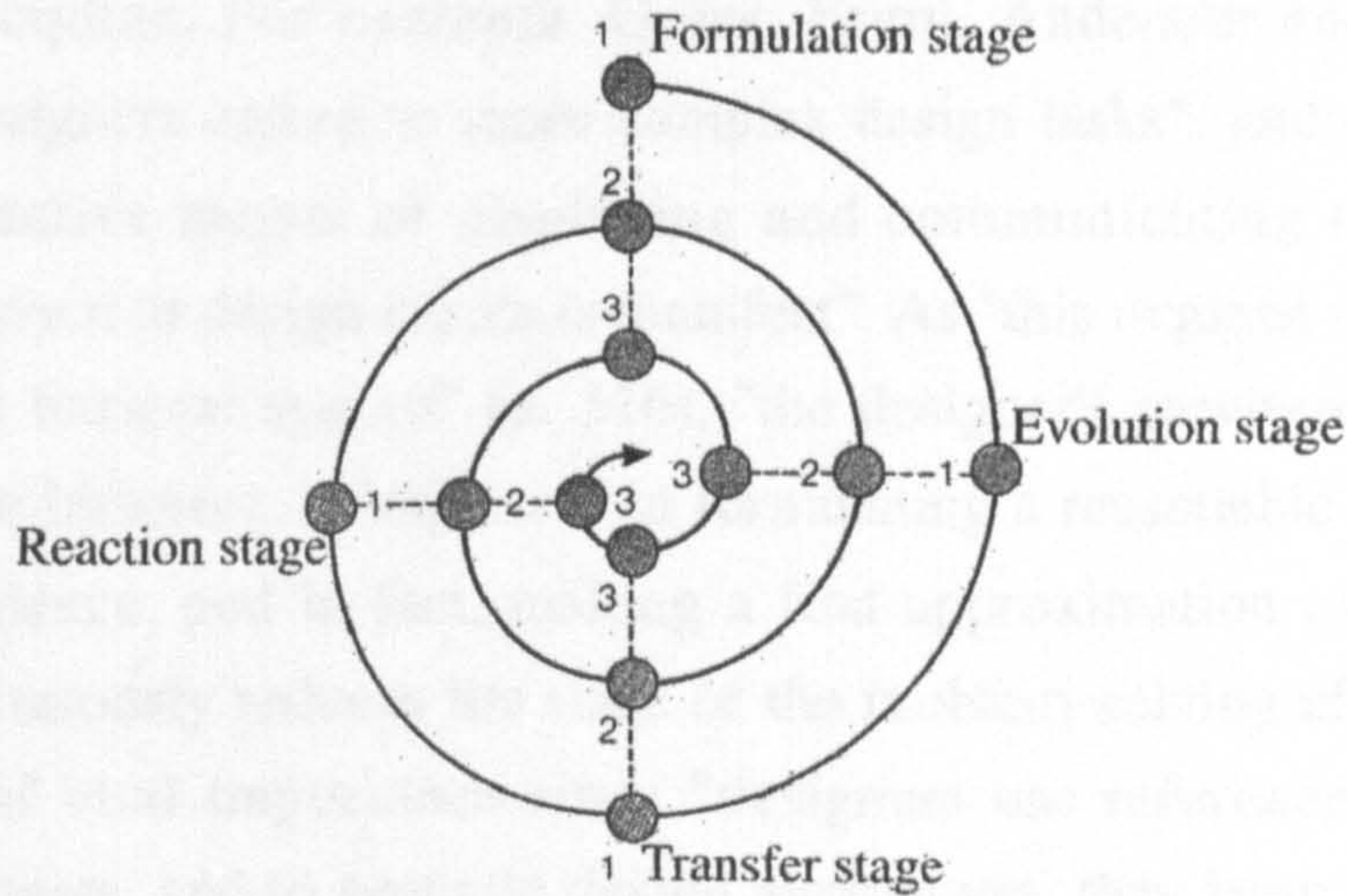


Figure 2.3: Oakley's Spiral model of the design process, 1990,  
(source: M. Oakley, 1990, p. 11)

Criticism of different models attempting to describe the design process have raised interest in the fundamentals of design theory. Dorst and Dijkhuis (1996, p. 253) argued that this criticism "fostered a need for more detailed descriptions of the design activity, leading to more attention to designers and design problems, rather than just for the design process".

Problem solving theories introduced by Simon provided a framework for the need mentioned, in the scope of design study by allowing the study of designers and design problems within the paradigm of a rational process. Simon's paradigm which is based on the positivist theories sees design as a rational problem solving process where "the problem solving approach means looking at design as a search process, in which the scope of the steps taken forward to a solution is limited by the information processing capacity of the acting subject" (Dorst and Dijkhuis, 1996, p. 253). This view is also supported by Baya and Leifer (1996). They describe design as "an information driven process" in which "over the course of a design process designers handle large amounts of information. Therefore, the quality of designs and the overall productivity of the design process depend heavily on the information management skills of designers". They also described information management as "the process of capturing and organising design information in such a manner that it can be retrieved and reused at a



later time". They conclude that "there is a need for developing tools, methods and technology which integrate smoothly with the design process and support information management without being cumbersome to use".

This need is seen as one of the most important emerging issues within the design discipline. For example, Gross, Ervin, Anderson and Fleisher (1988) argued that "designers turned to more complex design tasks", and that therefore, "the need for an effective means of displaying and communicating design states and information relevant to design events is manifest". As "this requires a flexible and expressive storage and retrieval system" (p. 316), "the designer's previous experience, and knowledge of case histories, is important in formulating a reasonable course of action on incomplete evidence, and in fact, making a first approximation on the basis of prior experience enormously reduces the scale of the problem solving effort" (Archer, 1986). This need is of vital importance since "designers use references and precedents to check, to evaluate, and to generate design alternatives, they learn by looking at designs, and they apply that knowledge in their own work" (Young, 1989, p. 316). On the same basis, Pasman and Muller (1995) argue that "existing or precedent designs are an important source of knowledge in the design process, in which when faced with a design problem, a designer can draw reference to existing solutions that have a bearing on the current situation. They can either do this from their own memory or from external sources like libraries, catalogues or journals". Pasman and Muller (1995) also argue that "the development of computer systems that support the designer in recollecting design ideas from existing designs is an emerging area in design research" while, Young (1989, p. 394) concluded that there is a need for "an effective information system and communication procedure" in which, it would be vital to: "ensure dissemination of information to all relevant bodies or individuals; and to ensure that a common basis of information is used on which to make design decisions" (p. 397 and 398). Further accounts on the benefit of accessible and meaningful records of design processes have also been discussed by many others, including Jones (1963), Archer (1986), Parnas and Clements (1986), Allison (1991), in the European Design Congress in 1992, Agnew (1993), Hirose, Cannon and Leifer (1994), and Bessis and Robertson (1995). In particular, Hirose, Cannon and Leifer (1994, p. 259) note that the benefits of accessible design work include: "the opportunity to avoid repeated work; better coordination of goals among designers; automatic propagation of the effects of changing goals and external factors; reduced effort and improved effectiveness in artifact diagnosis, maintenance, and redesign; and a permanent record of the design that can support better education".



A radically different paradigm from Simon's approach was proposed by Schon in which design is described as a process of reflection-in-action. This paradigm sees any design problem as unique, "a universe of one" (Dorst and Dijkhuis 1996, p. 255). To describe the tackling of fundamentally unique problems, Schon proposes "an alternative epistemology of practice, based on a constructionist view of human perception and thought processes. He sees design as a reflective conversation with the situation" (Dorst and Dijkhuis 1996, p. 255). A summary of both Simon's and Schon's paradigms is depicted in figure 2.4:

<b>Item</b>	<b>'Simon'</b>	<b>'Schon'</b>
<b>designer</b>	= information processor (in an objective reality)	= person constructing a reality
<b>design problem</b>	= ill defined, unstructured	= essentially unique
<b>design process</b>	= a rational search process	= a reflective conversation
<b>design knowledge</b>	= knowledge of design procedures and 'scientific' laws	= the artistry of design: when to apply which procedure/piece of knowledge
<b>example/model</b>	=optimisation theory, the natural sciences	= art/the social sciences

Figure 2.4: Simon's rational problem solving paradigm versus Schon's reflection-in-action paradigm (source: Ed.: N. Cross, H. Christiaans, K. Dorst, 1996, p.255)

Based on the above paradigms, it is important to note that neither of them disagree in the existence of design knowledge. Friedman (1997) quoting the Merriam-Webster Collegiate Dictionary (tenth edition, 1993, Springfield, Massachusetts) defines knowledge as "the fact or condition of knowing something with familiarity gained through experience or association, the fact or condition of being aware of something, the range of one's information or understanding, the circumstance or condition of apprehending truth or fact through reasoning and finally the sum of what is known". Following from this, in "a society that enters the information age" (Christie, 1985, G7 Information Society Conference, 1995 and Zuboff ,1988) and becomes information dependent, "knowledge is power" (rephrased by the original: 'et ipsa scientia potests est' which first written in 1597 by Francis Bacon. This is cited by Raivio,1996, p. 6) since, "knowledge becomes the key resource" (Rzevski 1995, p. 10) in which a society "both demands and creates more information" (Marchionini, 1995, p. 1). Furthermore, "in building the information society of the future, the aim should be a society of understanding, in which the first function is to carry out useful research and to generate

new information that technology can pass on to common use. Without research, the information society will be an empty shell" (Stenros, 1996, p. 4). Although the above statement suggests the need for research in general, he also adds that in relation to design: "theory and research will be an expanding segment of design in the information society of the future". Meanwhile in addition to the above comments regarding the entry of the society into the 'information age', Hayek, Reich and Drucker (1998, p. 55) introduced the theory of knowledge creation, which suggests that the 'information society' paradigm switches to the 'knowledge society'. Nonaka and Takeuchi (1998, p. 55) described this theory as the development of knowledge along "a spiral process of interaction" in which these "interactions result in the creation of new knowledge". This also matches Owen's model (1998, p. 11) of knowledge generation within a research process, in which he states that "knowledge is generated and accumulated through action". This process is illustrated in figure 2.5, in which "knowledge is used to create works, and works are evaluated to build knowledge":

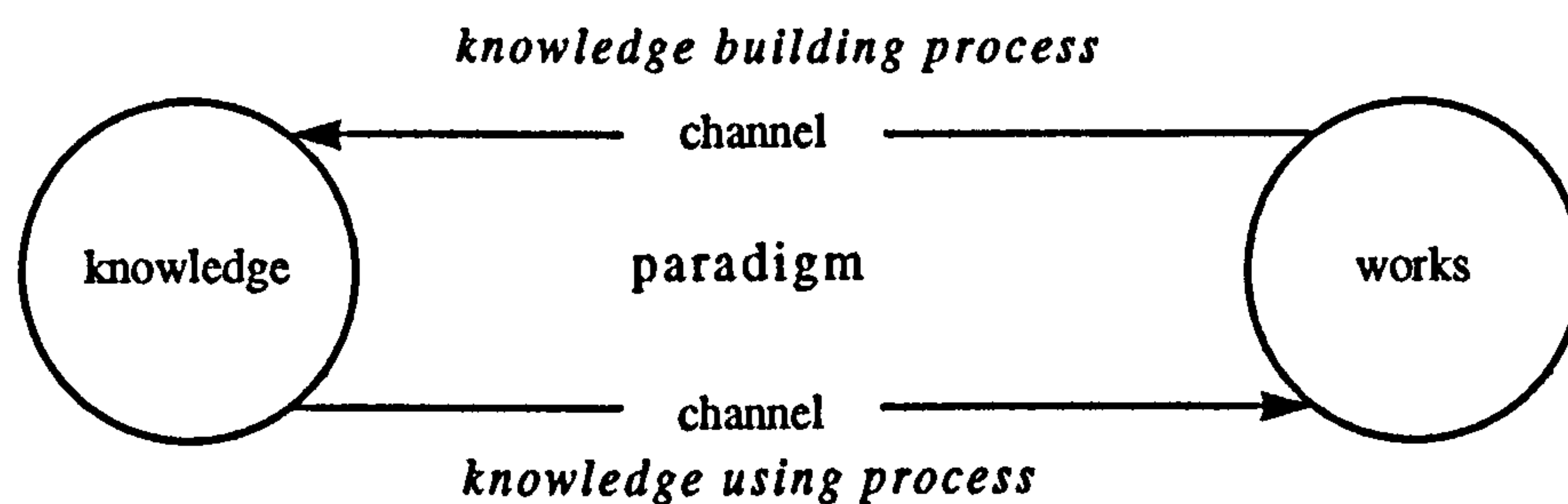


Figure 2.5: A general model for generating and accumulating knowledge, 1998  
(source: C. Owen, 1998, p.11)

To conclude this section, literature based interpretations indicate that design itself is a process that describes activities undertaken in the attempt to achieve a distinct aim. It was argued that these aims may not be of the same nature and therefore can have applications in different subject areas. Although literature based interpretations indicate that design as a process is considered independent from the properties that each subject area, it was argued that what may distinguish design within each subject area are those properties that describe what is special or particular. 'Design' in this thesis will then be taken to be a process which describes activities undertaken in the attempt to fulfil an aim in the following established subject areas: fashion, graphic, information, industrial, interior, management, multimedia and textiles. 'Design' in this thesis will also embrace the broader range of subject areas, as the thesis is conscious of the growing interdisciplinary and multidisciplinary nature of design. The newer subject areas include the theoretical and cultural design practices relating to three-dimensional, environmental issues, sustainability, software, interactive systems, digital exhibitions,



digital communication, installations, computer animation. Although the aim of this research is not to identify what is special or particular within each undertaken subject area, one of the most important issues to emerge is the need for an effective means of displaying and communicating their design states and relevant information. It has been also highlighted that the fact of living in the information society means that society demands and creates more information. In building the information society of the future, the first priority is to carry out research that leads to new information and knowledge. Bearing in mind that “the information generated by design research is of crucial importance to the evolution of design and its future health” (Stenros, 1996, p. 4) and “given that research is generally understood as the process whereby new knowledge is generated” (Newbury, 1996, p. 8), the question is raised as to how design disciplines based on the subject areas identified above shape such knowledge, or in other words they perform research. Next is the question how can people involved in design research, experience and be kept informed of design knowledge, or how can design research knowledge be communicated. In terms of these principles, the following section aims to examine the nature of research in general and design research in particular.

### ***2.2.2 Research and Design Research***

Ball (1993) wrote that the term ‘research’ first appeared in the 16th century, but was quite rare until the 18th century by which time it was understood as a “methodological investigation”. Ball also argued that to distinguish it from other forms of enquiry “research is typically characterised by the SORT rule: Scepticism, Originality, Rigour, and Testability”. For the same term, Frayling (1993 / 94, p. 1) referred to the Oxford English Dictionary (OED) in observing that “research with a big R - often used in partnership with the word development - means, according to OED, work directed towards the innovation, introduction, and improvement of products and processes”.

However, the development and pursuit of research within higher education and in particular in the form of a research degree makes it necessary to consider the definition of the PhD (Doctor of Philosophy). Scrivener (1999, p. 1) referring to the UK Council for Graduate Education report entitled *Practice - Base Doctorates in the Creative and Performing Arts* (1997) for the definition of a PhD in which the CNAA cites: “the PhD shall be awarded to a candidate who, having critically investigated and evaluated an approved topic resulting in an independent and original contribution to knowledge and demonstrated an understanding of research methods appropriate to the chosen field, has presented and defended a thesis by oral examination to the satisfaction of the



examiners”. In relation to the definition which De Montfort’s University provides in its Research Degree Regulations and Associated Research Degree Procedures (1998, p. 3) the following statement is given: “the degree of PhD is awarded to recognise the successful completion, under such conditions as are prescribed by Regulations of a supervised programme of individual research, development or design, the results of which have been satisfactorily embodied in a thesis, and which: a) demonstrate an understanding of research methods appropriate to the field of study; and b) demonstrate critical investigation and evaluation of the topic of research; and c) constitute an independent and original contribution to knowledge; and d) demonstrate the candidate’s ability to undertake further research without supervision”.

Within the UK higher education environment the Research Assessment Exercise (RAE) has been established to assess the quality of research outcomes in universities and colleges. This exercise take place every four to five years and its results enables the HEFCE to distribute public funds selectively on the basis of quality and quantity. There have been four RAE’s so far. The first RAE took place in 1988, the second in 1992, the third in 1996 and the fourth, the most recent, took place in 2001. The definition of research applied in all the above mentioned exercises, is given as follows: “research for the purpose of the RAE is to be understood as original investigation undertaken in order to gain knowledge and understanding. It includes work of direct relevance to the needs of commerce and industry, as well as to the public and voluntary sectors; scholarship; the invention and generation of ideas, images, performances and artefacts including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction” (RAE, 1999).

Further accounts are also given by many academics in which they have attempted to explain further the nature of research in general, and in the case of this thesis the nature of design research in particular. Allison (1993, p. 6) referred to research as that which “has been defined as accessible, rigorous and systematic inquiry”, which “increases the sum of knowledge” (Press, 1995, p. 38) and is “intentional, procedural, explicit and publicly accountable” (Gray, 1993).

In addition to these, Gray and Malins (1993, p. 30) also argued that “whatever the discipline, the processes involved in inquiry and research are common to all: a question / problem which is open to inquiry, but as yet ‘fuzzy’; an intentional / procedural



approach; transformation / synthesis / 'new knowledge'; public outcome / communication". Korvenmaa and James (1993, p. 22) point out that "research is, by its generally accepted definition, a process of objectification", while Newbury (1996, p. 9) refers to the four following criteria for the definition of research: "i. systematic, ii. rigorous, iii. critical and reflexive, and iv. communicable". According to him research is 'systematic' because it relates to a predefined system, or research methodology, which is theoretically informed. The word 'Rigorous' means that the research methodology is carried through in such a way that, within the limits of its effectiveness, the most valid results have been achieved. The words 'Critical and reflexive' means that a piece of research should signal the limitations of the knowledge it provides, and finally, the word 'communicable' means that it is dependent on research being circulated amongst peers and also being available in a permanent and accessible form. Archer expressed a similar approach (1995, p. 6) and argues: "research is the systematic enquiry whose goal is communicable knowledge". Archer also described the meaning of these descriptive terms as follows: it is 'systematic' because it is pursued according to some plan; an 'enquiry' because it seeks to find answers to questions; it is 'goal' - directed because the objects of the enquiry are posed by the task description; it is 'knowledge' - directed because the findings of the enquiry must go beyond providing mere information; and it is 'communicable' because the findings must be intelligible and located within some framework of understanding for an appropriate audience. In conclusion to this paragraph, research in general is considered as interdisciplinary and therefore, it is mainly described as a process consisting of attributes that apply to almost all application fields. Therefore, design research in particular should consist of the same attributes as research in general. Based on these principles, if design research is considered to be an intentional, procedural and systematic inquiry whose goal is communicable knowledge that aims to advance and increase the sum of knowledge, the question is raised as to what constitutes design research knowledge.

As stated earlier (p. 16), the term design in this thesis is based on the main subject areas of fashion, graphic, information, industrial, interior, management, multimedia and textiles. The author, however, is conscious of the growing interdisciplinary and multidisciplinary nature of design and art and design pedagogy. The broader range of subject areas include the theoretical and cultural design practices relating to three-dimensional, environmental issues, sustainability, software, interactive systems, digital exhibitions, digital communication, installations and computer animation. Therefore these subject areas form the particular fields in which design research may apply to. It is assumed then, that design research should be the intentional, procedural and



systematic inquiry whose goal is communicable knowledge that aims to advance and increase the sum of knowledge in relation to the specific fields of the subject areas mentioned above. Although this research is not intended to identify and examine what is special or particular about these subject areas, it assumes that design research is the research undertaken in the specific fields of these subject areas.

In order to determine what may constitute design research knowledge it is useful to reference the key subjects that participated in the various Research Assessment Exercises. The Web site for the RAE (<http://www.rae.ac.uk>, 2001) provides this information. The areas that were included in the RAE 92 were as follows: fine art, design for communication, design for production, including typography and graphic communication, design and technology (67 Unit of Assessment: Art and Design, RAE, 1999). In the RAE 96, the key areas were limited to fine art, applied arts, and design for communication including fashion design, theatre design, typography and graphic communication but excluding engineering based design which returned to the appropriate engineering unit of assessment (64 Unit of Assessment: Art and Design, RAE, 1999). Finally, in the most recent RAE 2001, the range of key areas involved in the Art and Design Unit of Assessment (64) increased significantly and a number of new areas were added. The key areas of Art and Design included were as follows: painting, public art, sculpture, performance, installation, time-based art, printmaking, photography, screen productions, virtual reality, multimedia, digital and interactive art and design, software design for digital artefacts, animation, illustration, graphic and communication design, art and design in the landscape, environmental and interior design, theatre design, exhibition and events design, fashion, textiles, jewellery and metalwork, ceramics, glass, automotive design, product and furniture design, art and design management, pedagogy in art and design, cultural, theoretical and historical studies. What constitutes design research therefore seems to have evolved and the RAE has contributed to this process. It is therefore argued that in the UK the RAE is the driving force behind the expansion of design research as the RAE is committed to reference all those key areas that seem to be at the forefront i.e. the theory and practice of contemporary culture within any research discipline. Based on these findings, design research is a discipline, which is undergoing continuous refinement and growth in terms of the key areas involved.

In addition to the debate as to what may constitute design research knowledge, Newbury (1996, p. 9) acknowledged that: “there is not one epistemological position from which art and design research makes knowledge claims”. Although this research



does not aim to identify the truth of this statement, it is argued that design is included in RAE's definition of the research term. Further to this, "research is generally understood as the process whereby new knowledge is generated" (Newbury, 1996, p. 8, Gray and Malins, 1993, p. 30). It is also accepted by theorists such as Popper, Kuhn and Feyerabend that "all knowledge is to some degree theory dependent" (Newbury, 1996, p. 8) in which "theories are nets cast to catch what we call 'the world': to rationalise, to explain, and to master it" (Popper, 1983, p. 59). Therefore, if "the new currency of knowledge is the product of a special form of experience, to be known as experiment" (Boorstin, 1985, p. 394) then, "experimentation makes it possible to shape theory" (Friedman, 1997) and as "there is little to point to as a theoretical knowledge base for design" (Owen, 1998, p. 10), "it is claimed, design has no theory and thus no research methodology of its own to understand itself" (Press, 1995, p.34).

However, these arguments that design research makes no knowledge may not stand up since according to the Popperian theory "generalisations, although never verifiable, are nevertheless falsifiable" (cited by Archer, 1995, p. 7). In addition to this, it may be unwise to judge that design research makes no knowledge claims, in that the design research endeavour is not capable of producing 'knowledge' through experimental procedures since design research "is a relatively new endeavour" (Allison, 1992). This is a concern that is supported by numerous others involved in design research, such as: Korvenmaa and James (1993, p. 23), Walker and Dagger (1995, p. 2), Friedman (1997), and Owen (1998, p. 9). Further, the findings which relate to the key areas covered by the various RAE's mentioned earlier demonstrate that design research is expanding which in itself may indicate that the discipline is undergoing a period of self establishment which is a common factor of a maturing discipline.

Accepting that design research is a maturing discipline, it is argued that design research should provide evidence of what has been done to prove that the design research endeavour is capable of knowledge making. This is the concern of Cooper (1995, p.14 and 19) who pointed out that "output is one of the most important issues for design" and therefore, there is a need "to publish design research, to inform its peers for review and criticism, that can prove the value of design research to society and supply evidence for its development and support". RAE (1996) also provides support for the value of disseminating research outcomes and making them available to the public. In particular, the RAE states that published research outcomes including printed academic work, art/artefacts, design of exhibitions or events, editorships and curation, public commissions, media presentations, mass production, patents and registered designs,



new processes and materials, new devices, reports, other non textual research output, authored books, chapters or articles in books or journals, papers and posters can be helpful in guiding funding decisions in industry and commerce, charities and other organisations that sponsor research. It can also give an indication of the relative quality and standing of UK academic research.

Additionally, Friedman (1997) argued: “the fact that design is young poses challenges to the development of a rich theoretical framework. In order to develop this framework, a community of researchers must identify themselves and enter into dialogue”. Vakkari (1996) identifying the need for a dialogue within a young scientific discipline argued: “discussion about the scope and content of a young field of research helps to form the identity of its scientific community. Internal organisation and boundary definitions are a central means for the social institutionalisation of a discipline. The exchange of opinions and even disputes concerning the nature and limits of a field to help to construct its identity and thus become bases for social cohesion”. For a dialogue or discussion within the design research community to take place, the involvement of the design community is required. This dialogue or discussion may enable or further support criticism on what has been done and may therefore drive what further examination and investigation is needed. Design researchers, scope and content are the components of this prospective dialogue. However, communication is considered as the process that drives such a dialogue and/or a discussion. In addition to this, communication itself is placed as an inseparable attribute within the definition of the research term irrelevant of its field application. The question is raised then as to what constitutes communication in general, and therefore without arguing as to whether there is communication or not within design research, the question should be, what needs to be considered in order to enable, or to improve communication within design research.

In conclusion to this section, research in general is considered as the process whereby new knowledge is generated through a systematic enquiry. Likewise the term research just like design appears to be interdisciplined, and irrelevant in the field of application. Therefore, it is argued that design research should be an endeavour that aims to advance and add to the sum of knowledge relating to the design subject areas of fashion, graphic, information, industrial, interior, management, multimedia, and textiles. As it has been claimed that design research is a young endeavour, the need for enabling or improving communication within the design research discipline was also highlighted. Therefore, the following section is dedicated to the definition of communication in general. In addition to this, the meaning of information and media within the



communication process will be presented as required for the act of communication itself. Next, the issue for the communication of research results within a discipline, as well as within design research is explored. Within this context, the needs and benefits of communicating design research amongst its proponents will be discussed, and finally, this will clearly identify the nature of the problem with which this research is concerned.

### 2.2.3 *The Nature of Communication*

During the last fifty years, communication has been subject to much research. Research into communication theory has its origins "in the wish to test and increase efficiency and effectiveness in education, propaganda, advertising, human and public relations" (McQuail and Windahl, 1981, p. 5). It is actually a discussion that started after the second world war in the United States of America (USA). Research into communication has resulted in the formulation and proposal of several representations in verbal, mathematical and diagrammatic forms, known as models, in which a model is considered as "a consciously simplified description in a graphic form of a piece or reality, which seeks to show the main elements of any structure or process and the relationships between these elements" (McQuail and Windahl, 1981, p. 2). Further accounts of what a model is considered to be, are also given by Benyon (1997, p. 6 and 7), Lucey (1991, p. 160) and Woodward (1982, p. 8).

Communication in its most fundamental sense, involves the transmission of information from one point to another. According to McQuail and Windahl (1981, p. 3) "communication implies a sender, a channel, a message, a receiver, a relationship between sender and receiver, an effect, a context in which communication occurs and a range of things to which 'messages' refer". Figure 2.6 illustrates communication in its most fundamental sense:



Figure 2.6: A general model of communication

Gerbner (1967) defined communication as "social interaction through messages" while, Theodorson and Theodorson (1969) defined it as "the transmission of information, ideas, attitudes, or emotion from one person or group to another (or others) primarily through symbols". Regarding this, McQuail and Windahl (1981, p. 3) pointed out that "sometimes, there is an intention, or purpose to 'communicate' or to 'receive'.



Communication can be any or all of the following: an *action on* others, an *interaction with* others and a *reaction to* others". The following paragraphs briefly present the main communication models and aims to provide an understanding of how researchers have attempted to explain the communication process.

The originator of one of the most basic models in communication research is Harold D. Lasswell's (1948) in which he pointed out that "a convenient way to describe an act of communication is to answer the following questions: who - says what - in which channel - to whom - with what effect". This is illustrated in the figure 2.7:



Figure 2.7: The Lasswell Communication Model, 1948

Although Laswell's simple model has been used in several ways, it is found that it is somewhat too simple and some researchers have developed it further. For instance, Braddocks (1958) extension of the Lasswell model added two more considerations to the act of communication, namely "the circumstances under which a message is sent, and for what purpose the communicator says something". However, the mathematician Claude Shannon who worked for Bell Telephone Laboratory and Warren Weaver in 1949 put forward other considerations in the form of questions such as: "what kind of communication channel can provide the maximum amount of signals? and how much of the transmitted signal will be destroyed by noise from transmitter to receiver?" According to them, communication is described as "a linear, one way process".

However, other communication theorists have "emphasised the importance of the two-way nature of communication in which the success of the process depends heavily upon the sender receiving feedback" (Evans, 1990, p. 25). Regarding this, DeFleur in 1966 developed the Shannon and Weaver model further allowing feedback and achieving correspondence between transmitter and receiver. Osgood and Schramm (1954) described communication as a highly circular model in which Schramm remarked that "in fact, it is misleading to think of the communication process as starting somewhere and ending somewhere. It is really endless. We are little switchboard centres handling and rerouting the great endless current of information". A development of Osgood and Schramm circular model is that of Dance's helical model (1967) in which he suggested "that communication comes back, full circle, to exactly the same point from which it started". The major difference here, is that Dance underlines the dynamic nature of



communication. The helix describes how different aspects of the process change over time and it is illustrated in the following figure 2.8:

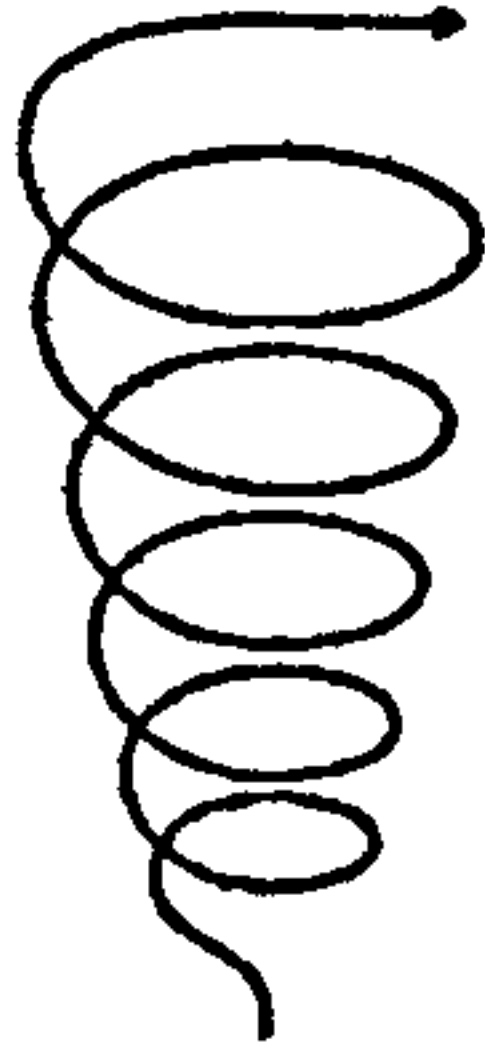


Figure 2.8: The Dance's Helical Model of the Communication Process, 1967

Based on these principles, communication is a duplex, two way, process in which a message (either as action, interaction and / or reaction, see McQuail and Windah, 1981, p. 3) is transferred from one point to another. In human terms the sender, channel and recipient are all affected by the transmission and reception. Therefore, this message transmission should concern the sequences that have taken place from the dispatch of the sender's message up to message reaching the receiver.

However, extended research in communication has been also concerned with specific purposes. Within the specific purpose of someone seeking information within a system, Ball-Rokeach and Defleur's (1976) expressed the idea that "receivers depend on a number of structural conditions in order to retrieve information resources for their knowledge". This has directed the interest of some researchers to the problem of how people retrieve their information. As an example, the Dohohew's and Tipton's flow chart model of seeking, avoiding and processing information (1973) is illustrated in the figure 2.9:

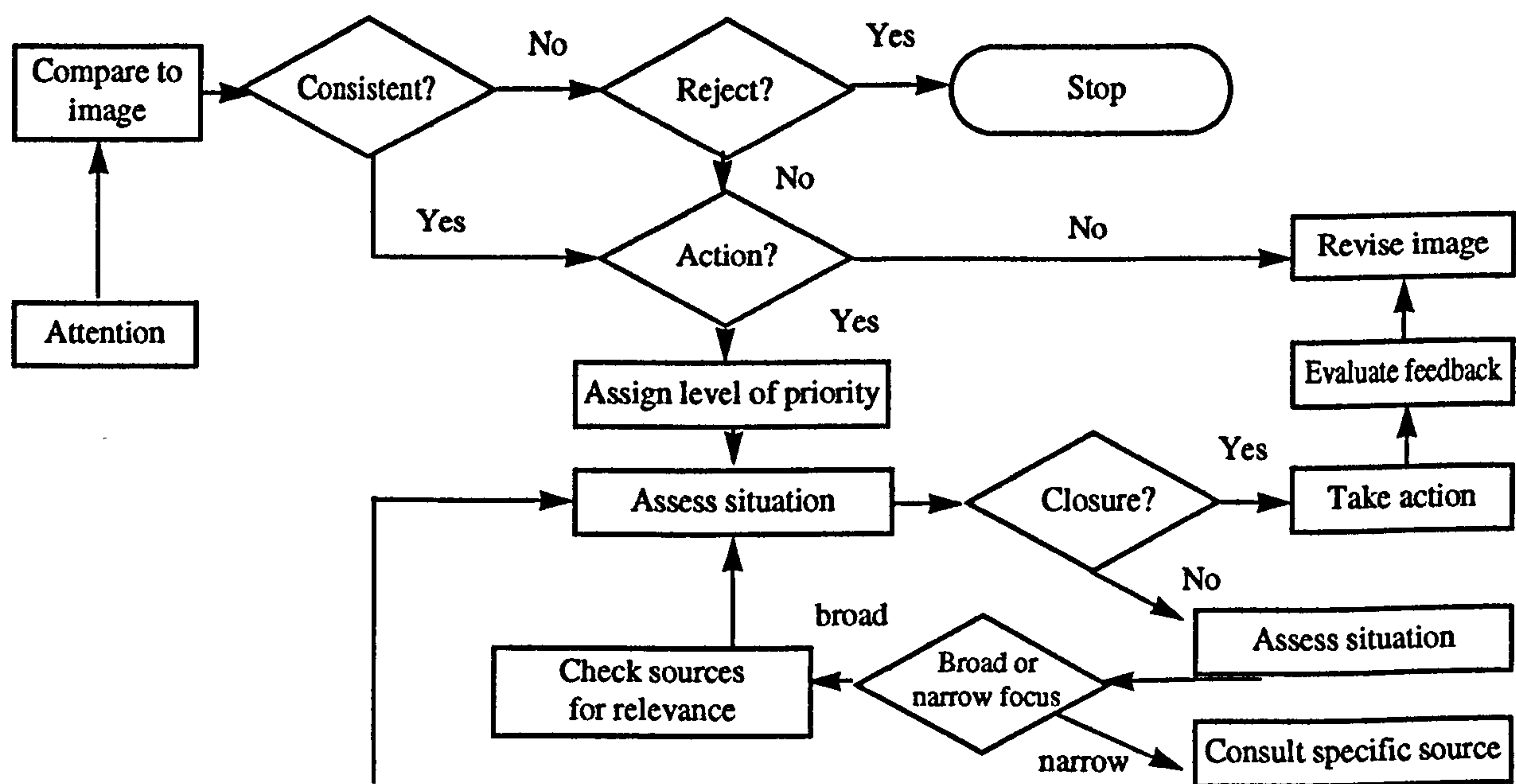


Figure 2.9: The Dohohew and Tipton's Flow Chart, 1973



However, Rogers (1976) claimed that the media for information distribution may play an important role. MacDonald (1986) argued that communication is "a process of exchanging information through the use of commonly understood symbols", which "when taken place within a single discipline (science for instance), communication is facilitated by a common understanding of terminology and more importantly, because they (participants) share the same constellation of beliefs, values and techniques" (Kuhn, 1970). This is also supported by others, such as Waern (1992) and Schartz (1992). In particular, Waern (1992) pointed out that "an important factor that makes communication successful is the common ground, including the knowledge, beliefs and presuppositions shared by both participants". Therefore, the question is raised as to what constitutes a common ground within a certain discipline or interested group. In other words, what information needs to be communicated and how it can be represented in a way that can be understood by this certain interested group.

To conclude this section, this thesis will refer to communication as a two-way process evolving a relationship between a sender, a piece of information, a medium and a receiver, which results in an information that is dispatched by a sender reaching a receiver. Based on these principles, the question is raised as to how and what needs to be presented in order to improve the transmission of information. Therefore, the following section will present the nature of the information as well as the nature of media as tools for processing information. As this is not aimed at presenting all the available media used for transferring information content, it will focus on the media used in information seeking procedures for the communication of research.

### *2.2.3.1 The Nature of Information within the Communication Process*

Very often, the 'information' context is interwoven with the human need to manage some enterprise, which Benyon (1997, p. 2) described as the contextual task such as at a simple level "catching a train", up to a more complex one of "running a multi-national business".

This view of the need for information at a very general level is illustrated in the following figure 2.10, in which the information system poses as "a system to collect, process, store, transmit and display information" (Wood-Harper, 1990):



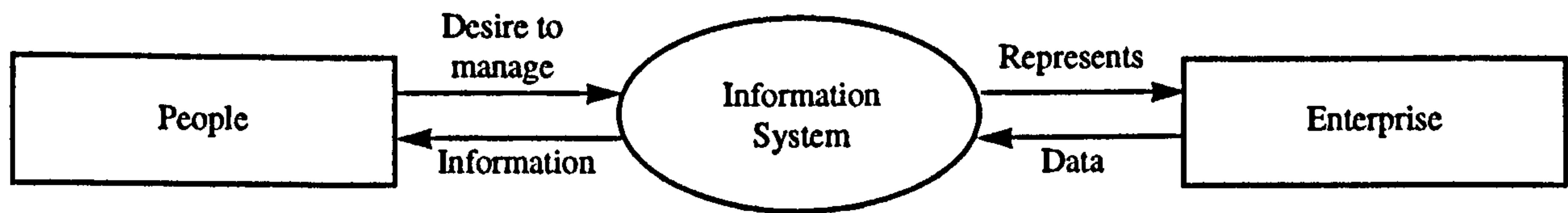


Figure 2.10: Human need information to manage an enterprise,  
source: Benyon, 1997, p. 3

Furthermore, Tschritzis and Lochovsky (1982) described the concept of information as that generally associated with the idea of 'surprise value'. For instance, Mirabito (1994, p. 2) defined the concept of information as a collection of symbols that, when combined, communicates a message or intelligence. On the other hand, Buckland (1991) distinguished information as process, (referring to the act of communication) information as knowledge, (referring to the increase or reduction of uncertainty) and information as thing (referring to the objects that may impact information). In addition to this, Tschritzis and Lochovsky (1982) argued that something is information if it enables the recipient to know something which they did not know before. Information according to them is 'an increment of knowledge'. This view is also supported by others, such as, Avison and Fitzgerald (1995), Marchionini (1995, p. 5 and 6), Hicks (1993), Laudon and Laudon (1991), Maddix (1990), Clare and Loucopoulos (1987), Galland (1982) and Belkin (1978). Maddix (1990, p. 50) argued that "information results in a change of state in the recipient", while Belkin (1978) pointed out that, generally, "information is anything that can change a person's knowledge". Galliers (1987, p. 4) defined the meaning of information as "that collection of data, which, when presented in a particular manner and at an appropriate time, improves the knowledge of the person receiving it in such a way that he / she is better able to undertake a (required) activity or make a (required) decision". On the same basis, Lucey (1991, p. 14) distinguished information from data. He defined 'data' as the input raw material from which information is produced, while, 'information' is the 'data' that has been processed in such a way as to be useful to the recipient.

To this extent, information in general has no value in itself, its value derives from the value of the change in a decision behaviour. In addition to this, Appleton (1984) argued that each combination of facts and meanings defines an individual piece of data, which when supplied in response to a request, becomes information. Within this context, Lucey (1991, p. 19) described information as 'good information' which when it is used, creates value and includes the following qualities: relevance, accuracy, completeness,



confidence in the source, communication to the right person, timing, detail, channels of communication, and understandability. Aiken (1996, p. 35) further expressed these criteria as follows: accuracy, completeness, consistency, extendibility, flexibility, modularity, reliability, relevancy, stability, timeliness and validity.

However living in the 'information society' as described earlier (Christie, 1985, G7 Information Society Conference, 1995, and Zuboff, 1988), Marchionini (1995, p. 1) argued that "the general consequences of the information society are threefold: larger volumes of information, new forms and aggregations of information, and the new tools for working with information". It must be considered however that more information does not necessarily convey better information to its users (Lucey, 1991, p. 16) and that the argument of Marchionini does not refer to the data itself, but to the 'good information' as Lucey determined, users must be prepared to respond to the Marchionini's threefold situation. In this context, users interested in information may be classified in the following two groups according to their actions: by those who are seeking information, hence information seekers and those who contribute and provide access to information for others, hence information providers. However, there is no restriction as to whether users may or may not physically belong in both groups.

To this extent, both groups, information seekers and information providers should be prepared for the new situation as Marchionini argued. Information seekers should increase their ability to seek and retrieve information available to them by employing the following criteria from Doyle (1992) : 1. recognise a need for information, 2. identify and locate appropriate information sources, 3. know how to gain access to the information contained in those sources, 4. evaluate the quality of information obtained, 5. organise the information, and 6. use the information effectively.

Therefore, information providers should also improve their performance in terms of the availability and accessibility of their information in relation the following functions as stated by Christie (1985, p. 38) which include: 1. generating information, 2. storing information, 3. seeking information, 4. retrieving information, 5. using information in a variety of ways, and 6. communicating information to others.

Marchionini (1995, p. 5 and 6) in relation to the information seeking action, referred to the "process in which humans purposefully engage in order to change their state of knowledge" and which "is closely related to learning and problem solving" situations.



In relation to the seekers' needs, Marchionini (1995, p. 49) classified the information seeking process as systematic and / or opportunistic and is composed of a set of subprocesses, as depicted in the following figure 2.11. Recognising and accepting an information problem according to the Marchionini's information seeking process, may be characterised as a gap or a need (and this is supported by Dervin's theory (1992) and Taylor (1962)) or as an 'anomalous state of knowledge' as described by Belkin (1980). Waldron and Brooks (1994, p. 242) presented the 'sense making theory' of Dervin in which, "individuals when they cannot deal with a situation in order to proceed, face gaps and seek help through building bridges". Gaps can be experienced if there is not enough information or resource to proceed in a given situation and therefore, individuals in order to overcome these gaps, try to bridge them "by seeking information, or developing strategies to obtain the pertinent information". The understanding of this gap or need in an articulated form leads to the definition of the problem, in which the seekers select a source or a search system and formulate a query according to their understanding of the gap / need. Execution of the search refers to the actions taken for conducting a search query. For instance, for searching on a computer database the execution refers to the action of typing the formed query. When responses are provided by the search system, the seeker examines the relevance of retrieved items with respect to his / her identified need and thereafter he / she judges their relevance. Finally, the seeker, according to the results provided by the search system, decides whether to stop or progress the information seeking process. This process is depicted by Marchionini (1995, p. 50) and it is illustrated in the following figure 2.11:

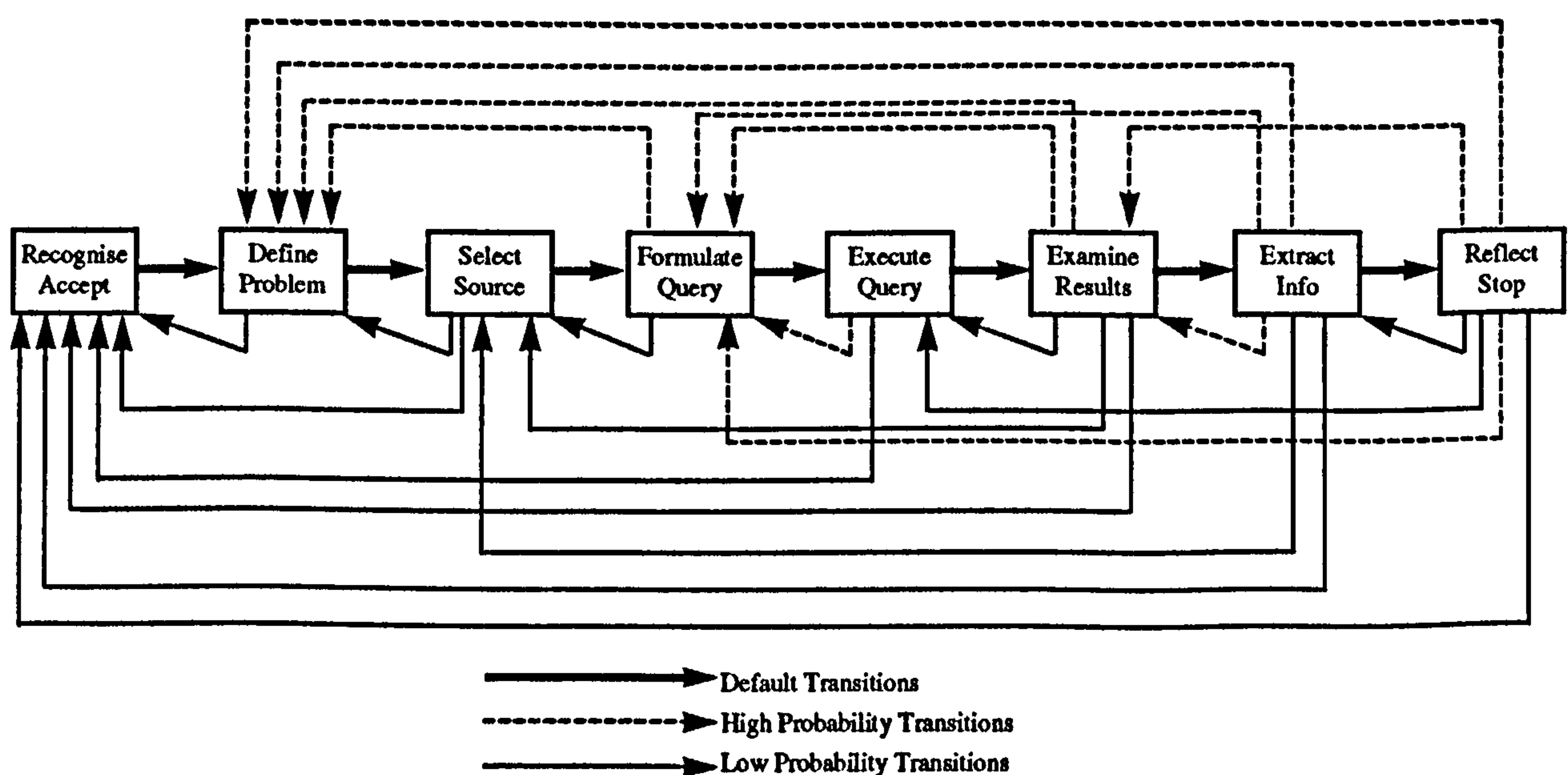


Figure 2.11: Information Seeking Process, (source: Marchionini, 1995, p. 50)



Therefore, a system which collects, processes, stores, transmits and displays information in the way the information seeking process is described above, is known as an information system. Although information and communication systems can make an information provision, and, therefore, involve the transmission of information from one point to another, it is argued that communication systems differ from information systems by the way information is communicated. For example, within an information system, the information contributor submits his / her message which is then stored in the information system's container. At this time, communication has not occurred since, communication results in a message received by someone else, the recipient. It is therefore assumed that the information system's container is not the recipient, since information systems, as described above, are those systems that aim to both collect, process, store, transmit and display a contributors' submitted information content to others, ie. to the information seekers. Transmission therefore does not imply reception. Therefore, although both communication and information systems involve the transmission of information from one point to another, they differ in the way information reaches the recipient.

However, as mentioned earlier by Doyle (1992) and Christie (1985, p. 38), representation, classification, quality of information and the means of communication are considered to be very important criteria for retrieving available and accessible sources of information. To this extent, one of the basic problems within an information system, is representing information in a way that can be understood in the same level of quality, context and capacity as it was created. In particular, there are a number of emerging issues within the context of information representation. This is supported by Marchionini (1995, p. 140) who stated that "problems associated with the representation of knowledge are central to research in information science". He argued, that representation can be classified as descriptive or semantic (p. 142) in which descriptive surrogates identify the attributes of items, such as author, producer and designer, and semantic attributes represent the meaning of objects in a collection, such as titles, headings, and abstract (p. 143). A similar approach has been suggested by Heaps (1978, p. 263), in which he argued that there are two forms of information representation within a document. "The first is based on attributes that often represent features physically present in the document; such features might include the title, the abstract, and author names. The other form of representation is based on indexing terms that are often chosen in reference to an external scheme of indexing such as might be described by a thesaurus". Other important issues for information representation within



an information system involve the classification and the quality of the represented information. Benyon (1997, p. 52) referred to classification as "the process of recognising various objects that share certain characteristics. Classification of objects means that we can represent and discuss a complex situation in simpler terms". Quality that will ensure the validity and reliability of information is a result that may be achieved through the use of a refereeing system, although it is admitted that referees can make mistakes. However, "the refereeing system is generally believed by scientists to provide the best method of imposing a uniform scientific standard" (Ziman, 1968). Finally, the means of communication is of fundamental importance in order for information to be transmitted and reach the recipient. The question is then raised as to what media are available for delivering information content and to what extent these media may help to improve the transmission of information content as described above, i.e. the quality, representation and classification.

To conclude this section, information in this thesis is considered to mean that data which is capable of changing the state of the recipient's knowledge. Additionally, it is argued that systems providing information to interested parties: hence information systems differ from communication systems in the way that information reaches the recipient. This is because, a communication system provides information while an information system need not communicate. In addition to this, representation, classification and quality of information are considered to be the emerging issues within an information system in terms of how information can be better presented and communicated to these interested. Based on these principles, a means of communication is also considered to be of great importance in terms of how information can be transmitted to the recipient and therefore, the following section aims to review the media available for communication and information systems. In keeping with the aim of this research, to improve communication within design research, it will also present systems used for communicating research in general, as well as, systems for communicating design research in particular.

### *2.2.3.2 Media for Communication and Information Systems*

Continuous development in the media technologies have revolutionised the way people communicate. As O'Reilly (1995) points out "the evolution of media continues to bring us closer to what is perhaps a fundamental human goal - to create a medium that reproduces, or exceeds, the human experience. Each new communication medium takes



us a little nearer to that goal". To this extent, information today is transformed in various ways to an extent never experienced before.

Evans (1990, p. 32-33) referring to ways of transforming information content cited the principal communication media, and these are: "written, oral, visual and computerised". In particular, 'written communication' includes: letters, reports, abstracts, articles, books, periodicals, journals while 'oral communication' includes: face-to-face discussions, interviews, meetings, seminars, conferences, and telephone. 'Visual communication' includes: diagrams, images, slides, videos, tapes, etc and finally, 'computerised communication' includes: computer networks, fax, video-conferencing, databases, and CD-ROMs.

Although the above classification type is useful, for this research, another classification type is employed which is capable of handling information material based on their original media form, and these are: printed, audio-visual, events and computer. It is argued that this classification has the following characteristic: printed material is visual, while an audio-visual material adds to this the audio value. Consequently, events are capable of combining both values (visual and audio) in addition to the site attendance, ie. in a conference or an exhibition site. Finally, computer based material is capable of combining all the values mentioned above in addition to distant site attendance, e.g. real-time attendance to a video-conference. Therefore for the purposes of this research, material based on computerised media will be called 'computer based', while all the others will be 'non computer based'.

Developments in current computerised communication media were envisaged by theorists decades ago. For example, twenty-five years ago, Sarnoff (1964) in a speech to the 1964 Joint Fall Computer Conference stated in relation to the future information seeking process: "it will be possible eventually for any individual sitting in his office, laboratory, or home to query a computer on any available subject and within seconds to receive an answer".

However, "as more information becomes available in electronic form, more systems are developed to support electronic information seeking". This is Marchionini's view (1995, p. 162) on the continuing evolution of information seeking, in which according to him an information system that obviously facilitates a search capability, as well as, a search system "is a source that represents knowledge and provide tools and rules for accessing



and using that knowledge" ( p. 38). However, developments in relation to electronic, as well as, to computer based information systems have been also made, including: hardware advances, integration of application software, vector representations and human computer interfaces. These developments of electronic environments have also influenced "the information process, involving changes in the volume of information available, remote access, transfer speed and behavioural action of users" (Marchionini, 1995, p. 162).

To conclude this section, media in this thesis is considered as the means to transform and communicate information with a content that may be classified in terms of its material form, ie. printed, audio-visual, events and computer based materials. For the purpose of this research, material which is based on computerised communication medium will called 'computer based materials', while printed, audio-visual and events 'non computer based materials'. It also highlights the fact that more information today and in the future will be based on computerised communication forms which are capable of supporting, handling and representing other media forms, ie. text, image, video, video-conference. Based on these principles, the following paragraphs will describe computer based information and communication systems, based on new Communication and Information Technology, including the On-line Public Access Catalogues, the CD ROM based Databases, the Internet and the World Wide Web which are widely used for searching and delivering information content related to research, electronically. Next, it will present the advantages and disadvantages of using such computer based communication and information systems, and the major search methods used for retrieving information content from these systems.

#### 2.2.3.2.1 On-line Public Access Catalogues (OPACs)

Most of the present libraries, and particularly academic libraries, provide their collection of material through a searchable computer based system called OPAC (On-line Public Access Catalogue). OPAC systems provide collections of books, reports, periodicals, journals, and miscellaneous material such as video and slides. The search facility includes title, author name, subject, keyword and their combinations.

The following figure 2.12 illustrates the De Montfort's University OPAC system located at Kimberlin Library (1999):



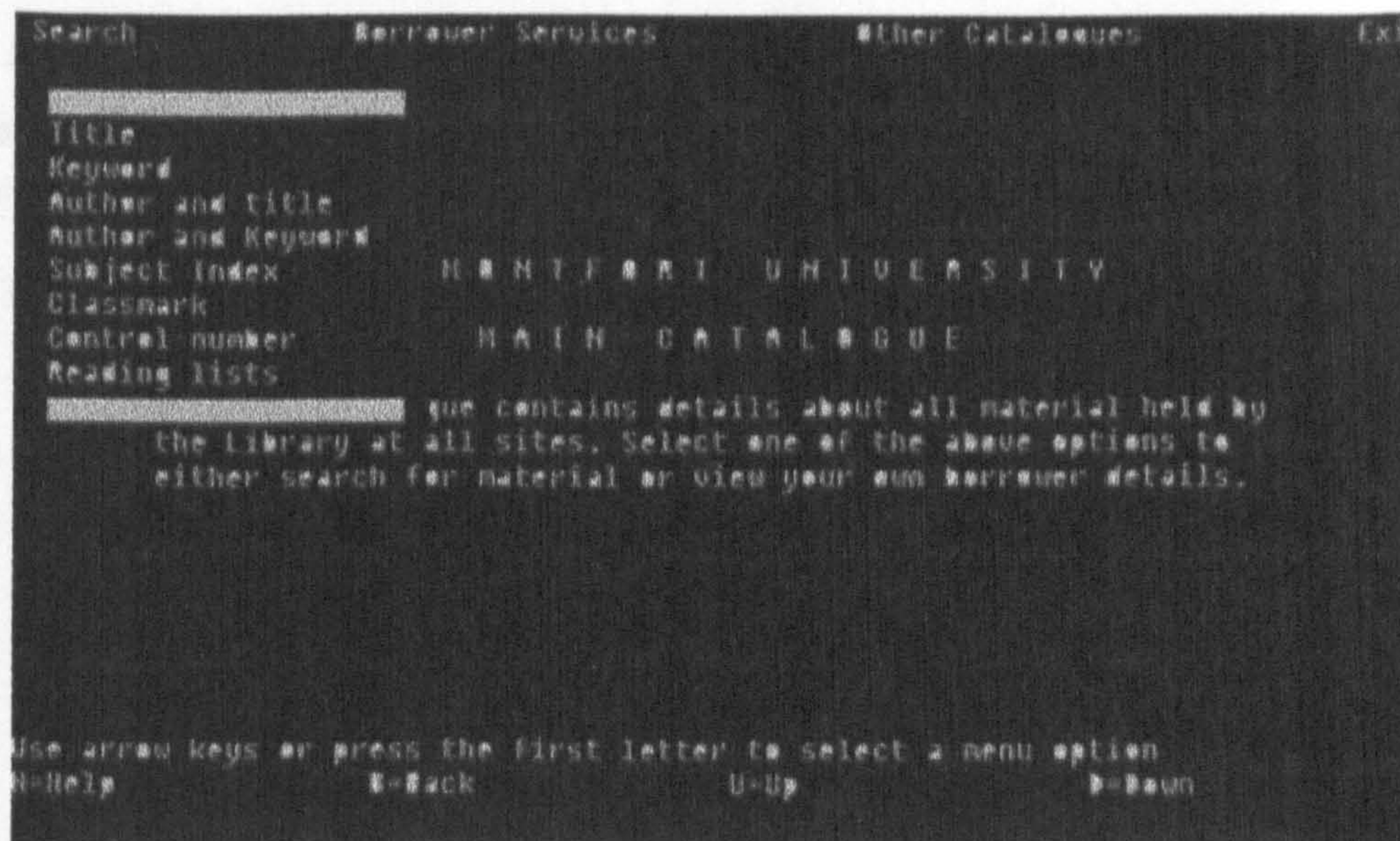


Figure 2.12: The De Montfort's University OPAC system, (1999)

However, regardless of their popularity, there are many disadvantages in using an OPAC system. A major weakness of an OPAC system is the currency of information. OPACs usually update their content with new material once per year. In addition to this, Brinkley and Burke (1995, p.4) argued that OPACs systems were designed with the traditional card catalogue principle, that is to search for known items. With regard to this, Hancock-Beaulier's (1992) research studies have "shown that in fact the vast majority of searches carried out on OPACs were subject searches, the known-item being the user's access point to that subject". In addition to this, Marchionini (1995, p. 87) presented the studies of Bates (1986) and Borgman (1986) in which they discovered that "OPACs allowed more subject access. They also indicate that 30% to 50% of all subject searches result in no hits". On this basis, Wu, Zhao and Ramsden (1994, p.25) argued that "it may (be) insufficient for users to decide whether retrieved material is really relevant". They also indicated the need for such systems to display both textual and visual material in support of the information retrieved (p.35). Further accounts are also given by Beheshti (1992) who noted that "the lack of a graphical user interface in such systems does not allow the representation of stored records in a visual form rather than simply textually".

However, in 1998, a new system which is also based on the OPAC concept was introduced called COPAC which stands for the Consolidated On-line Public Access Catalogue. "It is an international access catalogue that is based at the University of Manchester, and is funded by the Joint Information System Consortium (JISC). COPAC



can be accessed through a World Wide Web (WWW) interface or through Telnet and provides access to some of the largest university research libraries in the UK and Ireland" (COPAC, 1998). The following figures 2.13 and 2.14 illustrates the COPAC WWW and Telnet interface (1999):

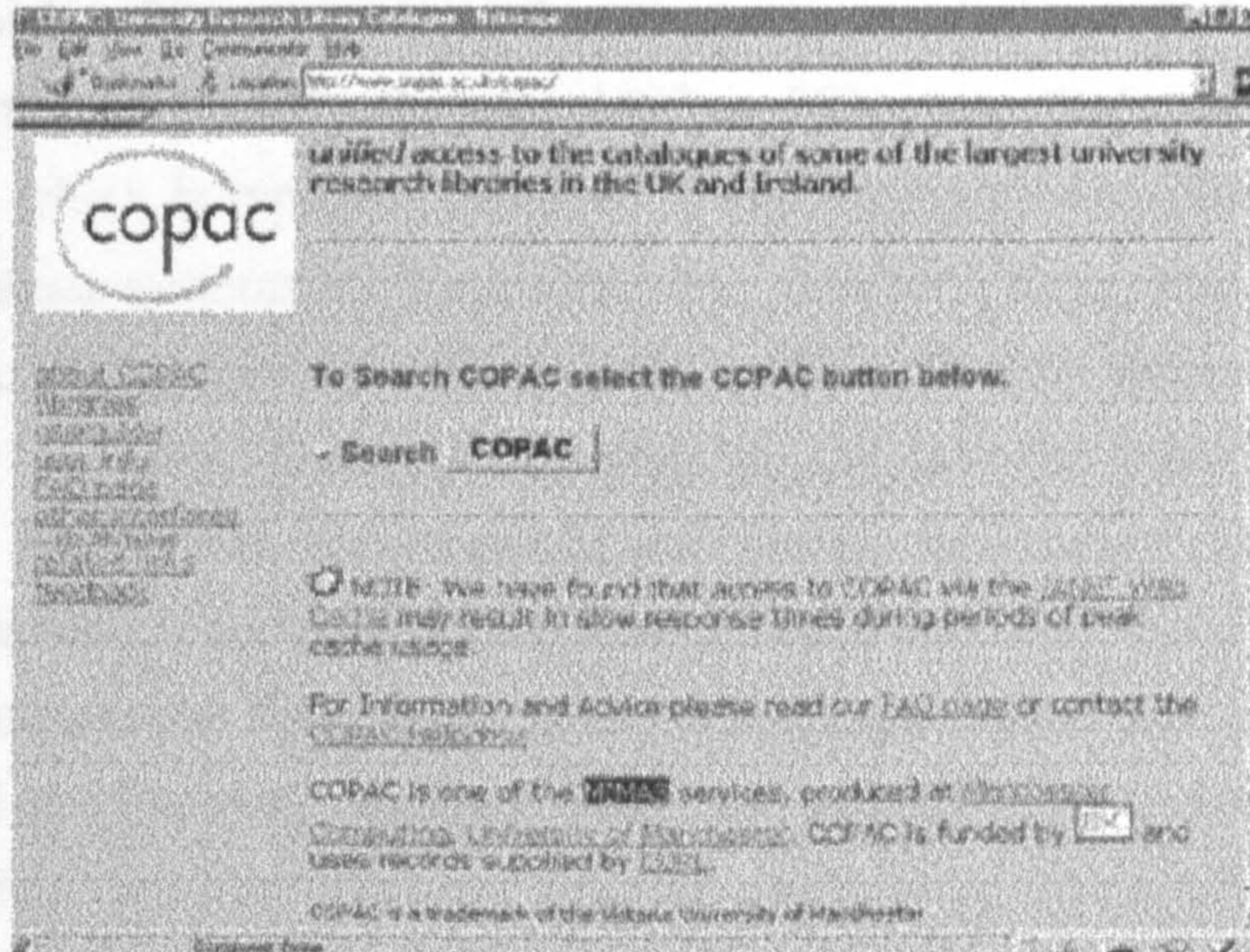


Figure 2.13: WWW COPAC system, (source, <http://copac.ac.uk/copac>, 1999)

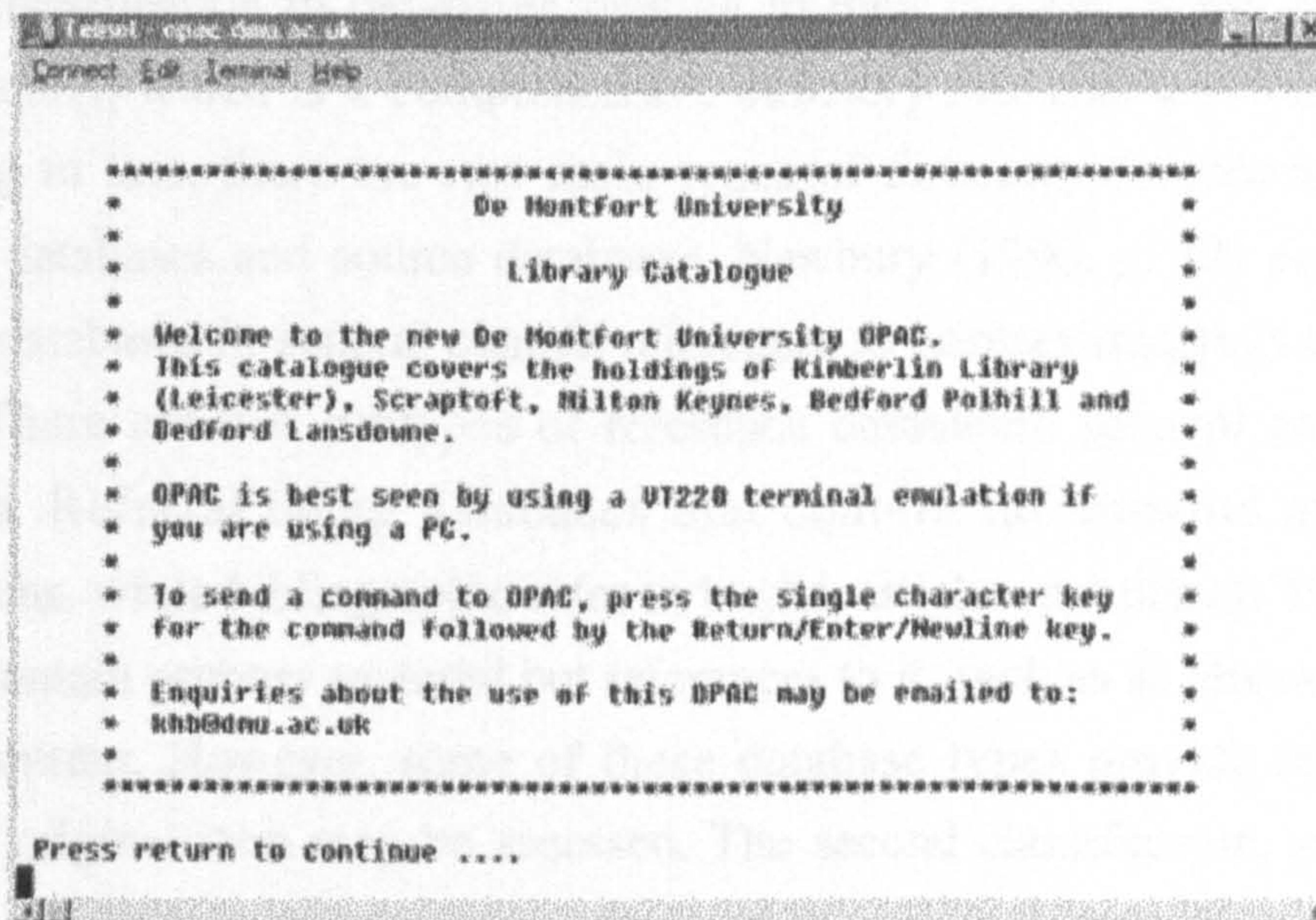


Figure 2.14: Telnet COPAC system, (source: Telnet: copac.ac.uk, 1999)

In addition to OPACs facilities, COPAC facilitates the search for books, reports, periodicals, journals, and miscellaneous material such as video and slides. Its access through the WWW can be found from the address: 'http://copac.ac.uk/copac', while its telnet address is: 'Telnet: copac.ac.uk'.



### 2.2.3.2.2 Databases and CD ROM based Databases

"Database is one of those terms that is widely used without having a precise definition that is shared by all users" (Feiler, 1999, p. 14). However, for the purpose of this research which refers to computer based systems, a database is "a search system that represents knowledge" (Marchionini, 1995, p. 38), or in other words is "a collection of information which is typically arranged to rigid categories or fields - which, in many modern database systems, may comprise text, numbers, dates, sounds, graphics or even video" (Ayre, Callaghan and Hoffos, 1996, p. 592). Further accounts are also given by Lucey (1991, p. 263). Databases in general, fall into the following "three primary categories: Relational, Hierarchical and Network" (Lucey, 1991, p. 264 - 265). Relational databases are those which their data are organised in tables. These databases use the standardised Structured Query Language (SQL) for access to their data. Hierarchical and Network databases both have in-built links, therefore they are linkage systems. They are powerful but require the user to know what links have been established in order to know on what basis data can be searched and retrieved.

Another classification of databases relating to their content, is the one based on the Gale Directory, which is a comprehensive directory that lists a number of databases. According to this, there are two main types of directory databases and these are: reference databases and source databases. Newbury (1996, p. 12) explained that the reference databases in general contain references to primary materials such as books or articles. There are two subtypes of reference databases: referral and bibliographic databases. Referral being databases that contain information about people or organisations, while bibliographic refer to books, articles and theses. The latter subtype does not contain primary material but references to it, such as an abstract or a summary of their content. However, some of these database types provide information as to where the original item may be accessed. The second classification, source databases, contain the complete information content of the original item. There are three basic subtypes and these are: full-text, numeric and image databases. Full-text databases contain the complete text of selected items, such as a database listing and containing the complete contents of all the issues of a particular newspaper. Numeric databases provide data for specific materials, such as a database containing financial data of a population in order to be used for statistical purposes. Image databases contain visual information, such as those databases containing patents. The following figures 2.15 and 2.16 present examples of a reference and a source database:



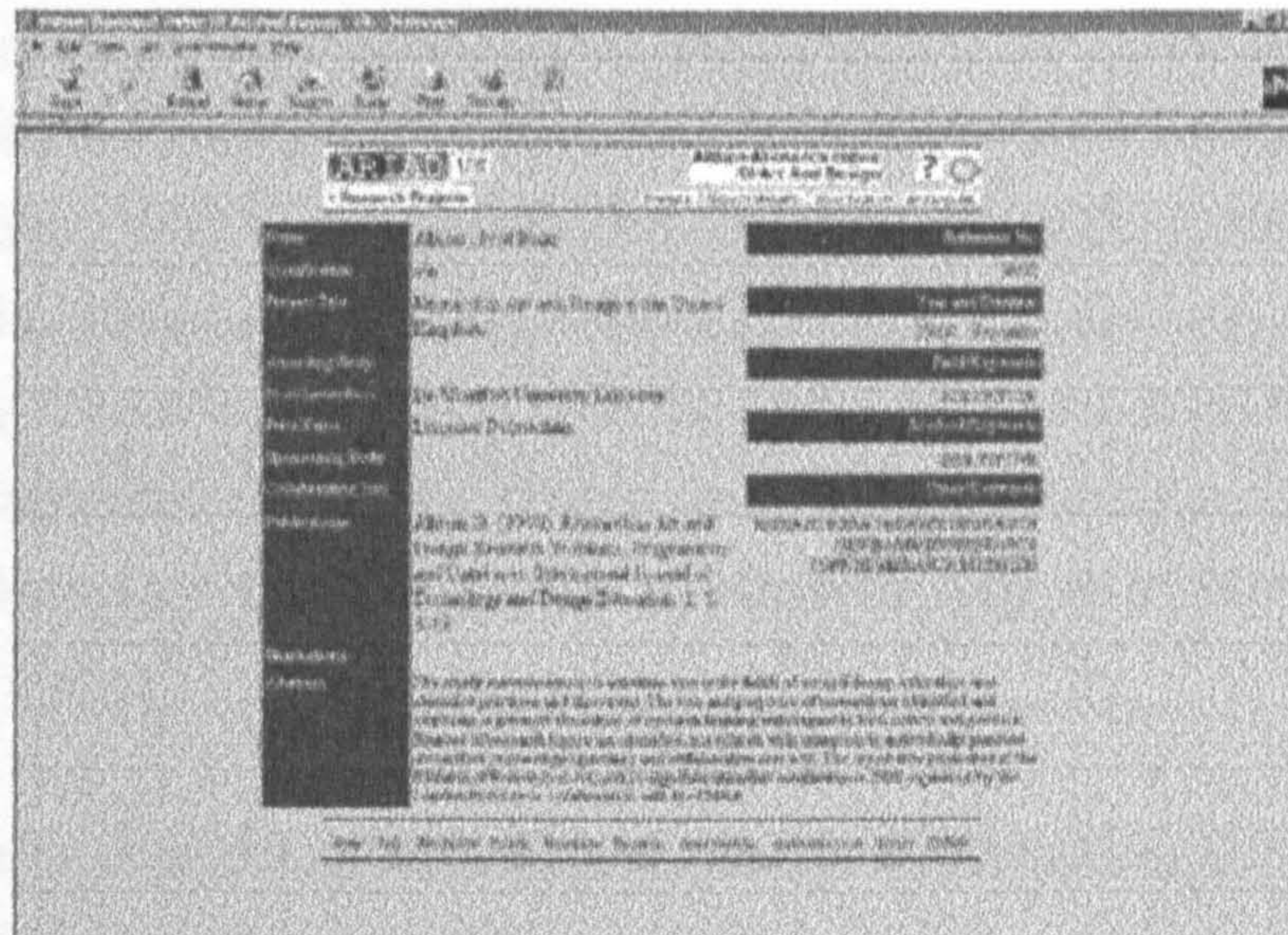


Figure 2.15: Reference Database, (source: ARIAD, 1999)

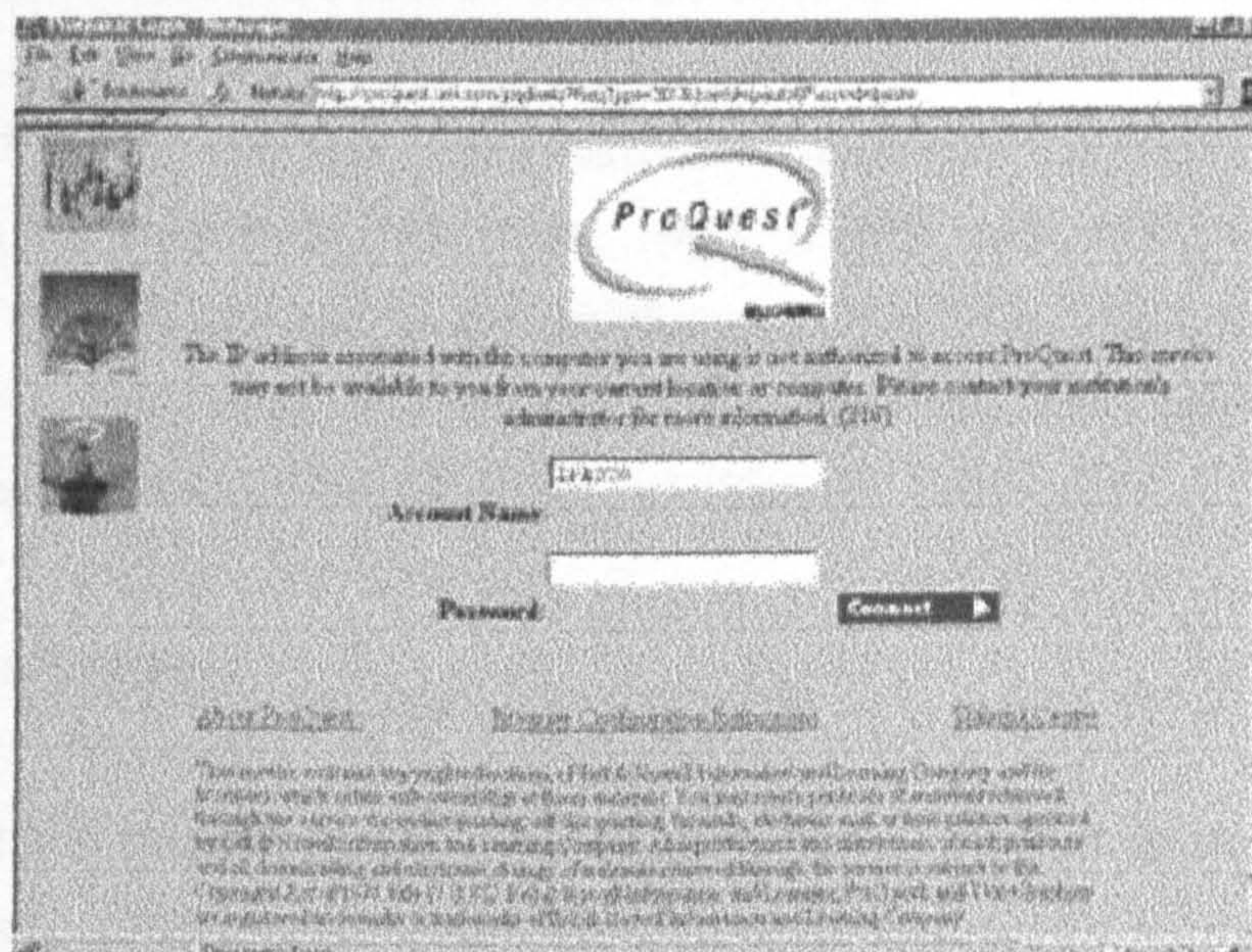


Figure 2.16: Source Database, (source: ABI, 1999)

There are a number of software products available on the market today which can be used to create databases. Some of them are listed by Brown and Honeycutt (1997, p. 851), and these are: Oracle, Sybase, mSQL, Illustra, Microsoft SQL, Postgres95, Ingres, FoxPro, Microsoft Access, File Maker Pro, HyperCard and 4D. Electronic databases are based on a computer form and therefore are accessed through a computer and can provide either on-line or off-line access. Both on-line and off-line databases can be stored on a computer's hard disk space or on a CD ROM (Compact Disk - Read Only Memory). The difference between on-line and off-line databases is in terms of their access point. On-line can be accessed through a computer network, while off-line databases can be accessed only if they are stored on a particular computer.



Regardless of their usability and accessibility, one of the major weaknesses of an off-line CD ROM based database is described by Thimbleby (1995) who argues that "CDs have no memory. If a user learns the contents of a CD, a day later they cannot continue...the document is always the same, and as it is used, the reader becomes increasingly frustrated that new material is harder and harder to find amongst the already encountered material". Within this context, a distributed off-line CD ROM based database as a medium suffers the inflexibility of adding and updating new information content.

Finally, in relation to the technological advances, CD ROMs are considered as a storage medium which "emerged as a major information storage tool in the 1980s" (Mirabito, 1994, p. 59). They are laser disks that can store large amounts of data up to 650 MBs (MegaBytes). "These data can be textual, numeric, visual, animated and / or video information and can be accessed through a personal computer system. They entered the market slowly until early 90s, when hardware manufacturers began to bundle CD ROM drives with their systems" (Justice, 1995, p. 65). However, demand for greater information storage has led to the development of DVDs which stands for the Digital Versatile or Video Disks. "DVDs are CD ROM sized discs which can store larger amount of data up to 17 GBs (GigaBytes)" (Sircom, 1999, p. 4).

#### 2.2.3.2.3 The Internet

The Internet has revolutionised the computer and communications world like nothing before. It is a world-wide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location. The Internet is especially "popular among scientists, and is probably the most important scientific instrument of the late twentieth century. The powerful, sophisticated access that it provides to specialised data and personal communication has speeded up the pace of scientific research enormously" (Sterling, 1996).

In historical terms, the actual concept of the Internet began in the 1960s and its original scope was "to provide a communication network that would work even if some of the sites were destroyed by nuclear attack" (Sterling, 1996). Hauben (1993, p.) cites the 1962 Rand Corporation report 'On Distributed Communications' by Paul Baran: "Baran's research, done under a grant from the United States (U.S.) Air Force, and



discusses how the U.S. military could protect its communications systems from serious attack. Baran outlines the principle of 'redundancy of connectivity' and explores various models of forming communications systems and evaluating their vulnerability". The report proposes a communications system where there would be no obvious central command and control point, but all surviving points would be able to re-establish contact in the event of an attack on any one point. Thus damage to a part would not destroy the whole and its effect on the whole would be minimised.

Within this context, the Internet was started in 1969 under a contract let by the Advanced Research Projects Agency (ARPA) of the U.S. Department of Defence which connected four major computers at universities in the southwestern United States. "The original idea was to develop a network to support military research" (Clarke, 1995, p. 26) in terms of collaborating on projects, trading notes on work, and eventually, to exchange information. Throughout the 70's, APRA's network grew as a result of the "TCP/IP (Transfer or Transmission Control Protocol / Internet Protocol) architecture which first proposed by Bob Kahn and further developed by both Kahn and Vint Cerf" (Brown and Honeycutt, 1997, p. 10). During the early 1980s, and specifically when the TCP/IP architecture developed, all networks were converted to this protocol (which basically enables all of the networks of the Internet to send data back and forth). Then the Advanced Research Projects Agency Network (ARPANET) became the backbone - the physical connection between the major sites of the new Internet, which comprised all TCP/IP based networks connected to the ARPANET. This conversion to TCP/IP was completed by the end of 1983 - and the Internet was born (Sterling, 1996). By then, "academic institutions had begun to use the network with high success under a recruitment drive that National Science Foundation introduced" (Clarke, 1995, p. 26).

For the first decade that the Internet was in existence, it was primarily used to facilitate E-Mail, support on-line Discussion Groups - now known as Newsgroups, allow access to distant databases, and support the transfer of files between government agencies, (based on FTP architecture network - File Transfer Protocol) companies and universities (Segal, 1995). Other services include the Telnet, the Gopher and currently the World Wide Web (WWW) which will be examined next in this section.

In particular, e-mail is a facility which allows users to send and retrieve text messages, images and other electronic materials over the network. Newsgroups are the special electronic boards which allows users to discuss specific news. FTP is the service that



facilitates file transfer over the network. Finally, Telnet is the internet standard protocol for remote terminal connection service, while Gopher allow users to access internet sites and to view information through a series of hierarchical menus. This menu driven information access service was developed at the University of Minnesota (Neou and Recker, 1995, p. 285). Further accounts on the above basic tools of the Internet are given by Clarke (1995, p. 27), Brown and Honeycutt (1997, p. 11), and Mockford and Torrens (1997, p. 162).

All the above mentioned internet services are based on the TCP/IP architecture and therefore, use unique network addresses - better known as Uniform Resource Locators or Identifiers (URL / URI). These URLs according to the service that they provide, consist of different parts. Therefore, to link with an FTP server the URL is: 'ftp://hostname/directoryname/filename', while to link with e-mail the URL becomes: 'mailto:username@hostname'. Accordingly, the URL for telnet, gopher and newgroups are: 'telnet://hostname:portnumber', 'gopher://hostname:port/gophertype[item]' and 'news:newsgroup' respectively (Neou and Recker, 1995, p. 50 - 55).

In conclusion to this section, the Internet is described as a computer based information network, allowing users access to a wide variety of information and resources. The Internet was initially funded by the United States government and was originally limited to military and educational research, and other governmental uses. It was envisioned as supporting a range of functions from file sharing and remote login to resource sharing and collaboration, including Newsgroups, FTP, Telnet, E-mail, Gopher and currently the WWW which is examined in the following section.

#### 2.2.3.2.4 The World Wide Web (WWW)

"While the Internet refers to the physical structure of computer networks (or internetworks), the World Wide Web (WWW) is actually just one of many applications that run on the Internet" (Brown and Honeycutt, 1997, p. 10). Further to this, the WWW refers to the collection of sites and the information that can be accessed when someone is using the Internet. The WWW is one of the newest services based on Internet technology and "uses three technologies: the HTML (HyperText Markup Language) that is used to write WWW pages, the HTTP (HyperText Transfer Protocol) to transmit those pages, and the WWW browser to receive data, interpret it, and display the results" (Brown and Honeycutt, 1997, p. 12).



Historically, it was in the late 1980's, when Tim Berners-Lee and others at the European Laboratory for Particle Physics, more popularly known as CERN, began experimenting with the creation of a service that would allow anyone to easily access and display documents that were stored on a server anywhere on the Internet via the unique network URL / URI addresses mentioned earlier (Segal, 1995). The URLs for the WWW consist also of three parts and these are: "protocol, hostname and filename" (Neou and Recker, 1995, p. 44). According to this, a URL on the WWW looks as follows, 'protocol://hostname/filename'. As an example the URL for the De Montfort University which displays information about research may look as follows, 'http://www.dmu.ac.uk/research'.

To do this, CERN developed, and in 1989, proposed a new protocol for information distribution. This primary protocol, which became the WWW in 1991, was based on the internet HyperText Transfer Protocol (HTTP), a standard format for documents that enabled them to be easily displayed by any type of display device, and allow links to other documents to be placed within documents. HTTP is also the mechanism that allows computers to communicate with each other. However, there are cases in which the information requested from a computer (server) is not directly available on it. Then, the server must retrieve it using another program, called gateway. Gateway programs must communicate with each other and this relational interaction is specified by the Common Gateway Interface (CGI). A CGI program is actually a script which can be written in different programming languages, such as C, C++, Perl, etc (Brown and Honeycutt, 1997).

The other primary standard was the HyperText Markup Language (HTML) which is used as a document description language. The HTML standard allows tags for passages of both text and graphics. This tagging allows the content to be formatted in a way that is appropriate for the display that the user is using, providing for effective use of text formatting (Feiler, 1999, p. 83). In addition to this, the need for an application that enables content as well as the documents written under the HTML format to be displayed over the WWW was automatically formed. Consequently, a number of different programs, more popularly known as browsers were developed to allow users to read those documents over the WWW (Neou and Recker, 1995, p. 4). "The first widely used browser was Mosaic which supported both textual and graphical content" (Neou and Recker, 1995, p. 295). "It was in 1993 when Marc Andreessen designed it and further developed by a team of students and staff at the University of Illinois" (Brown



and Honeycutt, 1997, p. 12). Currently, the two of the most well known browsers are Netscape Communicator and Microsoft Internet Explorer. However, there are cases when browsers have to use another program to handle content and file types that are not supported internally. These programs are called helper applications or plug-ins, and they can be specified in the configuration of the individual browsers. Based on the need to prevent incompatibility between browsers and plug ins, standards were of crucial importance. As a result, an organisation consisting of industry developers and institutions called the World Wide Web Consortium (W3C) was introduced.

However, due to the limitation of HTML being static, a new standard named Dynamic HTML (DHTML) was defined by the W3C which is "the combination of HTML, style sheets and scripts that allows documents to be animated" (Gulbransen and Rawlings, 1997, p. 8). In addition to this, "DHTML incorporates some new features that are designed to marry data and WWW pages" (Gulbransen and Rawlings, 1997, p. 14). Some of these new features including Java, JavaScript, VisualBasic Script, ActiveX controls, offer web authors more flexibility and control by redefining certain WWW page elements as distinct HTML objects (Brown and Honeycutt, 1997, p. 496). In particular, these script languages allow web authors to change the position of graphics, text and animation independently of one another.

Currently a new standard is under development. Its name is XML and its acronym stands for the eXtensible Markup Language. It "is a metamarkup language, in which the programmer makes up the tags he / she needs as he / she goes along" (Harold, 1998, p. 3). The first predecessor of XML was the Standard Generalised Markup Language (SGML) which is an international standard for document tagging and it is also considered as "unbelievably complex and very expensive" (Harold, 1998, p. 8). "SGML is a broad language used to define specific markup languages. For instance, HTML is a particular application of SGML" (Neou and Recker, 1995, p. 296). The main difference between XML and HTML is that HTML tags do not describe the meaning of their content, but rather how the content would look when displayed by a WWW browser. In contrast with HTML, XML is used to "describe a document's structure and its meaning" (Harold, 1998, p. 4). In November 1996, the first official draft specification for XML was published, and by July 1997, Microsoft released one of the first real applications of XML: the Channel Definition Format (CDF) for pushing WWW pages to subscribers (also known as Push Technology, or Webcasting). This characteristic was part of the Microsoft Explorer, version 4 (the WWW browser). A similar service was



also presented by Netscape, Microsoft's main competitor browser. Its name is Netscape Netcaster and its main characteristic is also to deliver information to the computer's desktop (Guilford and Kraynak, 1998, p. 189). By February 1998, XML was approved by the W3C.

As XML defines a metasyntax, it enables the creation of markup languages in a variety of disciplines that can be read and understood by standard tools. These markup languages are called XML applications. These applications have their own syntax and vocabulary that adheres to the fundamentals rules of XML. Some XML applications include: the Chemical Markup Language (CML) that manages chemical information, the Mathematical Markup Language (MathML) that include equations for sufficient expressives to handle almost all math, the Microsoft's Channel Definition Format (CDF) described earlier, the Synchronised Multimedia Integration Language (SMIL) that writes TV-like multimedia presentation for the WWW, and the Open Software Description (OSD) that provide information for software updates to be pushed over the CDF channels' subscribers. Further accounts on the XML subject and its applications are given by Harold (1998, p. 17-21).

Although the new standards help provide improved ways for publishing information on the WWW no technology is without its drawbacks. As mentioned before, the WWW has become a universally accessible source of information which attracts many people who spend time searching for information. The most frequently used tools for searching information on the WWW are search engines. These engines are automated software that collect and index information for many sites. These engines include: AltaVista, Excite, Yahoo, Hot-Bot, WebCrawler, Google and Lycos. However, as Grossman (1999, p. 52) pointed out "searching the Internet used to be like exploring a vast library with the lights out". "As networks become more 'content' driven, accessing the right kind of information is becoming more difficult" (Clarke, 1995, p.29). This is the result of the extraordinarily fast growth and development of the WWW and the continuous growth of WWW sites, which made search procedures become problematic. The fact that there is so much information, makes the search for information very difficult and typically "Alta Vista, one of the major search engines on the WWW claims that it indexes around a hundred million pages" (Ward, 1998, p. 753). If everyone in the world had just one home page, that would be six billion home pages alone. This illustrates the Internet's major problem: "the amorphous, non hierarchical nature of the medium made it difficult to prioritise and retrieve the best information" (Bradbury, 1998, p. 28).



In conclusion to the media for communication and information systems, it is argued that there is a plethora of media available for delivering information content, as well as, for research content. However, it should be borne in mind that as more information becomes available in electronic form, more systems are developed to support electronic information seeking. The following will present the advantages and disadvantages of such systems, compared to the other, non computer based systems as well as the search methods used for retrieving information over these computer based systems.

#### 2.2.3.2.5 Advantages and Disadvantages of Computer based Systems

Katz (1987) described four main advantages of computer based systems and these are: "speed, convenience, depth of searching and currency". In particular, Newbury (1996, p. 10) in relation to the advantages of computer based systems listed: "speed since, it is possible to search through some years of reference in less than the time taken to search an equivalent printed material source, flexibility, which refers to the greater number of points of access than printed formats. It is also easier to search for complex combinations of terms, range for accessing several databases from the same computer and currency, which refers to the point that databases are usually updated more frequently than other sources of information". Further similar accounts are also given by others, including Evans (1990, p.33), and Justice (1995, p. 66).

However, there are disadvantages, including: "speed which depends on the volume of transmitted data, costs that may be high in some particular tasks, ie. cost for hardware and software investments in a local or a national level, and finally copyright issues and legal implications" (Evans, 1990, p.33). However, one of the major disadvantages in using a computer based database is the amount of unwanted material known as false drops in return for a search query (Newbury, 1996, p. 10).

In conclusion to this section, computer based communication and information systems are considered powerful in terms of speed, global access and currency of information, however, they suffer the problem of returning a lot of unwanted material within a search query. The next section examines the methods used for retrieving and communicating information content over these systems and therefore, it will examine conventional and cutting edge technology driven search methods for accessing information based on computerised communication and information systems.



### 2.2.3.2.6 Search Methods

Computer based systems, such as OPACs, CD ROM Databases and the WWW use different methods for shaping a search query. These systems have been designed to be able to provide the user with the ability to search for both known and unknown items in which a known item search is the method where a user knows what he / she is looking for. Brinkley and Burke (1995, p. 4) argued that "both methods are still important", since both "help provide the users with the ability to search for a known item, as well as for any items available on a specific subject".

However, different methods have been developed for retrieval of unknown items. Boolean logic (Humphrey and Melloni, 1986) is one of them and "represents logical relationships between sets within a search query" and "provides a simple yet powerful method of combining search terms" (Brinkley and Burke, 1995, p. 7). These logical relationships uses different operators, including the 'and', the 'or', the 'not', and their combinations such as, the 'and-not' and the 'or-not'. For instance, a single-term search query will retrieve all documents having the requested term, while a two-term query under the 'and' operator will retrieve only those having both terms. Additionally, the 'or' operator will match all documents having either of the requested terms and the 'not' will match all documents except those having this term. Finally, the 'and-not' will match all documents having the requested term excluding those under the 'not' request, while the 'or-not' will match any documents having the requested term and all those excluding the term described under the 'not' operator. A more detailed approach to boolean logic is given by Newbury (1995, p. 45). However, Brinkley and Burke (1995, p. 7) argue that there are recent studies which have "shown boolean logic is in fact a less - than - optimal solution to information retrieval". According to them, the problem lies in the fact that, "in reality, relevance is a relative rather than an absolute value", something that was first claimed by Pao (1989).

Criticism of these weaknesses has raised interest in further experiments on the search methods of information retrieval systems. A number of experiments with best match or probabilistic searching have been conducted by Frisse and Cousins (1989) and also by Savoy and Desbois (1991). These experiments have proved quite successful in their initial aim, which was to "improve the effectiveness of retrieval and to provide starting points for browsing" (Croft and Turtle, 1993). In this method users are asked to enter their requests with natural language terminology. These terms are weighted according



to frequency of their occurrence within records and displayed on the user's terminal ranked as best matches and ordered by their weighting. Other search methods include probes, which are specific investigations launched by information seekers, and ranging from simple queries in a database to multiple step examinations of segments of information space. Marchionini (1995, p. 148) in relation to probe searching, argues that a "string search has repeatedly proved its usefulness in information seeking and represents the first significant advantage of searching within electronic environments in that it allows users to probe a database or document for higher units - word fragments, words or phrases".

New technologies have improved the probes' concept and Marchionini (1995) refers to more sophisticated probes that may take the form of agents or 'knowbots'. In general, a software agent, whether intelligent or not, is a program that performs a specific task on behalf of a user, either independently or with little guidance. Bui and Lee (1999, p. 226) list some of the characteristics of software agents. Similarly, Kalakota and Whinston (1996) list the main characteristics and these are: independence, learning, cooperation, reasoning and intelligence. Further accounts are given by Rzevski (1995, p. 9) in which, "knowledge, reasoning, recognising, learning and negotiating" are listed as the main characteristics of agents. The main idea behind intelligent agents began to form when programmers and system designers started to think of computer networks as complete systems, in the sense that individual machines that could run small parts of a larger process and effectively allow several discrete processes to run in parallel. Ingram (1999, p. 31) argues that "the ability of agents to receive instruction, do work unattended and then communicate the result gives to each of them (agents) an apparent degree of intelligence, leading to the broad term of intelligent agent (IA)". Furthermore, a more recent development of IAs include "the ability to cope with the ever changing environment" (Rzevski, 1995, p. 9). This development is implemented in the "need for mechanisms for identifying areas of a database that have changed and automatically notify users of those changes" (Yoder, Akscyn and McCracken, 1989, p. 39). Further accounts are also given by Halasz (1988, p. 845 and 846) who described these particular mechanisms, as one of the seven emergent issues for the next generation of hypermedia systems. These mechanisms were also suggested by Marchionini (1995, p. 148) in the form of "more complex agents that can remain active and regularly report results". He also suggested that these types of probes may be considered to be selective-dissemination-of-information agents that keep people informed of developments in specific areas of interest.



After years of extraordinarily fast growth and development of the WWW a new type of search method has been developed called PUSH or Webcasting. Push software technology delivers requested content to the viewer's desktop utilising IAs to find the information requested without the user having to continually repeat the search request. This software is usually an XML based application for defining channels which automatically allow WWW pages or sites to notify readers of changes to critical information. Some of the most well known Push software products are AirMedia Live, Autonomous Agentware, BackWeb Polite Agent, Earthlink, Intermind Communicator, Marimba Castanet, Microsoft CDF, Netscape Netcaster, and Pointcast.

PUSH technology can be described in the following terms: making the data come to the user and not the other way around. Guilford and Kraynak (1998, p. 189) point out that push technology "is a new form of information transfer over the Internet. With push technology, information is pushed to the user automatically instead of pulling it off the Web with the user's browser". In the most fundamental sense, push technology is used to make information more accessible to the user. It allows the user to specify the information they want to access while, it allows the information provider to know what the user wants. The way it works is simple. First, users identify what they want to be kept informed of. These requests can be simple or complex and may carry a form filled out by the information seeker which serves as a profile of the information need. Then, the agent's ability to "interact with other agents or other non-agent applications such as web browsers, spreadsheets and databases" (Bui and Lee, 1999, p. 228) make information retrieval easier and when matches are found, the vendor server pushes this information to the user's browser either by e-mailing him/her or by waiting until the user logs on and then, download it automatically as a screen saver. This process is illustrated in the following figure 2.17 in which the contributor of the information content submit his / her data to a system container. When this data matches the interest of a subscriber information seeker, the system pushes this content to the interested seeker. This method empowers the communication process since, the sender's submission triggers communication resulting in the sender's message reaching the appropriate recipient:

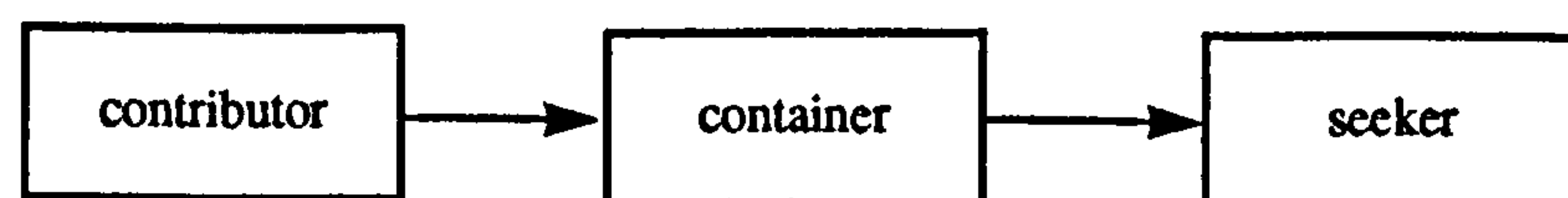


Figure 2.17: The Push Process



Some of the advantages of IAs and Push applications in the corporate world were discussed at the 1999 Conference of Knowledge Managers on the "issue on connecting people - profiling their interests and expertise and matching them up" (Morrow, 1999, p. 3). One advantage is that users no longer need to repeatedly search the internet and specify what they want. They can log-off the system and wait for agents to do their work and to notify them through e-mail, which can "minimise both time and cost".

However, as described earlier no new technology is without drawbacks. The major disadvantage of a push technique lies in the subscriber menu preference. In order to provide an explanation for this, the following example is given. Imagine a subscriber who chooses to be kept informed of the weather forecast for a particular geographical location. As has been mentioned earlier, push channels are capable of either pushing content to users without them searching for it, or to inform users of changes within a particular page or site. This means that when someone chooses to be kept informed on the weather forecast for a particular geographical location they will be satisfied. However, it raises the question to what extent users are able to define their own set of keywords. For instance, what happens if someone only wants to be informed when temperature rises by 5 degrees Celsius. It is unfortunate that push channels only have a predefined set of keywords, chosen by the push vendor and therefore are not designed to let users choose their own particular set of keywords. In the case of a database, the system will push and inform the user of a new entry regardless of whether the information content matches the user's interest.

In conclusion to this section, different search methods are employed in order that information seekers may achieve their information needs. Such search methods include: boolean logic, probabilistic, probes, string, IAs, and Push technology. Although the last is considered as an empowered method for communicating information content since it allows information systems to behave as communication systems in terms of how information reaches the recipient, it still has its drawbacks. The next major section is dedicated to the specific issue of communication within the design research discipline. Within this context, the needs and benefits of communicating research in general and design research in particular amongst its peers are presented. Also, the major communication and information systems used for communicating information relating to research in general and design research in particular are presented, and finally, the nature of the problem with which this PhD is concerned is more fully explained.



## **2.3 Communication within Research and Design Research**

The following sections will present the needs and benefits of communicating research in general and design research in particular.

### ***2.3.1 Recognition of the Importance for Communication of Research***

The importance of communication within any research endeavour has been subject to a great deal of research. Meadows (1974, p. 91) stated that "communication in one form or another usually takes up a significant fraction of a scientist's working life". In an attempt to determine how a scientist becomes aware of particular items of information, earlier studies in the United States of America indicated that "scientists were using journals, had attended scientific meetings, made personal contacts, and searched indexes and abstracts (Meadows, 1974, p. 107). Reflecting on the many investigations that were carried out, "during the 80s and 90s U.S.A. policy and planning initiatives in some scientific disciplines began to articulate the critical importance of information and data as resources" (Robbin, 1995, p. 38). Pechura and Martin (1991, p. 84) when supporting the same contextual importance wrote: "the scientific enterprise is composed by people who generate ideas, design ways to test those ideas, collect data, and communicate the ideas and data in a variety of ways. The communication of ideas and results is as important to the growth of knowledge as the data themselves". Based on these developments Wulf (1989) coined the metaphoric phrase 'collaboratory' in order to represent new modes of communication, cooperation and collaboration ('c-cubed') that would improve the efficiency and effectiveness of a scientific enterprise. Wulf (1993) also wrote that "a collaboratory represented a centre without walls, in which the nation's (U.S.A.) researchers can perform their research without regard to physical location - interacting with colleagues, accessing instrumentation, sharing data and computational resources, and accessing information in digital libraries". Robbin (1995) attempted to experiment further with Wulf's 'collaboratory' metaphor as well as with the criteria established by the U.S.A. National Research Council in 1993. She proposed an environment in which "data and information sharing" and "communication with remote colleagues" (p. 40) were two of its four basic constituents. She also argued about the importance of communicating research in that "the action of communicating outside the area of specialisation influences the development of new specialities, in which, in this way, research will become more interdisciplinary, and a research area will advance by integrating different specialisations" (p. 42).



### ***2.3.2 Recognition of the Need for Communication of Design Research***

In design as in all other disciplines, "research is generally understood as the process whereby new knowledge is generated" (Newbury, 1996, p. 8) and that it "is of crucial importance to the evolution of design and its future health" (Stenros, 1996, p. 4). For a long time, communication has been a major issue within the design research discipline. Alexander in 1964 argued that "enabling communication, enabling the processing of information, formulating methods and models, and capturing knowledge are some of the problems which appear within the design field just as in other subjects". Some years later, communication was still recognised as an important issue within design research where, "knowledge and information are useless if they are never communicated, transferred or applied" (Young, 1986, p. 320). Bearing in mind, that "knowledge is generated and accumulated through action" (Owen, 1998, p. 11), it can be argued that "an important aspect of knowledge exploration is communication" (Sonnenwald, 1996, p. 279). This is also the concern of many others involved in design research endeavour such as, Allison, (1993, p. 6) Archer, (1995, p. 6) Cooper, (1995, p. 17) Press, (1995, p. 38) Bessis and Robertson (1995), and Newbury (1996, p.9) since, they all argue that design research should be "communicable" and its outcomes "be accessible" and "transferable" to others.

Archer (1995, p. 10) argued that good practice in academic research should be expressed in much the same terms as the post - Popperian paradigm adopted in science research. These are among others: "i. that the enquiry must be calculated to expose new observations or new explanations; or it must seek to falsify previous observations or explanations, ii. any new data obtained must be recorded so as to be checkable by later observers, and iii. the record of the investigation and its findings must be published or otherwise exposed to critical appraisal by other investigators". This also matches Wenham's (1998, p. 63) view who stated in relation to the scientific paradigm that: "scientific knowledge growth lies on the basis of the evidence currently available" in which, "far from being conclusively proven, scientific knowledge is much more like a report on progress so far, which future investigators will accept, modify or contradict".

#### ***2.3.2.1 Current Problems with Communication in Design Research***

From the above evidence, design research needs to be communicated, but currently the evidence is that it is not being communicated effectively. Bearing in mind that "design research lacks evidence" (Cooper, 1995, p. 14) and is characterised "as a relatively new



endeavour” (Allison, 1992), design researchers should share their results to benefit not only each other’s work but also the discipline itself. Numerous others involved in design research support this concern. More specifically, this need for available and accessible design work that can be communicated has also been recognised by many others involved in the design research endeavour, including Parnas and Clements (1986) who identified the need for design documentation to be available. Agnew (1993) argued that documentation is the knowledge base for design research, in which: “the effect of the undocumented tradition (in design) is to leave us (design research) in the academic stone age”. On this basis, Allison (1993) concluded, “there is a need to build upon what has been done already” and in particular, “when information exchange has become easier” (Korvenmaa and James, 1993, p. 28). In an attempt to illustrate these problems, Allison refers back to the Polytechnic and College Funding Council (PCFC) report in which “research in the PCFC sector, (1990) shows that the volume of research in art and design was the lowest of all nine programme areas in the sector”. On this basis, Allison in 1991 argued: “if the PCFC picture of research was inaccurate, then it would seem that researchers in the field need to be more communicative about their work”.

However the Research Assessment Exercise has pointed out that across the UK as a whole, research quality in general as measured by their rating system has improved dramatically over the last decade. In particular, “in RAE 96 there was an increase of some 6% in the number of submissions and of some 11% in the number of researchers submitting since RAE 92. Results of the RAE 2001 confirm further improvements in the overall quality and international standing of research carried out in the universities and colleges of the UK. In particular, 55% of all research active staff now work in the top-rated 5 or 5\* departments compared with 31% in RAE 96. Furthermore, research at the lower end of the scale (rated 1 and 2), which in RAE 96 accounted for nearly a quarter of the submissions, now accounts for only 6% of submissions.

In addition to this, in RAE 2001, there has been a considerable increase in the volume of research that equates to national or international levels of excellence: 64% of the submissions in 2001 fell into these categories and were awarded grades of 4, 5 or 5\*, compared with 43% in RAE 96. The results of the 2001 RAE also confirm the UK’s position as one of the world’s foremost research nations. For example, “it is among the top five nations in terms of the number of papers produced per researcher” (RAE, 2001). Although these findings clearly demonstrate a degree of improvement overall, the question remains as to what degree improvements have been made within the specific Unit of Assessment of Art and Design.



An examination of the RAE outcomes carried out by the author, involved a comparison of the top rating scores achieved throughout the years and in particular a comparison of the outcomes achieved in the RAE 92, RAE 96 and RAE 2001 (see Appendix VIII). To achieve this, the author produced three lists of the RAE outcomes for all the UoA based on the published results of the RAE's in 92, 96 and the most recent one the RAE 2001 (see Appendix VIII, Listings 1, 2 and 3). It is worth noting that the intention was to include the RAE 88 results in these comparisons but this was not feasible since these results were not available. An effort to gain access to them through the RAE and HEFCE was not successful since they did not respond to the request.

For this examination, the first goal was to identify the actual position of the Art and Design Unit of Assessment (UoA) compared with the other Units of Assessment. Three listings have been produced. (See Appendix VIII, Listings 8, 9 and 10, Sort by Top Rating) These show the ratings achieved in all UoA's in RAE 92, 96, and 2001. The actual figures in the listings are percentages and are based on the number of institutions gaining the top ratings of 5 for RAE 92 and 5\* or 5 for RAE 96 and RAE 2001 in a particular UoA. (Note 5\* was not available in 92 and no institution achieve 5\* in unit 64 in 2001) It should be acknowledged that this figure is an estimate and not a perfect comparison as the rating systems are not directly comparable. Listing 8 shows the Art and Design UoA in RAE 1992 was placed 67th out of 72 with a value of '6.8'. Listing 9 shows the Art and Design UoA in RAE 1996 was placed 66th out of 69 with a value of '7.9' and listing 10 shows the Art and Design UoA in RAE 2001 was placed 66th out of 69 with a value of '16'. (Note that at the time of writing the thesis the Biochemistry UoA/12 had not published its results and therefore it was ranked last with the value of '0'. This is something that could affect the outcome of this investigation since Biochemistry was ranked 18th in the RAE 92 and 1st in the RAE 96). These results however indicate that Art and Design has one of the lowest average scores and therefore, the earlier statements made by Cooper and Allison may still be valid. However, as the RAE has pointed out that research quality in general as measured by their rating system has improved dramatically over the last decade, it is argued that although Art and Design may not have improved significantly relative to other UoA's, quality has improved within the discipline itself. Certainly there were more submissions with at least a score of 5 in Art and Design in 2001 than in 1996.

The next goal was to determine the quantity of art and design research in terms of the submissions made to the RAE in 1992, 1996 and 2001. A chart was produced (see



Appendix VIII, Listing 11: Sort by Submissions and Output) and the results show that Art and Design made 59 submissions in RAE 92, 89 in RAE 96 and 75 in RAE 2001. These findings demonstrate that although Art and Design made more submissions in RAE 96 compared to RAE 92, it still made fewer submissions in RAE 2001 compared to RAE 96. This result is though potentially misleading as the actual physical output also needs to be considered.

The following goal was therefore to determine the output based on the number of outcomes from active researchers in the RAE in 1992, 1996 and 2001. A second chart was produced (see Appendix VIII, Listing 11: Sort by Submissions & Output) and the results show that total Art and Design outputs were 976.4 in RAE 92, 1578 in RAE 96 and 1668.7 in RAE 2001. These findings clearly demonstrate that there has been a steady growth in the number of outputs and therefore, in the overall quantity of art and design research.

The final goal was to determine the ratio of design research output i.e. the number of outputs to the number of the submissions. A third chart was produced (See Appendix VIII, Listings 4, 5, 6 and 7: 1992/1996/2001 Outputs Sorted by Volume) which placed Art and Design UoA 23rd out of 72 in RAE 92, 22nd out of 69 in RAE 1996 and 18th out of 69 in the most recent RAE 2001. This clearly demonstrates that Art and Design is in a higher position than most of the other UoA in terms of outputs per submission. In addition to this, the results also demonstrate that there has been a steady improvement in terms of the number of outputs per submission in Art and Design throughout the various RAEs since, the results show that the ratios of Art and Design output to submissions were 16.5 in RAE 92, 17.7 in RAE 96 and 22.2 in RAE 2001. Together these findings clearly demonstrate that there has been a continuous improvement in terms of the volume of art and design research output.

All these results indicate an improvement in terms of both quality and quantity and consequently it is argued that more funding has come into the art and design sector for research, in many cases for the first time, as a direct result. To help calculate the amount of funds given to art and design research, Woolley (1998) has pointed out that ratings 1 and 2 attracted no funding, while a rating of 5\* attracted approximately four times as much funding as a rating of 3b for the same volume of research activity in RAE 1996. Woolley (1998) also lists the RAE ratings converted into funding weights for each unit of assessment. This list can also be seen in Appendix VIII (see Listing 12). Based on



this list, Art and Design UoA had an overall funding weight of 107.9 in RAE 1996 and using the same calculation a potential funding weight of 136.5 in RAE 2001 (see Appendix VIII, Listing 12: 2001 & 1996 Ratings and Funds). A comparison using the RAE 92 results was not attempted due to the incompatibility of the rating system. These results however clearly demonstrate that Art and Design should attract 26.27% more funds in RAE 2001 compared to RAE 1996 based on 1996 funding levels. This should further support the increase of both the quality and quantity of art and design research in the future.

To conclude this section: it can be argued that design research is a relatively new endeavour and although there has been an improvement in terms of the quality and quantity of design research output, this may have added to the complexity of actually communicating design research work. This complexity is due to the considerable increase in the volume of design research activity, i.e. the growth in the number of researchers involved in design research output and the design research output itself, as well as, the wider range of key design research areas referenced in the most recent RAE 2001 compared to the previous exercises. However, the question still remains as to whether communication of design research has improved in response.

### *2.3.2.2 Towards an Improvement*

This need for communication of design research results has also been identified by Friedman (1997) who pointed out that: "the fact that design is young poses challenges to the development of a rich theoretical framework. In order to develop this framework, a community of researchers must identify themselves and enter into dialogue". Vakkari (1996, p. 169) in relation to the development of a professional research community argued that: "discussion about the scope and content of a young field of research helps to form the identity of its scientific community". Korvenmaa and James (1993, p. 23) argued that in order for design research "to consolidate its position there should be accessibility of results and conformity of language" which matches Meadows' (1974, p. 92-93) question in relation to the scientific paradigm and in particular: "one must rather ask - is the information available in a way acceptable to the individual scientist?"

However, "creating and sharing knowledge are intangible activities that can neither be supervised nor forced out of people. They happen only when people co-operate voluntarily" (Kim and Mauborgne, 1997) . Although this may be true, Allison (1994)



argued in relation to this attitude of sharing knowledge within art and design research: "that those involved in research in art and design should be rigorous in their attention to previous work in the field - there are no prizes for the designer who reinvents the wheel - and in the reporting of research findings back to the field in an appropriate form". This has been well known and is cited as the 'professional attitude'.

In relation to the scientific paradigm, Schartz (1992) claims that "knowledge is comprised of both formal data and literature and informal results and news that is manipulated by the scientist, this manipulation includes browsing through the available knowledge, recording and sharing interrelationships between the items in a software environment to manipulate this knowledge by people with common interests and shared values". On the other hand, "one of the major goals of computer network development is to create a communication environment that is free of barriers as possible - an environment that can support the rapid communication of ideas and images at every stage of experimentation and discovery" (Pechura and Martin, 1991, p. 84) in which, "making all this information easily accessible to distributed users while effectively dealing with errors, conflicts, and updates presents a challenging research problem of the utmost urgency" (Lander, Langridge and Saccocio 1991, p. 34). To this extent, Marchionini (1995, p. 4) argued that "electronic information systems cause incremental changes in how people seek, acquire, and use information", and therefore, "there is a need for research on search systems" (p. 188).

In conclusion to this section, communication within any research discipline as well as within the design research discipline is considered of fundamental importance. The need for improved communication within the design discipline due to its relative immaturity and lack of evidence in relation to its progress has also been highlighted. In addition to this, the increased range of the design research key areas involved, the increased volume of design research output, the increased number of design researchers involved, the current context of the RAE, the potential of the latest developments in communication and information technologies, as well as the need for further research into their use in design research have also all been recognised. The associated need for the development of a rich theoretical framework as the foundation for communication between design researchers and their content has been stated. The following section will present some of the existing computer based communication and information systems used for communicating research in general and design research in particular.



### ***2.3.3 Communication and Information Systems used within Research***

There is a plethora of communication and information systems used in other non-design research areas. Some of the computer based systems include: the Bath Information and Data Services (BIDS), the British Humanities Index (BHI), the Current Research In Britain (CRIB), the Current Technology Index (CTI), the Edinburgh Engineering Virtual Library (EEVL) and the INSPEC. The following paragraphs provide more detail about these systems.

The Bath Information and Data Services (BIDS) provides access to the bibliographic records taken from 10,000 journals of the British Library's most requested titles. In addition to this, BIDS is a hosting service for a number of academic databases including the: Science Citation Index, Social Sciences Citation Index, Arts and Humanities Citation Index, Index to Scientific and Technical Proceedings, Compendex Plus, British Library Inside Information Database and International Bibliography of the Social Sciences. BIDS is updated twice a week and new journal titles are added within a few days of arriving at the British Library. BIDS is a shared service and it can be accessed via a Telnet connection. Users need to contact BIDS which provides username and password to those who are members of a subscribing Institution only. It can be accessed on-line at the following address: 'Telnet://bids.ac.uk '(BIDS, 1995).

The British Humanities Index (BHI) is a CD ROM based bibliographic database and lists periodical and newspaper articles from some 300 British titles. Subjects covered include: arts, music, philosophy, religion, literature, economics, politics, history and society. The index is updated quarterly (BHI, De Montfort University, 1996).

The Current Research In Britain (CRIB) is a CD ROM based database which "gives details of research projects currently being undertaken in the British academic establishments" (CRIB, De Montfort University, 1996). The database covers information from the current year, is updated annually and includes the subject of biological sciences, humanities, physical sciences and social sciences.

The Current Technology Index (CTI) is a CD ROM based bibliographic database and lists reference articles from technical periodicals in the areas of: chemistry of food, computing, engineering, ergonomics, operation research and physics. "CTI is updated quarterly and covers from 1981 onwards" (CTI, De Montfort University, 1996).



"The Edinburgh Engineering Virtual Library (EEVL) is a project to build a gateway for the higher education and research community to facilitate access to high quality information resources in engineering" (EEVL, 1996). EEVL project is under the Electronic Libraries Programme which is managed by the JISC on behalf of the UK Higher Education Funding Councils and it is similar in concept to SOSIG (Social Science Information Gateway) and OMNI (Organising Medical Networked Information), and it provides free access via the the WWW. Its access on the WWW is: '<http://www.eevl.ac.uk/welcome.html>'.

The INSPEC is a CD ROM based bibliographic database with abstracts which is updated quarterly. It lists periodical articles, major reports and conference papers in the following subject areas: electronics, physics, computing and information technology. (INSPEC, De Montfort University, 1996).

### ***2.3.4 Communication and Information Systems used within Design Research***

In design research, societies and organisations including the Chartered Society of Designers (CSD), the Design Management Institute (DMI), the Design Research Society (DRS), the European Academy of Design (EAD) and the Royal Society of Arts (RSA), provide a variety of communication and information systems within the design research discipline which are either computer or non computer based. Computer based systems used within the design research discipline include:

- Art, Design, Architecture and Media Information Gateway (ADAM)
- Allison Research Index of Art and Design (ARIAD)
- Art Bibliographies Modern
- Art Index
- Bath Information and Data Services (BIDS)
- Bulletin Board for Libraries (BUBL)
- BLDSC Conference Proceedings, the British Education Index
- British Reports, Translation and Theses
- Clothing and Textile Arts Index
- Current Technology Index
- Current Research in Britain
- Design and Applied Arts Index
- Educational Research Information Centre (ERIC)
- Index to Theses (ASLIB)
- Multimedia Assets for Industrial design (MAID)
- Textiles Technology Digest



The following paragraphs will present the most design research orientated systems:

The ADAM project is the Art, Design, Architecture and Media information gateway. The project's aim was to build an information gateway to quality checked resources related to the above disciplines on the Internet. This basically means a catalogue of records describing Internet resources that can be searched over the WWW. The ADAM Consortium consists of the following partners: the Pavilion Group, the Visual Arts Data Service (VADS), the UK Office for Library and Information Networking (UKOLN), the On-line Computer Library Centre (OCLC), the Access to Network Resources (ANR), the Technical Advisory Service for Images, and the Knowledge Gallery. The last three partners are funded by the JISC Electronic Library Programme. All information presented is acquired by the ADAM's WWW site which can be accessed from the address: 'http://www.adam.ac.uk'. The following figure 2.18 illustrates the ADAM WWW interface (1999):

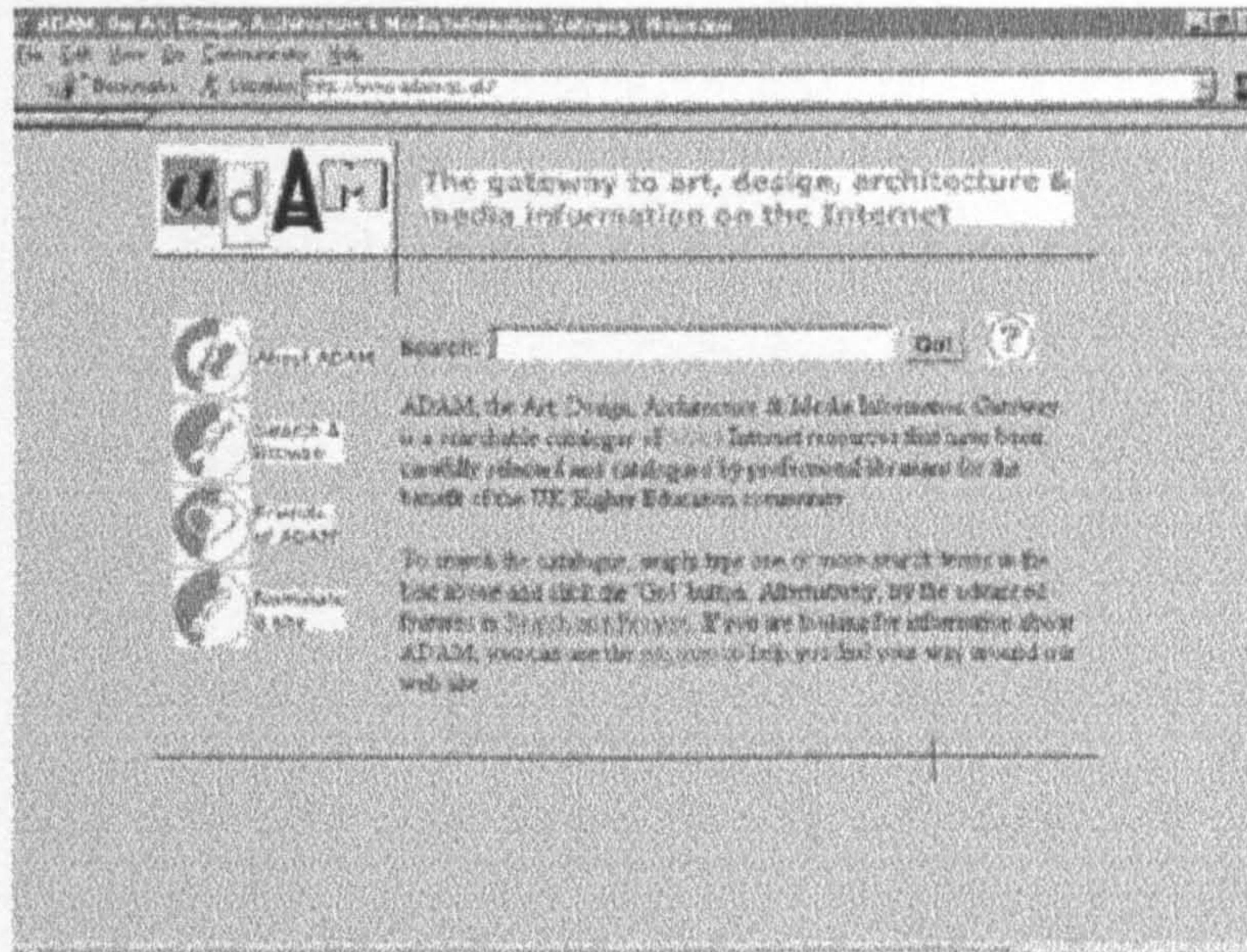


Figure 2.18: WWW ADAM system, (source, <http://www.adam.ac.uk>, 1999)

The Allison Research Index of Art and Design (ARIAD) is the UK national database for research in art and design and is developed with support from and in collaboration with the Arts Council of England, the Chartered Society of Designers, the Council of Subject Associations in Art and Design, the Conference for Higher Education in Art and Design, the Design Council, the Design Research Society and the National Society for Education in Art and Design. The ARIAD originated in and grew out of earlier index listings. The first was the Index of British Studies in Art Education and was published in 1975. It was originally a card index and listed submitted research for higher degrees included research from 1966 up to 1974. The second index named the



Index of British Studies in Art and Design Education was published in 1986 and covered research carried out up to 1985. The third Index, the Allison Research Index of Art and Design was the first edition that could be accessed in both hard copy and electronic form and contained research up to 1992. In 1995, an Australian version of the ARIAD was published and provided information on all research carried out up to the present time. In 1996, the ARIAD was published in its second and latest edition in an electronic form on a CD ROM. "It consists of three related databases: the Research Projects, the Research Institutions / Organisations, and the Research Resources" (Allison, 1996). This index includes all research projects up to 1995. The index's records contain an abstract that stands as a description of the project, name of the author, keywords identification, images where applicable, and finally, the names of the collaboration and award institutions. Submission of data is through paper forms. This edition is also (1999) accessible through a WWW interface at the address 'http://www.ariad.co.uk'. Figure 2.19 illustrates the ARIAD WWW interface (1999):

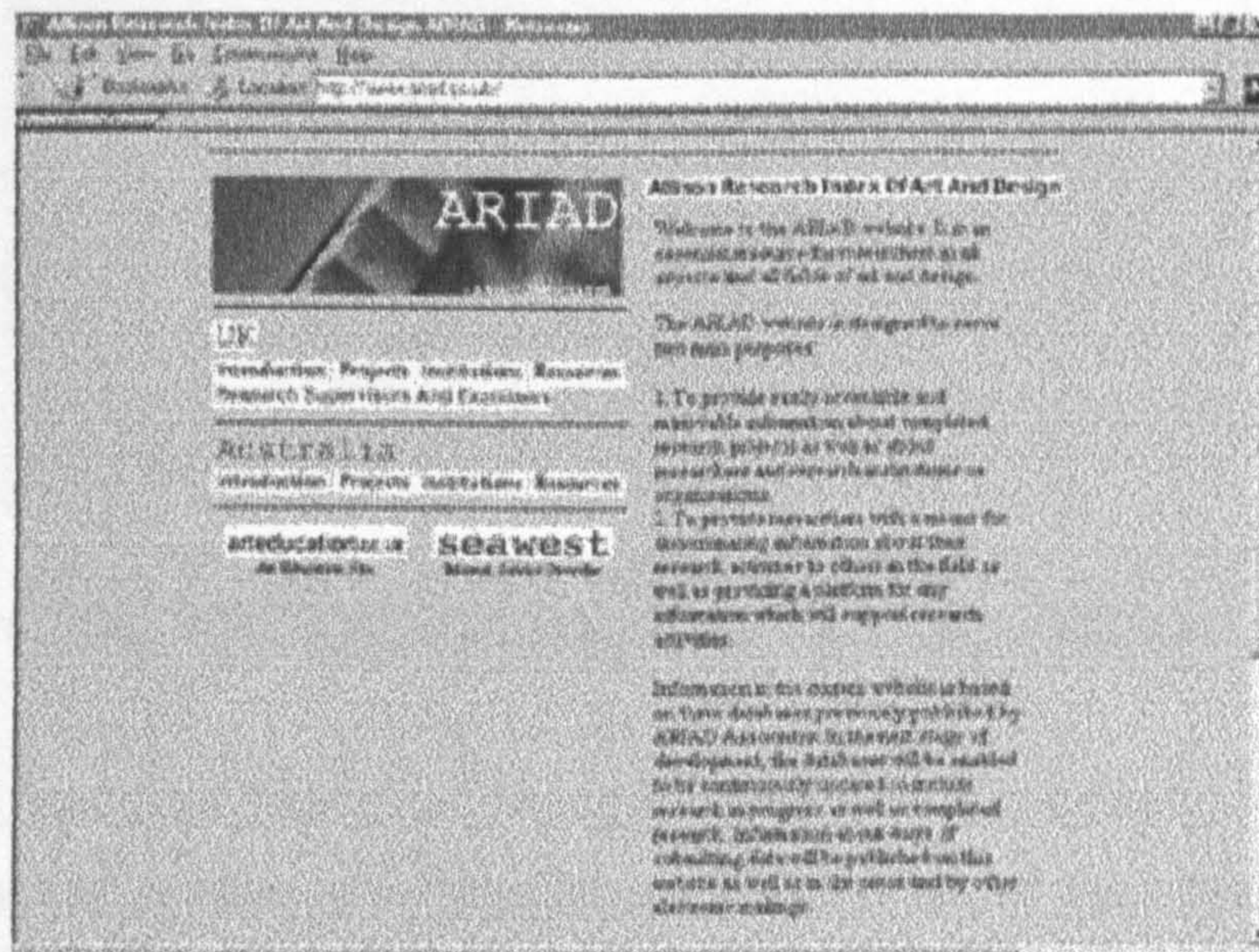


Figure 2.19: WWW ARIAD system, (source, <http://www.ariad.co.uk>, 1999)

The Design and Applied Art Index is a CD ROM based index which "lists 100,000 references from 450 design and craft periodicals" (Friggens, 1998), and includes articles from 1973 up to 1998. Its search capability facilitates search by subject and retrieved references are viewed with a short abstract.

EDINA is a JISC funded project and is the source of bibliographic information for art and design which offers a number of on-line services to UK higher education and is based at Edinburgh University. It consists of the Art Abstracts and the Periodical Contents Index (PCI) and both services can be accessed through a WWW interface.



EDINA Art Abstracts "is an enhanced version of Art Index" (Tubby and Bevan, 1998, p. 44) and it comprises the bibliographic contents of some 280 leading art periodicals. Each reference contains a detailed bibliographic description of the item and it covers up to 1984 as an index, with added abstracts from 1994 to the present. The database currently has nearly 400,000 records, and, with monthly updates, is growing steadily. EDINA PCI "offers on-line access to the table of contents of thousands of English and other European language journals from their date of issue to the early 90s" (Tubby and Bevan, 1998, p. 45). Its address on the WWW is: 'http://edina.ed.ac.uk'. Figure 2.20 illustrates the EDINA WWW interface (1999):

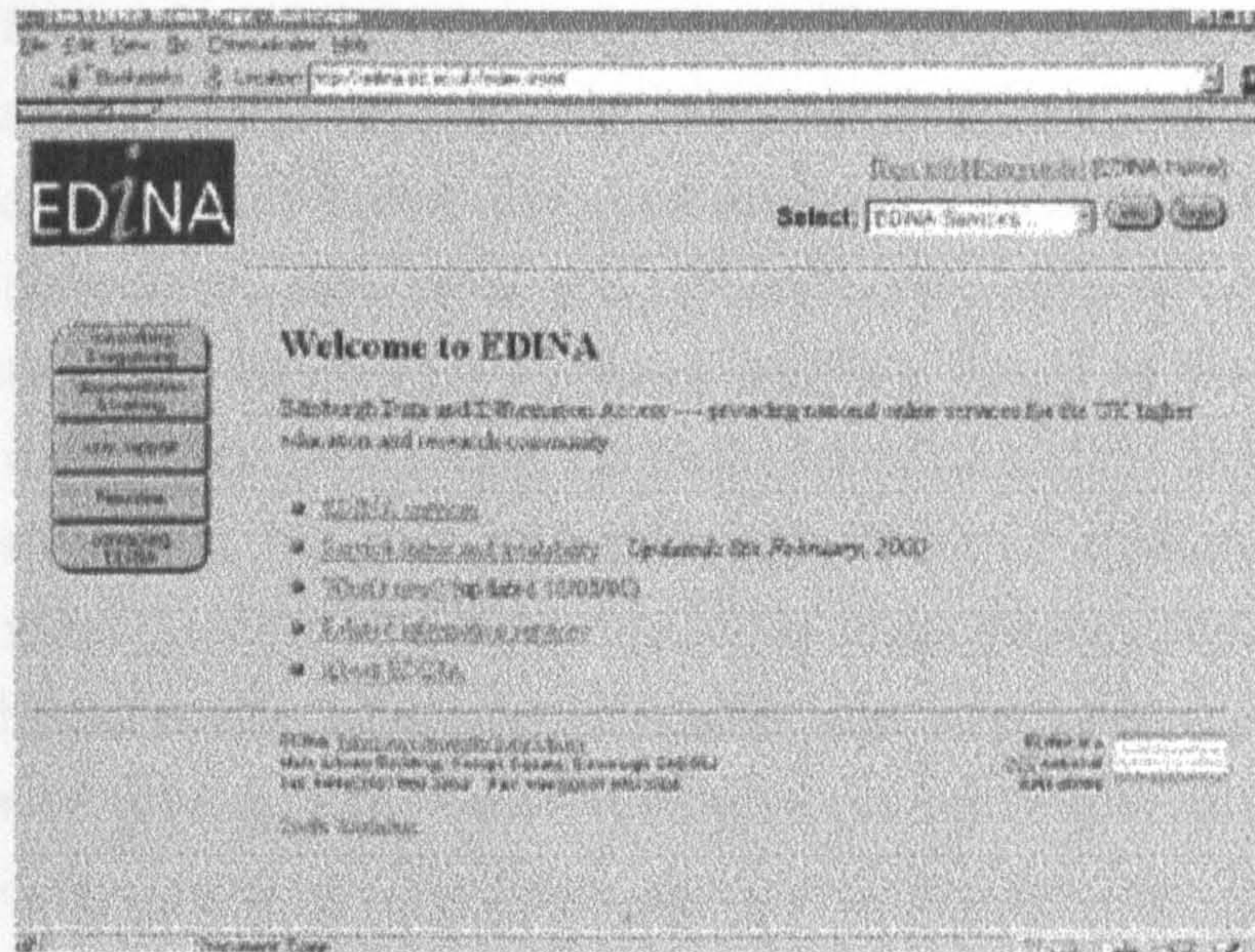


Figure 2.20: WWW EDINA system, (source, 'http://edina.ed.ac.uk, 1999)

Multimedia Assets in Industrial Design (MAID) is a telematics application project supported by the Information Engineering programme of European Commission DG XIII. According to its literature (MAID, 1996) "the project aims at improving the competitiveness of the design based industries and professions". Among others, the services will allow designers and industry to: "interactively access on-line multimedia databases and use them for professional purposes, interactively access on-line design tools and services for distant collaborative working and remote programme execution purposes, and access these services by user friendly interfaces and easy accessible heterogeneous networks". The MAID Consortium includes partners from the Netherlands, the UK, Ireland, Belgium, Spain, Finland, Portugal, Germany and Greece. More information about the MAID project can be found by accessing the WWW site of the Centre for International Technology and Education of the London Institute, London College of Printing. Its WWW address is: 'http://www.lond-inst.ac.uk/cite'.



MAILBASE is an electronic mailing based list that provides a variety of discussion forums in different subjects, as well as, art and design subjects and facilitates easy communication and discussion between its members. To join any of these mailbase discussion lists, a user needs to send an e-mail to: 'mailbase@mailbase.ac.uk' typing the command: 'Join [discussionlistname] firstname(s) lastname'. These discussion lists which relate to art and design issues include: 'the Artdeslib' which provides discussions for art and design library and information staff, the 'cti-art-design' which provides discussion on the use of computers and computer-based tools for research or use in fine art and design courses in higher education, the 'design-research' which provides a discussion forum for designers, academic staff and postgraduate students who are interested in design research, the 'ead' which stands for the European Academy of Design, and provides a forum for established researchers and academics new to research to disseminate their work and collaborate in research, the 'ten' which stands for the Textiles Environmental Network and is a group of researchers who meet regularly to discuss developments in the field of textiles and the environment, the 'three-d' which is run by the National Association for Three Dimensional Design Education and covers many aspects of design, including management, teaching or research in further and higher design education and finally, the 'vr-art' which provides a discussion forum for those interested in Virtual Reality and its relation to art and artistic practice. Further information about Mailbase and its discussion lists may be obtained by accessing its WWW site on the URL: '<http://www.mailbase.ac.uk/lists>'.

#### *2.3.4.1 Justification of the Systems used within Design Research*

This section will identify the strengths and weaknesses as well as the problems associated with exchanging and communicating information content relevant to design research in some of the communication and information systems discussed above.

As has been argued earlier, networked computer based systems, hence on-line systems offer a greater flexibility of access and are more effective in terms of exchanging and communicating information. The systems described earlier are mainly on-line apart from the Design and Applied Art Index which is CD ROM based. The ARIAD as the national database for design research indexes a vast amount of research content and although it currently serves its community on-line, it is based on a CD ROM structure. It can be therefore argued that the application of a CD ROM database such as ARIAD does not take full advantage of the on-line medium.



However, bearing in mind that developments in communication and information technologies attempt to empower the communication process in terms of how information is exchanged and communicated, the question is raised as to how effectively and efficiently the ADAM, ARIAD, EDINA, MAID and MAILBASE on-line systems facilitate the communication of information as well as how well information is collected, selected, represented, classified, stored, transmitted and displayed to a particular or interested group. Within this context, the ADAM, ARIAD, EDINA and MAID systems do not provide certain on-line facilities such as, on-line information collection and two way communication processes. Although a Mailbase system allows two way communication, feedback and information exchange, the reliability and validity of its information content varies since, it is more like a social communication tool for design researchers rather than an actual communication system supporting just refereed design research information content.

From the examination conducted so far, none of these examples are based on an empirically developed theoretical communication model which recognises the latest information and communication technologies in terms of what needs to be communicated in order to ensure design research results are more effectively and efficiently communicated amongst the subjects' peers. Therefore, the need to address these highlighted weaknesses of the existing systems is the purpose of this research study.

## **2.4 The Research Problem and the Objectives**

A literature-based review in relation to the communication of design research has identified a number of issues, which form the basis of this research. This research is concerned with communication within design research, and in particular, how design research results can be more effectively and efficiently be communicated amongst the subjects' peers. This is for the following reasons: firstly, both Allison (1991) and Cooper (1995, p. 17) for different purposes have argued that design research has lacked evidence in terms of communicating design research results. In addition to this, the need for availability and accessibility of design research results has been emphasised by Parnas and Clements (1986), Korvenmaa and James (1993, p. 23), Agnew (1993), Press (1995, p. 38), Bessis and Robertson (1995), Newbury (1996). Secondly, the increased funding that has come into the Art and Design sector for research, in many cases for the first time, and the wider range of the design research key areas involved in the most recent RAE compared to the previous RAE, have all led to a growth in the number of



researchers, as well as to the volume of design research output which in turn has added to the complexity and need to communicate design research work more efficiently and effectively. Thirdly, Friedman (1997) based on Vakkari (1996) has stated the need for the development of a rich theoretical framework as a basis for communication within the design research community. Fourthly, the literature review of current systems used for communicating design research results has identified a number of tangible disadvantages. Finally, the failure of information systems development methodologies to deliver what is required (Lucas, 1975, Galliers, 1987 and Mingers, 1995, p. 19), the novelty of the current communication and information technologies (Committee of Scottish Universities Principals, 1992) and the incremental changes in the way people seek, acquire and use information caused by electronic information systems (Marchionini, 1995, p. 4) form the need for further research in relation to information and communication models and systems that facilitate the communication of design research information. Based on these principles, this research aims to address the problem of how communication within design research can be improved by proposing the following research objectives:

- to review what already exists in terms of communication and information systems used for communicating design research information content
- to determine the information needs and requirements of potential users
- to develop a theoretical communication and information model concerned with how design research results can be more effectively and efficiently communicated between design researchers
- to review Human Computer Interaction considerations in order to produce a real world specification framework and a prototype in relation to the theoretical model
- to evaluate the validity of the theoretical communication and information model through this prototype in terms of its effectiveness and efficiency

## **2.5 Summary**

This chapter has established the aim of the research to address the need for improving communication of design research results between design researchers and therefore, the following chapter aims to present in detail the methodological approach to conduct this study based on the objectives presented above. A step by step framework is proposed in order to develop, formulate and evaluate a new theoretical communication and information model which will be concerned with how design research results can be more effectively and efficiently communicated between design researchers.



## **Chapter 3: Research Design**

### **3.1 Introduction**

Chapter 3 concerns the amalgam of techniques used to investigate the problem identified in Chapter 2. It starts by proposing a five step methodology aimed at identifying how design researchers can more effectively and efficiently communicate design research results. Next, it presents the Soft Systems Methodology (SSM) in greater detail and explains its suitability as the undertaken methodology. The Chapter presents the process by which the results of the literature review and primary research can be integrated into the development of a theoretical communication and information model aimed at improving communication within design research disciplines. It also presents the process in which a specification framework and an experimental working prototype can become the manifestation of this theoretical model in order for it to be evaluated in terms of its effectiveness and efficiency.

### **3.2 The Proposed Five Step Methodology**

The proposed five step methodology aims to develop a theoretical communication and information model, as a basis for a system, in which design research results can be more effectively and efficiently communicated between its peers. This five step methodology is based on the research objectives (section 2.4, p. 62) identified and presented in Chapter 2:

- to review what already exists in terms of communication and information systems used for communicating design research
- to determine the information needs and requirements of potential users
- to develop a theoretical communication and information model concerned with how design research results can be more effectively and efficiently communicated between design researchers
- to review Human Computer Interaction considerations in order to help produce a real world specification framework and a prototype in relation to the theoretical model
- to evaluate the validity of the theoretical communication and information model through this prototype in terms of its effectiveness and efficiency



The following paragraphs describe the five step methodology in a more detail:

- stage 1** To review the background area of Information Systems Development Methodologies (ISDMs), including Soft Systems Methodology (SSM) in order to identify methodological approaches potentially applicable to support the achievement of the aim of this research study
- stage 2** To explore and understand the nature of the problem by using SSM, i.e.. to draw a rich picture, examine the interventions, the cultural and political aspects of the problem situation, identify relevant conceptual systems and describe a root definition in relation to communicating design research results, as well as, the identification and formulation of a conceptual model.  
The need for a questionnaire as the primary research tool suitable for further understanding within the area of the investigation is identified
- stage 3** To acquire respondents input through the questionnaire which will be used to establish how design research knowledge is currently communicated, as well as to identify what methods, systems and networks for communication are currently employed or needed. These results along with the literature review will be used to make a comparison of the conceptual model identified in stage 2 against the perceived real world and to suggest feasible changes in the form of a new rich picture and a refined version of a root definition. These findings along with the literature review and the conceptual model are used to propose a new theoretical communication and information model concerned with how design research results can be more effectively efficiently communicated between its peers
- stage 4** To further analyse the questionnaire along with stages 2 and 3 findings and Human Computer Interaction (HCI) literature based considerations in order to produce a specification framework. Structured interviews will be performed to evaluate the initial specification framework prior to the formulation of the prototype which will stand as the manifestation of the proposed theoretical communication and information model which will be tested in stage 5 to determine the model's validity
- stage 5** To perform evaluation studies employing Formative and Summative exercises in order to test the working prototype, and thereby, the validity of the proposed theoretical communication and information model in terms of its effectiveness and efficiency



### **3.2.1 Stage 1**

This section provides an overview of the methodologies used to tackle problems within Information Systems (IS) development and identifies why and how Soft Systems Methodology (SSM) can be applied to this research problem.

The common aim of information systems development methodologies (ISDMs) is to "assist in successfully implementing information systems" (Savage and Mingers, 1996, 110). However, several reasons have been noted by Lucas (1975) for the failure of ISDMs to deliver what is required. Many of these failures "ultimately occur as a result of limitations in conventional (or 'hard') ISDMs" (Mingers, 1995, p. 19). Conventional or 'hard' ISDMs deal with "well defined problems in real world situations" (Horton, 1999, p. 2). Galliers (1987) stated that these "ISDMs lack mechanisms or techniques for identifying users key information requirements, as ISDMs assume that "existing systems are effective or that users know what they want and their requirements are straightforward to a technical solution". It is argued that, as "these methods pay less attention to the human aspects compared to the technical aspects" (Galliers, 1987), and hard methodologies "are geared primarily towards the technological aspects of design which causes a concentration on technical solutions to what may be complex social, organisational and communicational problems" (Mingers, 1995, p. 19). Furthermore, Hirschheim and Klein (1989) state that "these methodologies are underpinned by a positivist or objectivist viewpoint" and many writers (for example, Boland, 1985; Miles, 1985; Lytinen and Klein, 1985; Winograd and Flores, 1987; Checkland and Scholes, 1990; Stowell, 1991; and Lewis, 1993 - cited by Mingers, J. 1995) have argued that "this viewpoint is inappropriate for designing information systems which are but a part of the whole process of human communication". However, the failure "to cope with anything other than well structured problem situations led to the basic rethink of the fundamentals of systems thinking" (Checkland and Scholes, 1991, p. 18). Soft Systems Methodology (SSM) was developed in the 1970s in order to cope with problems that ISDMs are not capable of handling. SSM is based on the assumption that "all real world problem situations have at least one thing in common: they contain people interested in trying to take purposeful action. This idea is of a set of activities that are linked together so that the whole set, as a new entity, could pursue a purpose was taken to be a new kind of system concept, called a human activity system" (Checkland and Holwell, 1998, p. 18). This was to alleviate the main weaknesses of the ISDMs, in that they tried to extract a single set of compatible user requirements rather than to explore, and



understand users' requirements within a problem situation (Wood and Doyle, 1989, p. 4). The initial aim of SSM "is to generate a rich understanding of the relevant situation before exploring potential improvements. It is an organised way of tackling messy situations in the real world" (Checkland and Scholes, 1991, p. 1).

In contrast to hard systems, soft systems methodology "constructs conceptual models of systems and uses them as tools for investigating the real world" (Horton, 1999, p. 2). It "enables someone to view a collection of interrelated items as an ordered arrangement which, as a whole, achieves some purpose" (Patching, 1995, p. 9). As opposed to hard systems, soft systems methodologies addresses complex, badly structured problem situations. It is concerned with investigating a problematic situation that is not well defined. The following figure 3.1 illustrates the main characteristics of the hard and soft systems:

	<b>The 'Hard' Tradition (Simon)</b>	<b>The 'Soft' Tradition (Vickers)</b>
<b>Concept of organisation</b>	Social entities which are set up and seek to achieve goals	Social entities which seek to manage relationships
<b>Concept of information system</b>	An aid to decision making in pursuit of goals	A way of interpreting the world, and make sense of it, in relation to managing relationships
<b>Underlying systems thinking</b>	'Hard' systems thinking: the world assumed to be systemic	'Soft' systems thinking: the process of inquiry into the world assumed to be capable of being organised as a system
<b>Process of research and inquiry</b>	Predicated upon hypothesis testing: quantitative if possible	Predicated upon ,gaining insight and understanding; qualitative
<b>Social theory</b>	Functionalism (stemming from Durkheim)	Interpretive (stemming from Weber)
<b>Philosophy</b>	Positivism	Phenomenology

Figure 3.1: Hard versus Soft traditions, (source: Checkland and Holwell, 1998, p. 48)

The author proposes that SSM can therefore be applied to the research problem that has been identified and explained in Chapter 2 for the following reasons:

- the nature of identifying how design research results can be more effectively and efficiently communicated between the subjects' peers is concerned with the investigation of a non- tangible problem
- this research investigation of a non-tangible problem does not seek a straightforward solution
- the research does not aim to focus only on the technological aspects as it is concerned with the human aspects too



### 3.2.1.1 The Soft Systems Methodology (SSM) Approach

According to Professor Peter Checkland, the originator of the SSM, SSM is not a method for solving problems. It is a methodology (the originator defines methodology as a set of principles of methods, the definition is also used by the Oxford Dictionary of Current English, 1996, cited by Checkland and Scholes, 1999, p. A32) able to provide a way of investigating problematic situations and suggesting action to be taken. SSM was originally described as a seven stage process as seen in the figure 3.2:

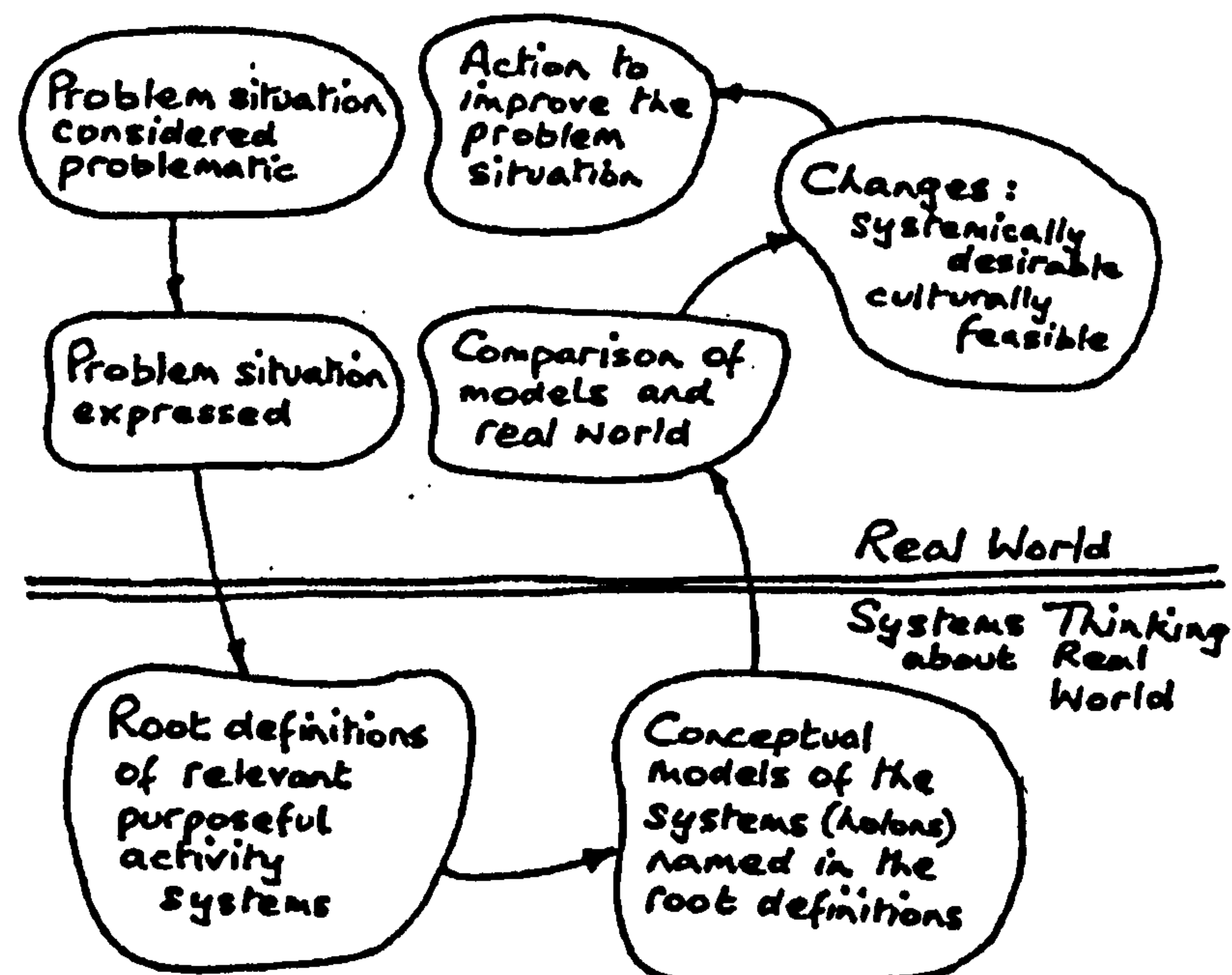


Figure 3.2: The Conventional seven stage process of SSM, 1975,  
(source: Checkland and Scholes, 1991, p. 27)

However, it was felt "in the late 1980s that the 1975 version seems rather bald, and in any case creates too much of an impression that SSM is a seven-stage process to be followed in sequence" (Checkland and Scholes, 1991, p. 27). In response, "the SSM has developed, since the seven-stage process has become outdated. The developed form of SSM is more sophisticated and it consists of two parallel streams of activity which interact with each other" (Horton, 1999, p. 7). The major step forward "enables judgement of cultural analysis to be made in terms of the intervention itself; the social system of the problem situation; and its politics" (Checkland, 1995, p. 6). This results in "a better representation of SSM" (Checkland, 1999 and Scholes p. 44) a process which is shown in figure 3.3 and it is this version which has been applied to this research. This model of SSM is considered "as an ideal type that can be used to make sense of any use



of the approach" (Checkland, 1995, p. 6). This version's concept is described by von Bulow's (1989) as follows: "SSM is a methodology that aims to bring about improvement in areas of social concern by activating in the people involved in the situation a learning cycle which is ideally never-ending. The learning takes place through the iterative process of using systems concepts to reflect upon and debate perceptions of the real world, taking action in the real world, and again reflecting on the happenings using systems concepts. The reflection and debate is structured by a number of systemic models. These are conceived as holistic ideal types of certain aspects of the problem situation rather than as accounts of it. It is taken as given that no objective and complete account of a problem situation can be provided":

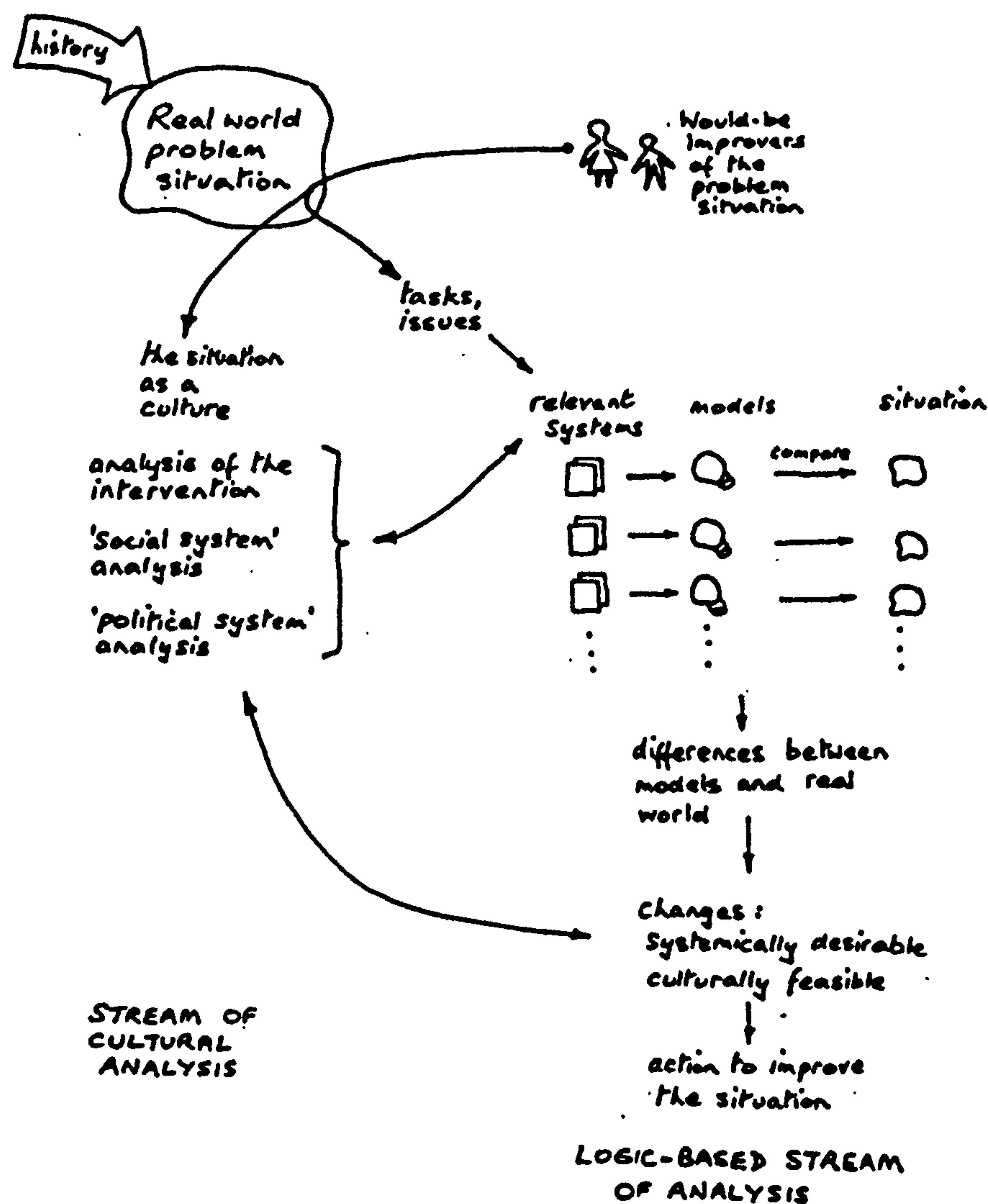


Figure 3.3: The process of SSM, 1988, (source: Checkland and Scholes, 1999, p. 29)

Figure 3.4 presents the SSM epistemology and is the language which is used during this process and it which has been applied to this study:



<b>Real World</b>	The unfolding interacting flux of events and ideas experienced as everyday life
<b>Systems Thinking World</b>	The world in which conscious reflection on the 'real world' using systems ideas takes place
<b>Problem Situation</b>	A real-world situation in which there is a sense of unease, a feeling that things could be better than they are, or some perceived problem requiring attention
<b>Analysis One, Two, Three</b>	<p><i>Analysis One:</i> examination of the intervention or interaction in terms of the roles; 'client' (caused the study to take place), 'problem solver' (undertakes the enquiry) and 'problem owner' (plausible roles from which the situation can be viewed, chosen by the 'problem solver')</p> <p><i>Analysis Two:</i> examination of the social (cultural) characteristics of the problem situation via interacting roles (social positions), norms (expected behaviour in roles) and values (by which role-holders are judged)</p> <p><i>Analysis Three:</i> examination of the power-related (political) aspects of the problem situation via elucidation of the 'commodities' of power in the situation</p>
<b>Rich Pictures</b>	Pictorial / diagrammatic representations of the situation's entities (structures), processes, relationships and issues
<b>Root Definitions</b>	Concise verbal definitions expressing the nature of purposeful activity systems regarded as relevant to exploring the problem situation. A full Root Definition would take the form: do X by Y in order to achieve Z
<b>CATWOE</b>	Elements considered in formulating root definitions. The core is expressed in T (transformation of some entity into a changed form of that entity) according to a declared <i>Weltanschauung</i> ( <i>Worldview</i> ), W. C (customers): victims or beneficiaries of T. A (actors): those who carry out the activities. O (owner): the person or group who could abolish the system. E: (the environmental constraints which the system takes as given)
<b>The 5Es</b>	Criteria by which T would be judged: Efficacy (does the means work?); Efficiency (are minimum resources used?); Effectiveness (does the T help the attainment of longer term goals related to O's expectations?); Ethicality (is T a moral thing to do?); Elegance (is T aesthetically pleasing?)
<b>Conceptual Model</b>	The structured set of activities necessary to realise the root definition and CATWOE, consisting of an operational subsystem and a monitoring and control subsystem based on the Es
<b>Comparison</b>	Setting the conceptual models against the perceived real world in order to generate debate about perceptions of it and changes to it which would be regarded as beneficial
<b>Desirable/Feasible Changes</b>	Possible changes which are (systemically) desirable on the basis of the learned relevance of the relevant systems, and (culturally) feasible for the people in the situation at this time
<b>Action</b>	Real-world action (as opposed to activity in conceptual models) to improve the problem situation as a result of operation of the learning cycle for which this epistemology provides a language

Figure 3.4: SSM's Epistemology, (source: Checkland and Scholes, 1999, p. 288)



The following sections will present a more detailed background review that aims to demonstrate both the streams of logic-based enquiry and the cultural-based analysis of the SSM process that has been employed to investigate the research problem as stated in stage 2 of the five step methodology, and also to familiarise the reader of this thesis with common SSM terminology. It is worth noting that these streams interact with each other and they proceed in parallel. The following is based on literature references by Checkland (1981), Checkland and Scholes (1991), Mingers (1995), Patching (1995), Checkland and Holwell (1998), Horton (1999), and Checkland and Scholes (1999).

#### 3.2.1.1.1 The stream of Logic-based Enquiry

This enquiry is a stream of thinking and discussion which is essentially logic-driven and can be used to question the real world. It is concerned with the naming and modelling of a number of various human systems describing their purposeful activities in the form of models and used to illuminate the problem situation. These approaches are described as follows:

- Selecting Relevant (Conceptual ) Systems
- Naming Relevant Systems - Root Definitions and CATWOE
- Modelling (Conceptual) Relevant Systems
- Comparing the Model with Perceived Reality

#### • **Selecting Relevant (Conceptual ) Systems**

This step is used in order to identify and describe relevant conceptual systems that do not exist in the real world. These systems are examined in relation to the different views and beliefs that exist within a situation. These views are known as 'Weltanschauung' (worldviews). Worldviews which refer to the problem themes are known as primary tasks relevant systems, while the issues in the problem situation are known issue-based relevant systems.

#### • **Naming Relevant Systems - Root Definitions and CATWOE**

Some of the relevant systems identified above are further defined and modelled. The root definition expresses the core purpose of the system. This input - output conversion is known as the transformation (T). The root definitions may be formulated as follows: who is doing what for whom, to whom are they answerable, what assumptions are being made, and in what environment. This is also known as the CATWOE (Smyth and Checkland, 1976) mnemonic and is illustrated below:



Customers	(whom):	beneficiaries or victims of the transformation (T)
Actors	(who):	those who would do transformation (T)
Transformation	(what):	the conversion of input to output
Weltanschauung	(assumptions):	those worldviews which makes this T meaningful within its context
Owner(s)	(answerable):	those who own the system and often have the authority to stop the (T)
Environmental Constraints		elements outside the system, i.e.. physical, social

#### • Modelling (Conceptual) Relevant Systems

Using this approach the system is modelled in terms of activities expressed as verbs. This model contains the activities necessary to carry out the transformation within other constraints of the model. However, the system as a whole entity should adapt and survive in the changing environment of the complexity of everyday's life. Forbes and Checkland (1987) highlighted three criteria by which performance of a proposed system as a whole is judged and these are as follows:

Efficacy	'does the means work?', this checks of whether the output is produced
Efficiency	the 'amount of output divided by amount of resources used', which checks whether minimum resources are used to obtain it
Effectiveness	'is T meeting the longer term aim?', this checks of whether this T is worth doing it

Although the '3Es' cover the most basic idea of transformation, current considerations include the additional criteria of Ethicacy and Elegance (Checkland and Scholes, 1999, p. 42).

#### • Comparing a Model with Perceived Reality

Checkland (1981) presents four ways of evaluating models, and these are:

- informal discussion
- formal questioning
- scenario writing based on operating the models
- trying to model the real world in the same structure as the conceptual models

in which, formal questioning "has emerged as by far the most common" technique (Checkland and Scholes, 1991, p. 43).



### 3.2.1.1.2 The stream of Cultural Enquiry

As the logic-based stream of enquiry has a part to play in human affairs, there is also a need to pay attention to other aspects of human situations which specifically make these affairs, human and therefore, this stream involves the myths and meanings which human beings attribute to their professional and personal relationships with their fellow beings. Based on this, the following ways of enquiring into the systems of myths and meanings which constitute what is meant by culture are described:

- Rich Pictures
- Analysis 1: Analysis of the Intervention
- Analysis 2: Social Systems Analysis
- Analysis 3: Political Systems Analysis
- Making Desirable and Feasible Changes

- **Rich Pictures**

Rich pictures is a technique which has been used to explore the communication and comprehension of the problem situation. Checkland and Scholes (1999, p. A16) note that their rationale lies in the fact that the complexity of human affairs is always a complexity of multiple interacting relationships; and pictures are a better medium than linear prose for expressing relationships. They are used to show:

structure	organisation or field boundaries, geographical considerations, people and institutions
process	activities, flows of information or materials
climate	the relationship between structure and process, and any associated problems
soft facts	concerns, conflicts and views
environment	external interested bodies, factors affecting organisation or field

- **Analysis 1: Analysis of the Intervention**

This analysis refers to the problem solving activity, the SSM study itself and determines who occupies the three specific roles in the intervention. These are:

client	the person who commissions or who caused the study to take place
problem solver(s)	those who wish to do something about the situation, or those who are prepared to support the study by making resources available
problem owner	this lists the possible problem owners and always include client



- **Analysis 2: Social Systems Analysis**

This analysis refers to the social system in the problem which consists of a continually changing interaction between roles, norms and values. In particular:

roles	these are social positions which are recognised by people in the situation under study
norms	these are the ways in which the occupant of a particular role is expected to behave
values	these are the standards on which performance of role holders is assessed

- **Analysis 3: Political Systems Analysis**

This analysis looks at the way in which power is gained, maintained and used. It is concerned with the process by which different interests reach accommodation that do not necessarily involve agreement.

- **Making Desirable and Feasible Changes**

Checkland and Scholes (1999, p. 52) argue that SSM aims to do something about a situation regarded as in some way unsatisfactory. As action has been applied using SSM, these changes are aimed to help remove the dissatisfaction. These changes themselves are usually described as 'systemically desirable' and 'culturally feasible'.

### *3.2.1.2 Soft Systems Methodology (SSM) Limitations*

Although, "SSM activity models can form a cogent basis for information flow models upon which the information system design process can be based"(Checkland and Griffin, 1970), "there is not a systematic way of determining the information needed and produced by an activity, nor of developing data models. There is no connection to standard IS design methodologies or case tools to facilitate the detailed design work after the requirements have been identified" (Mingers, 1995, p. 25).

However, as Checkland and Scholes (1991, p. 25) have stated: "SSM subsumes the hard approach, which is a special case of it, one arising when there is local agreement on some system to be engineered". To this extent, many have tried to link SSM with other existing structured design methods. This was first raised by Stowell (1985) who suggested that "an agreed conceptual model could be expanded into a detailed data specification using a data flow diagram (DFD)".



In trying to establish links between SSM and ISDMs, three different options have been suggested by Wood and Doyle (1989). Firstly, by incorporating tools and techniques from ISDMs within an SSM framework. Secondly, by linking SSM to ISDMs, where SSM is used as a front-end and thirdly, by using elements of both methodologies to build a framework. Miles (1988) has classified the first two options as 'embedding' and 'grafting' respectively. In linking SSM with other ISDMs, Mingers (1995, p. 29 - 39) cites a number of different approaches that have been studied, including: Miles (1988), Prior (1990), Avison and Wood-Harper (1990, 1992), Sawyer (1991), Gregory and Merali (1992), Savage and Mingers (1993). The following figure 3.5 presents the comparison of these methods:

<u>Conceptual Model (CM)</u>					
<u>Method</u>	<u>Type of CM</u>	<u>Number of CMs</u>	<u>Data model above/ below line*</u>	<u>Link to IS method</u>	<u>Additional SSM constructs</u>
Wilson	Primary	One	Below	None	Maltese Cross
Checkland	'Relevant'	One	Above	None	
Prior	'Agreed'	One	Below	DFD	
Sawyer	Issue to primary	One	Above	DFD	
Gregori & Merali	'Agreed'	One	Below	DFD	Logico-linguistic model
Miles	'Agreed'	One	Below	None	Conceptual flow model / Conceptual data model
Savage & Mingers	'Relevant'	One or more	Below	JSD (Jackson System Development)	JSD framework
Galliers	'Relevant'	Multiple	Below	None	Scenarios

Figure 3.5: The Comparison of Methods for Linking SSM to IS, (source: Mingers, 1995, p. 42)

\* where the line divides the real world from the systems thinking about the real world

However, linking SSM with other IS methods "is very much a developing area and there are a number of difficulties and questions that must be addressed" (Mingers, 1995, p. 43). One of the major concerns is the difference between SSM and ISDMs "in terms of underlying philosophy, particularly epistemology" (Savage and Mingers, 1996, p. 112), with "one being objectivist and the other being subjectivist" (Mingers, 1995, p. 27).

Therefore, the method of linking SSM with other IS was not applied in this case since:

- it is still a developing area with major concerns and criticisms
- it is not widely documented
- it has not provided evidence of successful use



### **3.2.2 Stages 2 and 3**

These stages (Chapter 4) document the SSM approach aimed at exploring and understanding the nature of the problem which has been defined in Chapter 2. It utilises all the SSM steps described in stage 1 and they are documented in the form stated in the figure 3.4 which is concerned with the SSM's epistemology. These steps include:

- rich picture
- analyses one, two and three
- relevant systems - root definition and CATWOE
- conceptual model

After the conceptual's model formulation a questionnaire was employed as the primary research tool of the study to help provide information on certain aspects of the problem and in particular, in terms of:

- how design research knowledge is currently communicated
- what methods, systems and networks for communication are employed or needed

The questionnaire was also designed with the purpose of reviewing and identifying the awareness and use of current computer based systems within the design research discipline as this is a primary focus of the research problem, as well as, to examine the:

- strengths and weaknesses of those communication systems already used

These results along with literature review were used to:

- make a comparison of the conceptual model against the perceived reality
- suggest feasible changes in the form of a new rich picture and a refined root definition

Finally, integration of these primary research results along with the literature review and the conceptual model was compiled in the form of a:

- new theoretical communication and information model concerned with how design research results can be more effectively and efficiently communicated between design researchers



The questionnaire (see appendix I) was closed-form and structured. The closed-form questionnaire was chosen instead of an open-form one, since open-form questionnaires "achieve less uniformity of measurement than closed-form questionnaires and they achieve less reliability" (Van Dalen, 1979, p. 154). Questions were fixed alternative, including options such as:

'Yes' and 'No'	
'One to Two Years' to 'More than Ten Years'	(four-point scaled)
'Less than Five hours per week' to 'More than Twenty hours per week'	(four-point scaled)
'Very Experienced' to 'Not Experienced'	(four-point scaled)
'Always' to 'Never'	(four-point scaled)
'Very Important' to 'Unimportant'	(four-point scaled)
'Very Useful' to 'Not Useful'	(four-point scaled)
'Strength' to 'Weakness'	(two-point scaled)
'Very Appropriate' to 'Inappropriate'	(four-point scaled)
'Other'	where it was considered appropriate

Content analysis was not employed in this questionnaire since the 'Other' option was very rarely filled. The results were statistically analysed using the S.P.S.S. (Statistical Package for Social Sciences) release 6.1.1 on an Apple Macintosh operating system which is considered "the most comprehensive" (Maddix, 1990, p. 82). Participants in this questionnaire included designers, researchers, supervisors, examiners and Universities staff and involved:

**circulation**

67	members of De Montfort University (DMU)
396	members of the Chartered Society of Designers (CSD)
100	members of the Design Research Society (DRS)
37	users of the Allison Research Index of Art and Design (ARIAD)

The questionnaire was distributed throughout UK using the postal method between July 1997 and January 1998 to a population of the 600 subjects. Van Dalen (1979, p. 130 - 131) pointed out that a sample of 30 subjects or a 10 to 20 percent of the population is often used and permits the use of large sample statistics. Therefore, the 87 responses (14.5%) are considered acceptable for the purposes of this research.



### **3.2.3 Stage 4**

Previous sections (stages 1, 2 and 3) have discussed the methods which supported the development and the formulation of the theoretical communication and information model concerning how design research results can be more effectively and efficiently communicated between the design researchers. However, even using such techniques, there is still a need to assess and test this model's outcome, to ensure that it actually behaves as it is expected to, and this is documented in Chapter 5. Therefore, this stage describes how the SSM theoretical model produced is used to formulate a specification framework and ultimately a prototype which will enable the model to be tested.

Human Computer Interaction (HCI) considerations are employed in order to formulate these manifestations in a real world situation by:

- illustrating the theoretical model's process flow chart

Then, additional questions included in the primary research tool employed in the stages 2 and 3 (i.e. the questionnaire) were used to help justify:

- whether design researchers can operate the system in the environment for the purposes as described in the theoretical model
- usability factors aimed to augment performance of the system as described in the theoretical model and illustrated in the initial process flow chart

Incorporation of the these findings resulted in a:

- a refined version of the process flow chart

Analysis of all the findings related to this stage allowed the development of the:

- specification framework

Using this framework, one-to-one structured interviews with five experts in the field of design research were then conducted aimed to evaluate this specification framework prior to the development for an appropriate prototype. This evaluation method examined:

- whether the system would be useful to design researchers



- whether there is a need for improvements and / or modifications
- what will be the key core elements for this system

These results formed the basis for the:

- final version of the specification framework in an operational form

### ***3.2.4 Stage 5***

This stage is documented in Chapter 6 and describes the nature of the exercises used to judge the efficacy, effectiveness and efficiency of the theoretical communication and information model. As Newman and Lamming have pointed out: "this is solved empirically, by building and testing a prototype" (p. 190), in which these kinds of tests are generally known as evaluation exercises.

In this study, the specification framework formulated in stage 4, based on the theoretical communication and information model was used to develop:

- an appropriate real world working prototype to serve as the manifestation of the theoretical model

This prototype was evaluated at intervals during its development and at the end.

Although one aim of this study was to assess the usability and functionality of such a prototype this was considered a secondary exercise. The primary exercise was to assess the validity of the theoretical communication and information model and therefore these evaluation methods included:

- secondary exercise: the formative evaluation
- primary exercise: the summative evaluation

#### ***3.2.4.1 Secondary Exercise: The Formative Evaluation***

This type of evaluation assisted the process of developing and envisaging the implementation of the experimental prototype design. Both at intervals and at the end, the prototype was tested in terms of its efficacy (according to the SSM epistemology on page 70 of this thesis, efficacy is concerned with whether the means is working) as well



as its usability and functionality in relation to its efficient operation, and the results were then fed into its next stage of development. Hix and Hartson (1993) have pointed out that, "this overall approach has been called formative evaluation because it is oriented towards helping form the solution to the design problem" (p. 190).

However, as the formative evaluation was only used to help in developing a suitable prototype to assess the validity of the proposed theoretical model and underlying thinking, it was designed only to ensure that the prototype was an accurate manifestation of the theoretical model, that is, to ensure that the prototype being tested did not adversely affect users' productivity in relation to the aspects in the theoretical model which would then interfere with the primary evaluation.

Participants of this evaluation varied from experts in the field to the end users including supervisors, lecturers in screen design and research students. These evaluation exercises were based on the work of Kerr and Hiltz (1982, p.162), Dix, Finlay, Abowd and Beale (1993, p. 375), Shneiderman (1992, p. 478), Wilcox (1994, p. 18), and, Newman and Lamming (1995, p. 190) and were employed as follows:

- one-to-one expert evaluation review with five experts in content, design and technical matters
- user group based evaluation with fifteen prospective end-users to assess the efficiency of the prototype in a user environment
- a comparison of features with other similar systems to ensure that the prototype is an accurate manifestation of the the proposed theoretical model

A one-to-one evaluation review with five experts in terms of the content, technical and design matters was employed with the aim to assess the first working version of the prototype. The prototype was assessed in relation to its efficient operation, as well as, its efficacy in relation to its functionality and usability. In particular, this exercise examined the overall reaction, terminology, screen layouts (including navigation, colours, text) and finally features' functionality and system capabilities. Subjects of this exercise included two lecturers in multimedia design and three MA / MSc / MPhil / PhD supervisors from De Montfort University. The exercise was interview based and subjects' feedback was documented on a questionnaire. Questions employed were fixed alternative five point scaled and based on the evaluation strategies of Shneiderman (1992, p. 478 and 483). In addition to the fixed alternative five point scale items, a space for comments was also provided.



A user group based formative evaluation exercise with fifteen participants (MA / MSc / MPhil / PhD students of De Montfort University) was then employed to ensure that the final prototype supported all the aspects described in the theoretical model in an efficient way and did not adversely affect users' productivity in relation to its functions and thus the primary evaluation. These exercises were based on Shneiderman (1992, p. 478) evaluation strategies employing a questionnaire using fixed alternative five point scale items, and an open ended space for comments.

Finally, in order to justify whether or not this final prototype supported all the aspects indicated by the theoretical model two features' check lists were made. Based on these exercises and features check lists, it was then determined that the prototype was unique, an accurate manifestation in relation to the aspects of the theoretical model and a suitable vehicle for the primary evaluation exercise of the theoretical model.

#### *3.2.4.2 Primary Exercise: The Summative Evaluation*

As argued earlier, this type of exercise's aim is to assess whether or not the proposed theoretical model meets the aim of this research and therefore, to validate whether this model provides a more effective and efficient means for communication of design research results between design researchers. In order to achieve such validation, the method of acquiring feedback from experts in the field was employed and in particular:

- one-to-one evaluation reviews with five experts in design research issues employed to assess the validity of the theoretical model in terms of its effectiveness and efficiency

Participants for this evaluation exercise were all active design researchers, supervisors or examiners and experts in design research issues.

### **3.3 The Research Framework**

This five step methodology as described above is illustrated in the following figure 3.6:



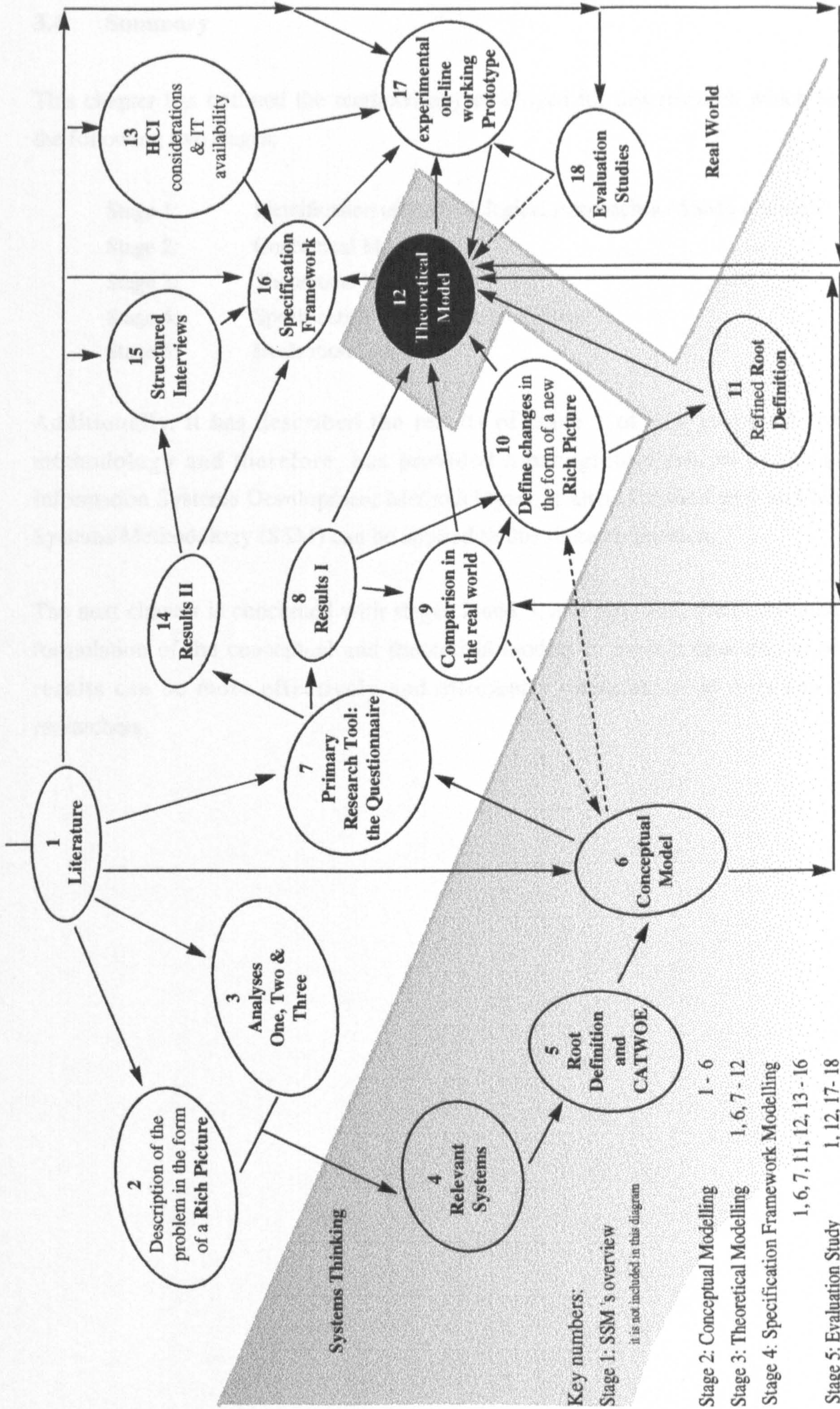


Figure 3.6: The Research Framework



### 3.4 Summary

This chapter has outlined the methodology employed for this research which involves the following five stages:

Stage 1:	Identification of Methodological Approaches / SSM's overview
Stage 2:	Conceptual Modelling
Stage 3:	Theoretical Modelling
Stage 4:	Specification Framework Modelling
Stage 5:	Evaluation Exercises

Additionally, it has described the results of stage 1 of this proposed five step methodology and therefore, has provided a background review of the area of Information Systems Development Methodologies. It also identified why and how Soft Systems Methodology (SSM) can be applied to this research problem.

The next chapter is concerned with stages 2 and 3, and also with the development and formulation of the conceptual and theoretical models to explain how design research results can be more effectively and efficiently communicated between design researchers.



## Chapter 4: Conceptual and Theoretical Modelling

### 4.1 Introduction

Chapter 4 concerns stages 2 and 3 of the proposed five step methodology as presented in Chapter 3 and in particular with the key numbers 1 - 12 shown originally in fig. 3.6 of the research framework on page 82 of this thesis. This is also shown in figure 4.1 on the next page for reference purposes and it clearly illustrates the relationship of the parts involved within this chapter. These include:

- Stage 2 (key numbers: 1 - 6) describes how the cultural and logic based stream analysis of Soft Systems Methodology (SSM) are used to investigate the problem situation and lead to the development of a conceptual model. In particular, stage 2 involves the identification and formulation of the:

- Rich Picture *(key number: 2)*
- Analyses One, Two and Three *(key number: 3)*
- Relevant Systems - Root Definition and CATWOE *(key numbers: 4 and 5)*
- Conceptual Model *(key number: 6)*

- Stage 3 (key numbers: 1, 6, 7 - 12) is concerned with the primary research tool which is a questionnaire (key number: 7) addressed mainly to the design research community (for full documentation of the instruments and results see Appendix I) and examines:

- how design research results are currently communicated
- what systems for communication design researchers employ or need
- strengths and weaknesses of those communication systems already used

Findings of this questionnaire (key number: 8) with literature review are used to:

- compare the conceptual model against the perceived reality *(key number: 9)*
- suggest desirable and feasible changes *(key numbers: 10 and 11)*

Integration of these findings with the literature review are compiled in the form of a:

- new theoretical model concerned with how design research results can more effectively and efficiently communicated between design researchers *(key number: 12)*



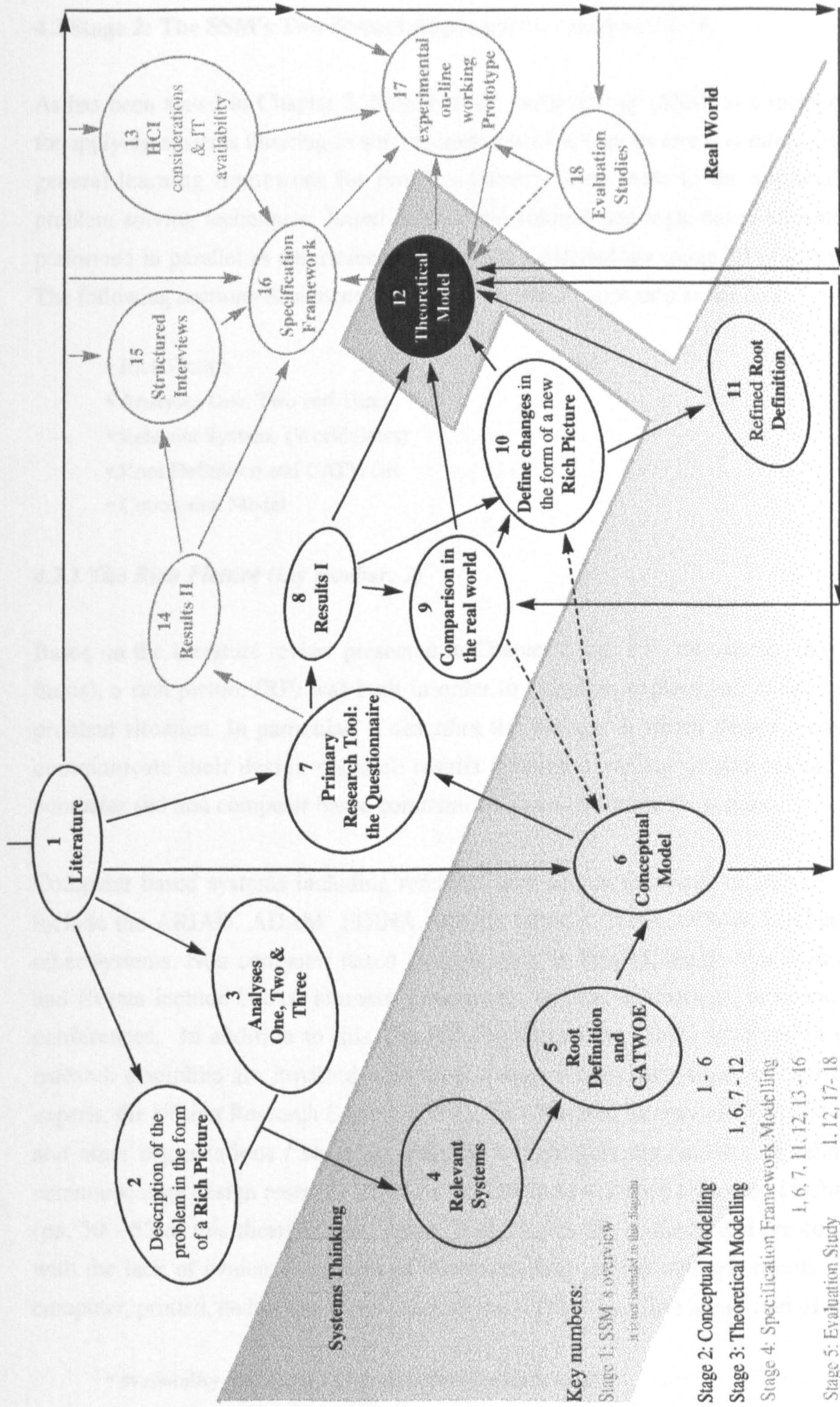


figure 4.1: Part of the Research Framework concerning the formulations of the Conceptual and Theoretical Models



## **4.2 Stage 2: The SSM's Two Stream Approach (*key numbers: 1 - 6*)**

As has been stated in Chapter 3, Soft Systems Methodology (SSM) is a methodology for applying systems thinking to soft or unstructured situations and it is introduced as a general learning framework for problem identification prior to the application of problem solving techniques. Based on this, the cultural and logic-based streams were performed in parallel as determined by the SSM epistemology (page 70 of this thesis). The following sections document the SSM's two stream approach as follows:

- Rich Picture
- Analyses One, Two and Three
- Relevant Systems (Worldviews)
- Root Definition and CATWOE
- Conceptual Model

### **4.2.1 The Rich Picture (*key number: 2*)**

Based on the literature review presented in Chapter 2 (pp. 33 - 44 and 56 - 62 of this thesis), a rich picture (RP) was built in order to visualise, explore and understand the problem situation. In particular, it describes the process in which design researchers communicate their design research results through a variety of sources including computer and non computer based communication and information systems.

Computer based systems including reference and source databases or indexes which include the ARIAD, ADAM, EDINA, MAID, OPACs, Telnet, WWW, Mailbase and other systems. Non computer based systems such as Printed, Audio-Visual Materials and Events include books, journals, periodicals, reports, exhibitions, interviews, and conferences. In addition to this, the RP illustrates how people involved in design research discipline are involved with other design researchers, supervisors, referees, experts, the Design Research Society (DRS), the Chartered Society of Designers (CSD) and other organisations / societies. Finally, it highlights the conflicts in relation to communicating design research based on the literature evidence presented in Chapter 2 (pp. 50 - 55 of this thesis). In particular, it highlights the conflicts that are concerned with the lack of evidence in terms of communicating design research results through computer, printed, audio-visual and other sources. These conflicts are related to the:

- availability and accessibility of design research work



- quality and validity of design research work - refereed processes
- confidence and reliability in the source of information
- submission processes
- currency of design research work

These processes, views, flows and conflicts that take place between design researchers when they communicate design research results are shown in the following figure 4.2 on page 88 of this thesis in the form of a 'Rich Picture'.

#### ***4.2.2 Analysis One: Analysis of the Intervention (key number: 3)***

This analysis examines the intervention itself and describes who occupies the three specific roles in the intervention. The following paragraphs documents these roles as follows:

- Client
- Problem Solver
- Problem Owner

##### **• Client**

"Client is the person who commissioned the study" (Horton, 1999, p. 17). So, for this study the client is the author, as he is the one who committed to undertake the study. Therefore, in his own right he may be responsible for causing some intervention. However, the author's inspiration and aspiration as the client of this study is based on the need identified in the literature review, that is to improve communication between design researchers. To this extent, the author himself undertakes the responsibility of being the client of this study on behalf of design researchers.

##### **• Problem Solver**

Checkland and Scholes (1999, p. A19) describes the "problem solvers as all those people who are going to conduct the study, including all those who wish to do something about the problem situation and are prepared to support the study by making resources available". Within this context, the problem solvers for this study include the author himself and his environment in terms of the available resources, methods and tools. These include the users of the Allison Research Index of Art and Design (ARIAD), staff of De Montfort University (DMU), members of the Chartered Society of Designers (CSD) and the Design Research Society (DRS) as the subjects of the



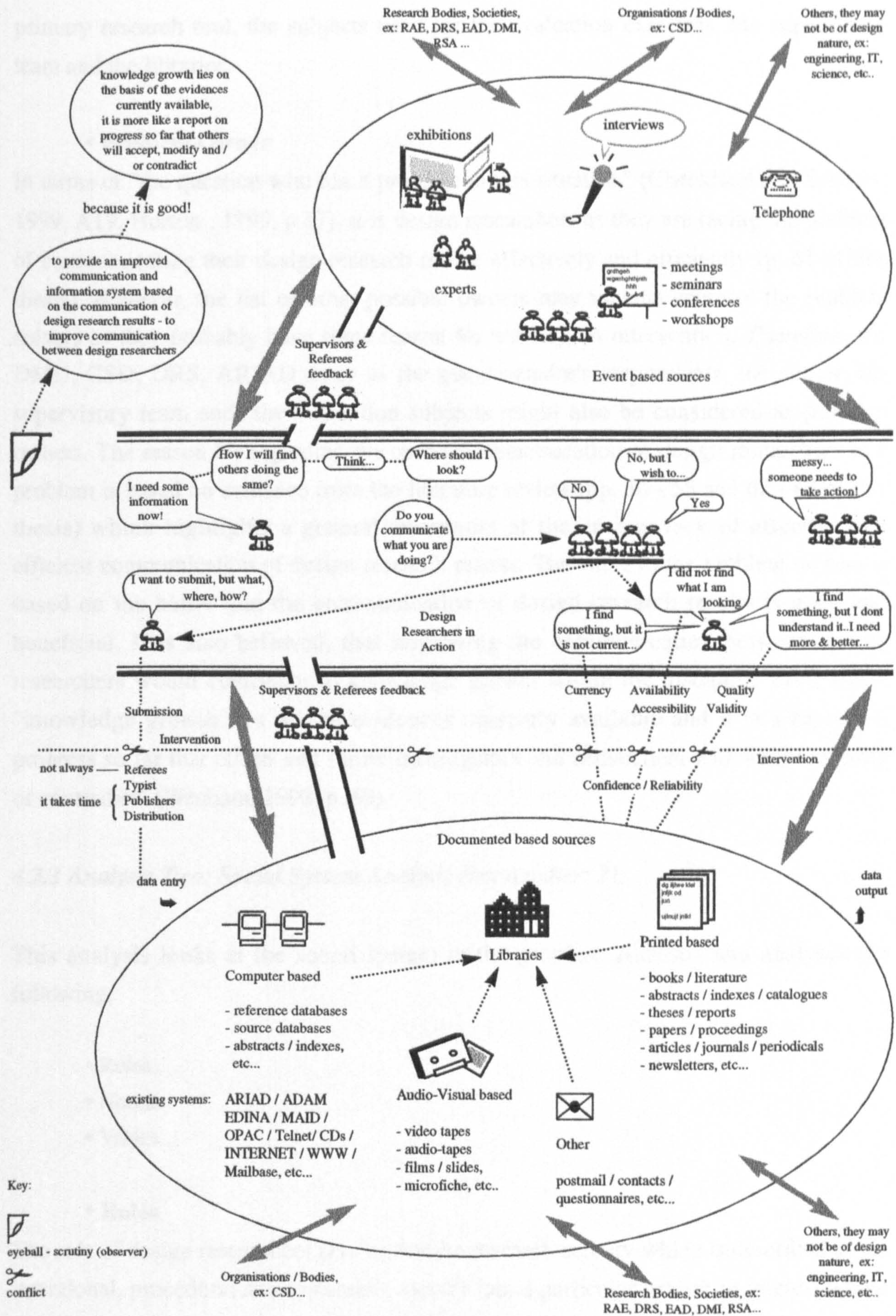


figure 4.2: A Rich Picture concerned with the Communication within Design Research



primary research tool, the subjects used for the evaluation exercises, the supervisory team and the libraries.

- **Problem Owner**

In terms of "the question who has a problem in this situation" (Checkland and Scholes, 1999, A19, Horton , 1999, p.17), it is design researchers as they are facing the problem of communicating their design research results effectively and efficiently (p. 61 of this thesis). However, the list of other possible owners may include some of the problem solvers as they probably have some reason for wanting an intervention. Therefore, the DMU, CSD, DRS, ARIAD users as the questionnaire's respondents, the author, his supervisory team and the evaluation subjects might also be considered as problem owners. The reason for regarding the current communication of design researchers as a problem is based on evidence from the literature review (pp. 50 - 55 and 62 - 63 of this thesis) which highlights a general awareness of the current lack of effective and efficient communication of design research results. The value to the problem owners is based on the belief that the communication of design research results is good and beneficial. It is also believed, that improving the communication between design researchers would contribute to knowledge growth within the discipline itself since, "knowledge growth lies on the evidences currently available and it is a report on progress so far that others and future investigators and researchers will accept, modify or contradict" (Wenham, 1998, p. 63).

#### ***4.2.3 Analysis Two: Social System Analysis (key number: 3)***

This analysis looks at the social system in the problem situation and analyses the following:

- Roles
- Norms
- Values

- **Roles**

The role of design researchers is to undertake research activity which is described as the intentional, procedural and systematic inquiry into a particular subject of interest whose goal is communicable knowledge that aims to advance and increase the sum of knowledge (pp. 17 - 23 of this thesis). In addition to this, the rich picture (page 88) illustrates the role of how supervisors and referees are involved and monitor research.



- **Norms**

It is expected that design researchers generate new knowledge and they do not re-invent the wheel as they make an original contribution to that body of knowledge (pp. 18 - 23 of this thesis). To do that, it is expected that design researchers are: aware of what has been done in the area of their research interests, as well as, disseminating their results to others in order that others are aware of what research has been done. Additionally, it is also expected that supervisors and referees have to be aware of what has been done in the area in order to assist research. Therefore, it is expected that all people involved in design research should communicate and maintain relationships with others in the light of the availability and accessibility of design research results.

- **Values**

The commitment of people involved in design research to contribute to knowledge growth determines the need for keeping and maintaining an attitude in relation to sharing their work. This clearly identifies the value of communicating research results to others. This means making information available and accessible in order for others to examine, observe and criticise before they accept, modify or contradict it (page 50).

#### ***4.2.4 Analysis Three: Political System Analysis (key number: 3)***

This analysis is concerned with the fact that everyone who participates in a group quickly acquires a sense of what they should do to cause things to happen, to stop possible action and to significantly affect the actions the group takes. These means in which powers are embodied are called 'commodities' (Checkland and Scholes, 1999, p.A20).

It is expected that people involved in design research should realise that the result of their involvement is a commodity which gives them power within the group that is interested in this particular activity (Checkland and Scholes, 1999, p. 50). In relation to design researchers, the disposition for communicating design research results is the means of their power and because this depends of whether design researchers are able to communicate their work or not, there is nothing to guarantee their power. On the same basis and in relation to other people involved in design research such as referees, the disposition for refereed design research results is the means of their power and this depends of whether design researchers are able to communicate their work or not. It also depends on whether referees keep providing their commodities or not, and



therefore there is nothing to guarantee power for both design researchers and referees. To this extent, the nature of the power embodied in communicating design research results as described above has the ability to:

- support design research results criticism and feedback
- obtain validity and credibility
- make an original contribution to the field
- keep a high quality of design research results
- keep a report on progress so far
- contribute to the knowledge growth and to the discipline's progress itself
- propose needs for further and future research
- support and influence others research
- encourage others to communicate their work

#### ***4.2.5 The Relevant Systems - Worldviews (key number: 4)***

This section is concerned with either naming the human activity in relation to the problem situation or by focusing on the issues, problems and conflicts within the problem situation. These two ways of naming relevant systems are:

- Primary Task System
- Issue-Based Relevant System

##### **• Primary Task System**

Communicating design research results is based on the professional attitude of sharing knowledge that is vital to design research knowledge growth, as knowledge growth depends on the evidence currently available and it is more like a report on progress in so far that future design researchers will accept, modify or contradict it.

##### **• Issue-Based Relevant System**

Improving communication of design research results by providing a more effective and efficient method is needed by all people involved in design research, as well as, design researchers, as it makes them aware of what has been done, how, when, where and by whom, so as to ensure they are not duplicating research. It also allows design researchers and others involved in design research to perform a critical appraisal of past design research work in order to accept, modify and / or contradict it and ultimately, to contribute to the growth of knowledge.



#### ***4.2.6 The Root Definition and the CATWOE (key number: 5)***

A root definition and a CATWOE were defined in relation to the issue-based relevant system described above and these are as follows:

- **Root Definition**

An information and communication system owned, managed and operated by design researchers to improve communication between design researchers in a form suiting their requirements in terms of how design research results can more effectively and efficiently be communicated.

- **CATWOE**

The root definition formulated above can be specified by the following CATWOE (where, C: customers, A: actors, T: transformation, W: worldview, O: owner, E: environmental constrains - for more details see on pages 70 - 72 and 87 - 90) that stands as the mnemonic acronym of who is doing what for whom, to whom are they answerable, what assumptions are being made, and in what environment:

- C** The Design Research Discipline itself, including Design Researchers - either as design research results seekers, providers or referees
- A** Design Researchers - either as seekers, providers or referees
- T** Need for improved communication between Design Researchers through their design research results  $\longrightarrow$  Need met
- W** This system's T is good and beneficial to the Design Research Discipline itself and its members (Design Researchers)
- O** Hardware and Software Providers, and the Design Researchers - either as seekers, providers or referees
- E** It is given that Design Researchers will keep the attitude of sharing their design research results and referees will keep providing their assessment services. In addition to this, the study may be affected by the resources listed in the problem solvers paragraph including hardware and software availability or other limitations as they may affect implementation of the proposed improvement.

#### ***4.2.7 The Conceptual Model (key number: 6)***

This step, involves the root definition's conceptual modelling by expressing verbs as the activities necessary to carry out the transformation within the other constraints of the model and it is based on the incorporation of all the SSM's findings so far:



- rich picture
- analyses one, two and three
- primary task
- root definition and CATWOE

In particular, the rich picture shown in figure 4.2 illustrates a graphical representation of how processes, conflicts and problems in relation to the communication of design research results currently take place within the field. Analyses one, two and three describe how the people involved in design research may inadvertently add to these problems and therefore, it is argued that by contributing and maintaining the professional attitude of sharing their work they will effectively and efficiently improve communication between design researchers. In particular, the work of people involved in design research is their commodity, as well as, the means of their power and therefore, there is nothing to guarantee their power if they do not share that work. Therefore, there is a need for people involved in design research to share these commodities. Based on these principles, communication between design researchers will be improved by providing a more effective and efficient method in which people involved in design research will be able to utilise each others commodities. To this extent, the root definition proposes a system in which design researchers will be able to more effectively and efficiently communicate design research results by utilising each other commodities in a form suiting design researchers requirements.

In relation to the activities which such a system should provide, the literature review in Chapter 2 (p. 26 of this thesis), described how a system assisting communication of information from one point to another involves the activities of processing, storing, transmitting and displaying information. Therefore, a system which presupposes the sharing of work, involves the activities where design researchers are able to provide their work to others, referees are able to assess others' works and seekers are able to obtain these assessed work. It is expected that the system should be capable of supporting these abilities and in particular the activities of obtaining such works, as well as, processing, holding, transmitting and displaying these works to others. However, the literature review in Chapter 2 (pp. 23 - 26 of this thesis) described how the transmission of information from one point to another, can involve either action on others, interaction with others or reaction of others and it can be considered misleading to think of communication as a one-way process. The communication activity should include the ability for feedback and data criticism and a mechanism in which people involved in design research will be able to act, interact or react in relation to each other



is proposed. Based on these principles, the following are considered as the minimum activities and resources of the system described above:

- 1 obtaining design research results from providers
- 2 assessing design research results by assessors
- 3 holding assessed design research results in a storage system
- 4 allowing seekers to express their interest in relation to assessed design research results
- 5 performing and determining to whom assessed design research results will be communicated
- 6 delivering assessed design research results as decided above
- 7 allowing communication ability for feedback and data criticism

The following figure 4.3, represents the author's approach in relation to the graphical representation of the activities and processes of the system described above:

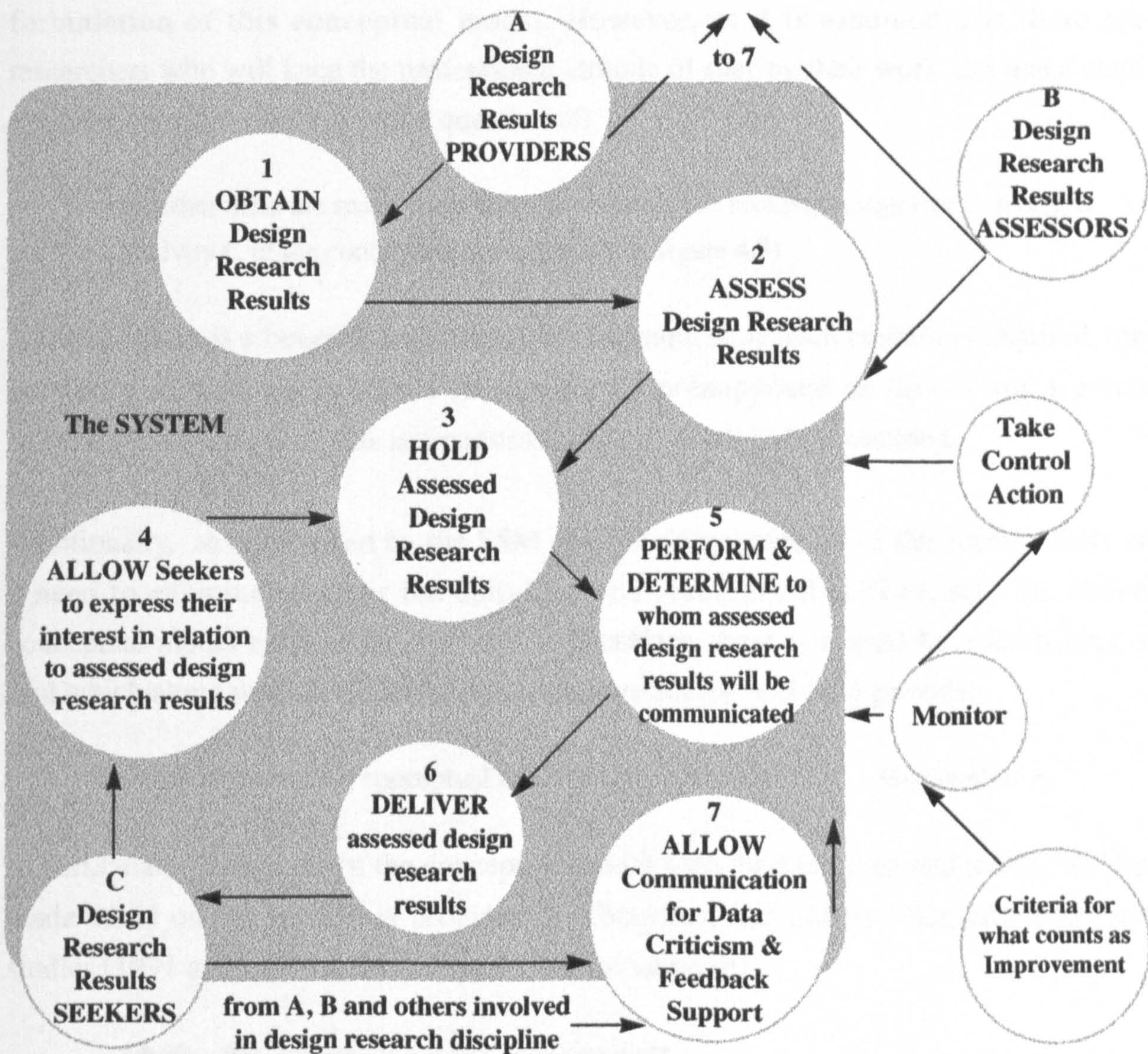


figure 4.3: The Conceptual Model



The ability for data criticism and feedback support (7) will continuously monitor and enhance all the other activities of the system, particularly the ways in which design research results can be more effectively and efficiently communicated. It will also help to create a dialogue in which people involved in the design research discipline will be able to critically appraise and comment on each others shared commodities, including past and / or current design research work.

However, the conceptual model as shown above assumes that the people involved will keep a professional attitude in sharing their commodities and therefore, it is assumed that design researchers will share design research work and that assessors of design research results will also share their commodity of design research results assessment. To this extent, both the activity (A) of sharing design research results, as well as, the activity (B) involving the assessment of design research results are assumed in the formulation of this conceptual model. However, as it is assumed that there are researchers who will keep the professional attitude of sharing their work and make them available to others, there is still a question of:

- whether there are researchers who are interested in seeking design research results (activity C of the conceptual model shown in figure 4.3)

Although there is a belief that a system for communicating such content is required, the existence of such an audience should not be presupposed as this is not a given statement, and therefore, this is a question that still needs to be examined.

Additionally, as determined by the SSM epistemology (page 70 of this thesis), there is a need to examine whether the activities and resources that constitute the above conceptual model exist in the real world. Therefore, there is a need for establishing a tool which along with the findings from literature review will help provide:

- a comparison of the conceptual model with perceived reality (*key number: 9*)

In particular, comparison of the conceptual model with the perceived real world, will be made based on the guidelines provided by Checkland and Scholes' literature and case studies (1991 and 1999) and involves the examination of:

- whether the conceptual model's activities exist
- in what form and in which systems
- if they are good or bad



- feasible alternatives that may improve the situation (key number: 10 and 11)

These findings along with literature review will then be compiled in the form of a:

- a theoretical communication and information model (key number: 12)

Finally, the SSM epistemology proposes the evaluation of this conceptual model in terms of its efficacy, efficiency and effectiveness. However, as also stated in the SSM epistemology, comparison of the conceptual model with perceived reality can provide real world feasible changes and in the case of this research, these feasible changes will be compiled in the form of a theoretical model. Therefore, identification of what counts as an improvement, as well as an evaluation of whether the resultant theoretical model is an improvement in terms of its efficacy, effectiveness and efficiency to this particular situation of concern will be conducted. The following section will now describe the need for the primary research tool in the form of a questionnaire.

#### *4.2.7.1 The need for a Questionnaire*

As described earlier, the conceptual model needs to be compared with perceived reality in terms of whether its activities exist in the real world and if they exist, how they are performed and judged. To do this, a formal questionnaire (Checkland and Scholes, 1991 and 1999, p.43) was employed in order for the comparison to be made along with findings from the literature review. However, as stated in Chapter 3 the questionnaire had a multiple purpose. The following section is concerned with stage 3 and aims to introduce this questionnaire as the primary research tool for this study (for more information about this questionnaire see also Appendix I where a copy of the questionnaire and full statistical data are documented).

### **4.3 Stage 3: The Questionnaire as a Primary Research Tool (key numbers: 1, 6, 7 - 12)**

The objectives of the questionnaire as the primary research tool for this research study are concerned with:

- **whether design researchers are interested in seeking design research results (in relation to activity C of the conceptual model)**
- **comparison of the conceptual model in the perceived real world**
- **development and formulation of the theoretical model**
- **formulation of the specification framework (this is concerned with stage 4)**



In relation to the questionnaire stage 3 involved only the first three objectives listed above and the following section describes the relevant questions that have been asked, how and to whom in relation to them. A description of what additional questions have been asked in relation to the formulation of the specification framework will be presented in Chapter (5) since, they are concerned with the next stage (4) of the study. It is also worth noting that the questions which are concerned with stage 4 were presented to the same subjects at the same time as the questions for this stage.

#### ***4.3.1 The Questionnaire in relation to Stage 3 (key number: 7)***

Based on the objectives mentioned above, the questionnaire has been designed to provide information on certain aspects of the problem in terms of how design research results are currently communicated amongst its peers and in particular:

- whether subjects search for design research results
- what systems for communication subjects employ or need
- what are the strengths and weaknesses of those systems currently used

The questionnaire was closed-form and structured including an 'Other' option where it was considered necessary. Questions were fixed alternative, including the options of:

'Yes' or 'No'	(two-point scaled)
'Always' to 'Frequently'	(four-point scaled)
'Very Experienced' to 'Not Experienced'	(four-point scaled)
'Very Important' to 'Unimportant'	(four-point scaled)
'Strength' or 'Weakness'	(two-point scaled)

In addition to this, the questionnaire was divided into the following nine sections:

Section 1	Personal and Professional Details
Section 2	Research Activity
Section 3	Computer Technology
Section 4	Research Practice
Section 5	Non Computer based Information and Communication Systems
Section 6	Computer based Information and Communication Systems / Resources
Section 7	Database Search Categories
Section 8	Review: Strengths and Weaknesses of Selected Data and Communication Systems
Section 9	Future Data and Communication Features



Based on this structure, these sections fulfilled the objectives mentioned on the previous page. However, the first two sections were concerned with determining the subjects' personal, professional and research's activity details, in order to:

- **ensure the subjects' suitability in relation to the study**

These particular questions were assigned different options to those mentioned above and were as follows:

Q1.0 Please indicate Title and Sex

Q1.1 Please indicate your age category from one of the following groups

Q1.2 Please indicate your educational qualification(s)

Q1.3 Please indicate your main discipline

Q1.4 Please indicate which post describes your main occupational status

Q1.6 Please indicate which best describes your institution's / body's occupational status

Q1.7 Please indicate your membership(s) of the following professional organisations

Q2.1 Please indicate if you are actively involved in design research and if yes, to what extent

Q2.2 Please indicate for how many years have you been research active

Q2.3 Please list any research paper(s) you presented in the last year

Questions in relation to whether the subjects wished to be further contacted along with their telephone, post and e-mail address, Surname, First Name and Institution / Body name in which subjects are employed (Q1.5) were also asked. This is because one of the societies which provided the list of names and addresses stated that the list was their property and therefore, the author had no access to the details of these subjects in case they were interested and wished to be contacted further in relation to this study.

In relation to the question:

- **whether design researchers are interested in seeking design research results (activity C of the conceptual model shown in the figure 4.3)**

the following questions (section 4) were asked:

Q2.1 Please indicate if you are actively involved in design research and if yes, to what extent

Q4.1 When you conduct research in design, how often do you search for previous and / or current research relevant to your enquiry

Finally, in relation to the:



- **comparison of the conceptual model in the perceived real world**
- **development and formulation of the theoretical model**

the following questions (sections 4, 5, 6, 8, 9) were asked:

**Q4.2 Which of the following information and communication systems do you use to search for previous and / or current research**

**Q5.1 Please rate the following in terms of importance as contributors to your research activity**

**Q5.2 Please rate the following in terms of importance as contributors to your research activity**

**Q6.1 Please rate the following in terms of importance as contributors to your research activity**

**Q6.2 Please rate the following in terms of importance as contributors to your research activity**

**Q8.2 Please rate the relevant features of any of the following systems in terms of their strengths / weaknesses**

**Q8.3 Please rate the relevant features of any of the following systems in terms of their strengths / weaknesses**

**Q9.1 Please rate the following characteristics which you feel should feature in any new data and communication system in terms of importance to your research activity**

**Q9.2 Please arrange the following databases in order of importance to your research needs**

**Q9.3 Please rate the following delivery systems in terms of appropriateness for the database you identify as most important in question 9.2**

In terms of to whom this questionnaire should be addressed, the rich picture (page 88) identified the role of the Chartered Society of Designers (CSD), Design Research Society (DRS) and Allison Research Index of Art and Design (ARIAD) in communication between design researchers. It also proposed that design research is an activity undertaken in Universities too, and therefore, the distribution of this questionnaire involved members of the CSD, DRS, the users of the ARIAD and research staff / students in UK Universities. The questionnaire was distributed throughout UK using the postal mail method between July 1997 and January 1998 to the following population:

De Montfort University:	67
Supervisors and Examiners (ARIAD):	37
Design Research Society:	100
Chartered Society of Designers:	<u>396 = 600, in total</u>

Van Dalen (1979, p. 130 - 131) pointed out that a sample of 30 subjects or a 10 to 20 percent of the population is often used and permits the use of large sample statistics. Therefore, the 87 responses (14.5%) are considered acceptable for this research.



In relation to the analysis of the questionnaire, the Statistical Package for the Social Sciences (SPSS), a comprehensive and flexible statistical and data management system software package, was used and the following sections will provide basic calculations of the respondents and statistical probabilistic tests where it was considered necessary. However, in most cases selected numerical values were assigned to each of the answers in which the total score indicated the balance or the tendency towards agreement / disagreement with the particular item. All the analysis was based on the SPSS 6.1 base system user's guide Part 1/2 since, the author had no previous experience with statistics.

#### *4.3.1.1 Subjects' Personal, Professional and Research's Activity related Details (key number: 8)*

This section is concerned with the questions that were asked in order to establish subjects' details, as well as, to ensure the subjects' suitability in relation to the study:

Starting with the subjects' title and sex/ (question 1.0):

- 68.9% were Mr / Mrs / Ms / Miss
- 20.7% were Drs
- 9.2% were Professors
- 1.1% did not indicated their title
  
- 54% were male
- 41.4% were female
- 4.6% did not indicate their gender

In terms of the subjects' age (question 1.1):

- 13.8% were below the age of 28
- 20.7% were between 29 - 34
- 26.4% were between 35 - 44
- 33.3% were between 45 - 58
- 5.7% were above the age of 58

In terms of the subjects' educational qualification(s) / (question 1.2):

- 37.9% held an additional MA / MSc / MPhil qualification
- 29.9% held a PhD and / or a Post-Doct qualification
- 27.6% held either a HND / BTEC and / or a BA / BSc / BEng qualification
- 4.6% did not indicate any qualification

In terms of the subjects' main discipline / (question 1.3):



- 23% indicated Fashion / Textiles Design
- 21.8% indicated Other Design Discipline
- 18.4% indicated Graphics / Multimedia Design
- 17.2% indicated Industrial / Product Design
- 13.8% indicated Interior / Furniture Design
- 12.6% indicated Design Management
- 11.5% indicated Non Design Discipline

In terms of the subjects' occupational status (incorporation of the questions 1.4 and 1.6):

- 77% were employed by an educational establishment for educational purposes
- 23% were employed by a non educational establishment for non-educational purposes

In terms of the subjects' membership of a professional organisation (question 1.7):

- 71.3% were registered with an organisation and / or a society
- 33.3% were registered with the CSD
- 22.8% were registered with the DRS
- 15.2% were registered with other organisations / societies

In terms of whether subjects were actively involved in research or not and to what extent (questions 2.1 / 2.2 / 2.3):

- 73.6% were actively involved in research  
(hereafter this group will be referred as 'Research Active')
- 42.6% of the subjects were actively involved in research on a part time basis
- 31% of the subjects were actively involved in research on a full time basis
  
- 9.2% had been actively involved in research for around 1 - 2 years
- 21.8% had been actively involved in research for around 3 - 5 years
- 11.5% had been actively involved in research for around 6 - 10 years
- 29.9% had been actively involved in research for more than 10 years
  
- 40.2% of all subjects had presented one or more research papers within the last year (1997)

The results presented above, indicate the subjects of the questionnaire were primarily of high educational status, registered with either a professional organisation or a research society, actively involved in research activities and employed by an educational organisation for educational purposes. Findings in relation to the subjects' title, sex, age and main discipline indicate a normal distribution flow. To this extent, subjects are considered as suitable for the purpose of the study.



### 4.3.2 Determination of whether Subjects are interested in Seeking Design Research Results (key number: 8)

As stated earlier in the section on the questionnaire (p. 96) and in the formulation of the conceptual model (p. 92 - 95), there is a question in relation to activity C of the conceptual model which needs to be examined, and is concerned with:

- whether there are researchers who are interested in seeking design research results

In response to question 4.1 which was concerned with how often subjects when they conduct research in design search for previous and / or current research relevant to their enquiry, the following results were obtained:

- 44.8% said they did it always
- 29.9% said they did it frequently
- 17.2% said they did it seldomly
- 4.6% said they never searched for previous and / or current research
- 3.4% did not indicate whether they did or did not

The question was then raised as to whether there was any difference in response between those who were research active and those who were not. To this extent, it was assumed that there was no difference. A crosstabulation test in the form of a Pearson Chi-Square test was applied. This test was based on the two independent variables and provided the probability of whether there is a difference between those who were research active and those who were not (question 2.1) in relation to searching for previous and / or current research work (question 4.1). If the observed significance level of this probability test is small enough (less than 0.05) then, the initial assumption is rejected. The following table 4.1 shows the results of this test, where V2.1A refers to those who were research active or not and V4.1 refers to the attitude of searching for previous and / or current research relevant to their enquiry:

V2.1A	V4.1 Count					Total	
	Always	Frequently	Seldom	Never	No Indication		
Research Active	35	22	7	1	1	64	73.6%
Non-Research Active	3	4	4	8	4	23	26.4%



<b>Chi-Square</b>	<b>Value</b>	<b>DF</b>	<b>Significance</b>
<b>Pearson</b>	<b>31.94122</b>	<b>4</b>	<b>.00000</b>
Likelihood Ratio	31.65266	4	.00000
Minimum Expected Frequency -	.793		
Cells with Expected Frequency < 5 -	5 OF	10 ( 50.0%)	
Number of Missing Observations:	0		

**table 4.1: Pearson Chi-Square Probability Test of Searching Past and / or Current Design Research Work in relation of whether subjects are Research Active or Not**

The result indicated that there is high significant level and therefore, the assumption that there is no difference between those who were research active and those who were not in relation to searching for previous and / or current research work can be rejected. This may therefore indicate that there is difference between those who were research active and those who were not in relation to searching for previous and / or current research work and now this is further explored.

The following table 4.2 shows the calculation of the degree to which research active subjects only, search for previous and / or current research relevant to their enquiry (incorporation of questions 2.1 and 4.1). This is based on 64 responses (research active subjects) and it is equivalent to the 73.6% of the total responses:

**V4.1 Frequency of Searching Previous and / or Current Research Results**

Always	54.7	%
Frequently	34.4	%
Seldom	10.9	%
Never	-	%

**table 4.2: Research Active Subjects in relation to Searching Past / Current Research**

These results indicate that there is a high tendency for research active subjects to search for previous and / or current research relevant to their enquiry. Incorporation of this section's findings indicate that the research active subjects of this questionnaire are the main group in which design research results are communicated. In relation to the question of whether design researchers are interested in seeking for design research results (activity C of the conceptual model), it can be argued that the research active subjects of this questionnaire are interested in seeking for design research work and therefore, the research active subjects of this questionnaire will be the only group for which the following examinations will be considered.



### ***4.3.3 Comparison of the Conceptual Model with Perceived Reality (key number: 9)***

As stated earlier on pages 70 - 72 and 95 of this thesis, comparison of the conceptual model with the perceived real world involves the examination and identification of:

- Whether the conceptual model's activities exist in the real world
- In what form the conceptual model's activities exist in the real world
- In what systems the conceptual model's activities exist in the real world
- Whether the conceptual model's activities that exist in the real world are good or bad
- Feasible alternatives that may improve the situation

The following sections will attempt to examine each of the above issues in relation to the activities of the conceptual model as shown below and seen originally in figure 4.3, using findings from literature review and primary research:

- obtaining design research results from providers
- assessing design research results by assessors
- holding assessed design research results in a storage system
- allowing seekers to express their interest in relation to assessed design research results
- assessing to whom assessed design research results will be communicated
- delivering assessed design research results as decided above
- allowing communication ability for feedback and data criticism support

#### ***4.3.3.1 Examination of whether the Conceptual Model's Activities Exist in the Real World***

Literature presented in Chapter 2 (p. 26 of this thesis) has already identified that an information system is a system to collect, process, store, transmit and display information. In relation to design research, the literature review in Chapter 2 (p. 59 of this thesis), indicated that the ARIAD is the only specialised system which both collects descriptions (an abstract, not the research itself) of design research work, stores, processes and delivers it to others. Based on this evidence, ARIAD is considered as one of the main systems with which a comparison can be made. However, the comparison is not based on the ARIAD only but extended to other systems. As argued, ARIAD is the only one that consists of the main activities of an information system as described earlier and therefore, the activities of the conceptual model as shown in figure 4.3 and in particular, the activities of obtaining, storing and delivering information do actually exist in reality. Questions are raised however about the other activities of assessing information for inclusion in a system, the delivery to an appropriate seeker and the



communication facility for data criticism and feedback support. It can however be argued that these activities do seem to exist but only in other systems. For instance, in terms of the first question of whether the activity of assessing information for inclusion in a system exists, refereed journals like 'The Design Journal' or 'Design Studies' are examples in which, design research results in the form of an article is the subject of a blind referees' approval. When an article is finally accepted for publication, its content is stored in the form of printed material and thereafter available to the readers. In relation to the second question whether the activity of delivering information to an appropriate interested seeker exists it can be argued that the facility of a search form within a computer based information system (ADAM, ARIAD, OPACs, etc..), a database or the WWW provides the facility for a query to be processed, compared and matched with relevant material which thereafter is delivered to its enquirer. Finally, whether the activity of allowing data criticism and / or feedback communication exists, it can be argued there is an ability to communicate through communications systems such as e-mail, letter, interview or phone. In conclusion, all the activities of the conceptual model shown in figure 4.3 seem to exist in the real world, however, there is no evidence of all these activities existing in a single system.

#### *4.3.3.2 Examination In What Form the Conceptual Model's Activities Exist in the Real World*

Although a comparison of the activities of the conceptual model with perceived reality supports their existence, the next question is in what form and whether these activities are currently taking place. As an example, a description of the design research work only (not the full research itself) can be included in the ARIAD.

It must be emphasised here that the primary research took place in 1997 / 1998 and therefore the subsequent changes in the field have not been explored due to their not being implemented at that time. This means that the analysis of ARIAD for example is based on the practices at the time of the primary research. This is discussed further in Chapter 7.

ARIAD collects descriptions of design research work in paper form that the editor provides to interested contributors. There is then an informal assessment in which the editor checks the syntax of the submission. Although formal refereeing does not take place at this stage, it may be argued that a submitted description to the ARIAD system has been already assessed. This is because, the submitted description may only be a



registered completed research study, from an educational institution such as an MA, MPhil, PhD, Post-Doct or a paper that has been already been published by a journal or presented to a conference. In all cases, submissions have been assessed by an examination board or by a referee board to which the paper has been presented. To this extent, description of design research results included in the ARIAD are refereed, however, it can be argued that this is not an activity of the ARIAD system itself. This is an activity which is part of the MA, MPhil or PhD completion system or part of the paper presentation or publication system at a conference or a journal. When this description is submitted to the ARIAD it is thereafter stored in a database that indexes and classifies it based on keyword descriptions, from which interested seekers are able to retrieve it through their query. The description is then delivered to the interested seeker via the query medium's interface which, in this case can be either via the CD ROM or the WWW interface.

In relation to what form the activity of feedback communication of the conceptual model takes in the real world, ARIAD only provides the seeker with postal details. Therefore, it can be argued that there is no way in which ARIAD allows such forms of direct communication since, there is a need for an external method or system such as a letter in order for communication to take place. E-mail can provide a user with a feedback facility, however, it does not support assessed content, or search methods to retrieve relevant material.

In conclusion to this examination, although all the activities of the conceptual model seem to exist, they are not integrated in a single system.

#### *4.3.3.3 Examination In What Systems the Conceptual Model's Activities Exist in the Real World*

Analysis of the questionnaire was made in order to examine what information and communication systems research active subjects use to search for previous and / or current research and therefore, to identify what are the systems which are used to communicate design research results.

The following table 4.3 provides these results from questions 2.1 and 4.2. The result is based on the 64 research active subjects since, earlier findings from section 4.3.2 indicated that this is the main group in which design research results are communicated:



<b>Q4.2 Sources of Information</b>	<b>Count</b>		<b>%</b>
<b>Printed Materials</b>	<b>63</b>	<b>98.4</b>	<b>%</b>
<b>Computer based Materials</b>	<b>54</b>	<b>84.4</b>	<b>%</b>
<b>Audio-Visual Materials</b>	<b>22</b>	<b>34.4</b>	<b>%</b>
<b>Events</b>	<b>40</b>	<b>62.5</b>	<b>%</b>

**table 4.3: Information and Communication Systems used by Design Researchers when Searching for Previous and / or Current Research**

This result indicates that research active subjects use both printed and computer based materials heavily.

The question is then raised as to which non-computer based information and communication systems research active subjects use and prefer for their research activity. These results are from question 5.1 and based on 63 responses (one of the 64 subjects used only computer based materials). In order to analyse the subjects four-point scaled indication, selected numerical values were assigned to each of these answers as follows: 'very important' assigned 3, 'important' assigned 2, 'not very important' assigned 1 and 'unimportant' assigned 0. Therefore for each question in this version the maximum totals for any response are 189 for 'very important', 126 for 'important', 63 for 'not very important' and 0 for 'unimportant'. The closer to the highest numerical value of 189, the greater the tendency to use this particular item. The following table 4.4 shows these results:

**Q5.1 Non-Computer based Information and**

<b>Communication Systems</b>	<b>Very Important</b>	<b>Important</b>	<b>Not Very Important</b>	<b>Unimportant</b>	<b>Total</b>
<b>Literature / Periodicals</b>	<b>55</b>	<b>6</b>	<b>1</b>	<b>-</b>	<b>178</b>
<b>Conferences</b>	<b>29</b>	<b>23</b>	<b>7</b>	<b>1</b>	<b>140</b>
<b>Correspondence Contacts</b>	<b>24</b>	<b>30</b>	<b>6</b>	<b>-</b>	<b>138</b>
<b>Meetings</b>	<b>24</b>	<b>22</b>	<b>11</b>	<b>2</b>	<b>127</b>
<b>Seminars</b>	<b>15</b>	<b>29</b>	<b>10</b>	<b>3</b>	<b>113</b>
<b>Workshops</b>	<b>9</b>	<b>30</b>	<b>18</b>	<b>2</b>	<b>105</b>
<b>Exhibitions</b>	<b>17</b>	<b>20</b>	<b>13</b>	<b>6</b>	<b>104</b>

**table 4.4: Non Computer based Information and Communication Systems used by Design Researchers when Searching for Previous and / or Current Research**



This result indicates that research active subjects felt that literature and periodicals were the most important non computer sources in terms of their contribution to their research activity and they scored above the halfway mark of the range between very important and important. Subjects also felt that the other non computer based materials were important to their research activity as they all scored above the halfway mark of the range between important and not very important.

The next question raised is what are the specific non computer based communication and information systems which research active subjects find important to their research activity. These results are from question 5.2. In order to analyse the subjects four-point scaled indication, the same numerical values were assigned to each of these answers as used for the table 4.4. These results are also based on 63 responses and therefore the score can not be either higher than the '189' value or lower than the '0' value in total. The following table 4.5 shows these results in which greater values indicate higher importance:

**Q5.2 Specific Non-Computer based Information and**

<b>Communication Systems</b>	<b>Very Important</b>	<b>Important</b>	<b>Not Very Important</b>	<b>Unimportant</b>	<b>Total</b>
<b>Books</b>	<b>42</b>	<b>19</b>	<b>-</b>	<b>1</b>	<b>164</b>
<b>Articles / Reviews</b>	<b>35</b>	<b>25</b>	<b>2</b>	<b>-</b>	<b>157</b>
<b>Papers / Proceedings</b>	<b>36</b>	<b>16</b>	<b>9</b>	<b>-</b>	<b>149</b>
<b>Direct Contacts / Interviews</b>	<b>32</b>	<b>22</b>	<b>5</b>	<b>2</b>	<b>145</b>
<b>Telephone / Fax</b>	<b>25</b>	<b>29</b>	<b>3</b>	<b>3</b>	<b>136</b>
<b>Mail</b>	<b>19</b>	<b>28</b>	<b>11</b>	<b>2</b>	<b>124</b>
<b>Research Theses</b>	<b>21</b>	<b>21</b>	<b>19</b>	<b>1</b>	<b>124</b>
<b>Reports</b>	<b>19</b>	<b>28</b>	<b>10</b>	<b>1</b>	<b>123</b>
<b>Abstracts / Indexes / Catalogues</b>	<b>33</b>	<b>22</b>	<b>3</b>	<b>2</b>	<b>105</b>
<b>Questionnaires</b>	<b>13</b>	<b>16</b>	<b>19</b>	<b>12</b>	<b>90</b>
<b>Newsletters</b>	<b>4</b>	<b>27</b>	<b>23</b>	<b>3</b>	<b>89</b>
<b>Slides</b>	<b>7</b>	<b>13</b>	<b>25</b>	<b>10</b>	<b>72</b>
<b>Microform</b>	<b>3</b>	<b>6</b>	<b>27</b>	<b>18</b>	<b>48</b>
<b>Tapes</b>	<b>2</b>	<b>4</b>	<b>33</b>	<b>16</b>	<b>47</b>

**table 4.5: Specific Non Computer based Information and Communication Systems used by Design Researchers when Searching for Previous and / or Current Research**

This result indicates that research active subjects felt that books were the most important in terms of the contribution to their research activity and they scored above



the halfway mark of the range between very important and important. Subjects also felt that articles / reviews, papers / proceedings, direct contacts / interviews, telephone / fax, mail, research theses, reports and abstracts / indexes / catalogues were also important since their scores were above the halfway mark of the range between important and not very important. On the other hand, the scores for questionnaires, newsletters, slides, tapes and microform indicate that the subjects felt these systems were not so important as contributors to their research enquiry.

However, the findings shown in table 4.3 indicate that research active subjects heavily use computer based materials and therefore, computer based information and communication systems used by design researchers will now be examined. These results are from question 6.1 and they are based on 52 subjects since, the other research active subjects either did not use computer based materials at all (see table 4.3) or did not answer this question. In order to analyse the subjects four-point scaled indication, the same numerical values were assigned to each of the answers as used for tables 4.4 and 4.5. Therefore for each question in this section the maximum totals possible for any response are 156 for 'very important', 104 for 'important', 52 for 'not very important' and 0 for 'unimportant'. The following table 4.6 shows these results in which greater values indicate higher importance:

**Q6.1 Computer based Information and**

<b>Communication Systems</b>	<b>Very Important</b>	<b>Important</b>	<b>Not Very Important</b>	<b>Unimportant</b>	<b>Total</b>
<b>E-Mail</b>	<b>21</b>	<b>22</b>	<b>6</b>	<b>2</b>	<b>113</b>
<b>WWW</b>	<b>14</b>	<b>24</b>	<b>9</b>	<b>2</b>	<b>99</b>
<b>CD ROM Databases</b>	<b>16</b>	<b>19</b>	<b>10</b>	<b>3</b>	<b>96</b>
<b>OPAC's</b>	<b>14</b>	<b>12</b>	<b>7</b>	<b>11</b>	<b>73</b>
<b>Telnet</b>	<b>7</b>	<b>9</b>	<b>16</b>	<b>9</b>	<b>55</b>
<b>Mail-Base</b>	<b>4</b>	<b>12</b>	<b>13</b>	<b>10</b>	<b>49</b>
<b>Newsgroups</b>	<b>2</b>	<b>11</b>	<b>16</b>	<b>15</b>	<b>44</b>
<b>FTP / Gopher</b>	<b>4</b>	<b>7</b>	<b>15</b>	<b>12</b>	<b>41</b>

**table 4.6: Computer based Information and Communication Systems and Resources used by Design Researchers when Searching for Previous and / or Current Research**

This result indicates that research active subjects felt that E-Mail, WWW and CD-ROM Databases were important in terms of searching for information relevant to their research enquiry because they scored above the halfway mark of the range between important and not very important. However, the other computer based systems were



found not to be very important as contributors to the subjects' research activity since, they scored below the halfway mark of the range between important and not very important.

The next question raised is then what specific computer based information and communication systems and resources design researchers use and their importance as contributors to their research activity. These results are from question 6.2 and they are based on 49 subjects since, the other research active subjects either did not use computer based materials at all (see table 4.3) or did not answer this question. In order to analyse the subjects four-point scaled indication, the same numerical values were assigned to each of the answers as used for tables 4.4, 4.5 and 4.6. Therefore for each question in this section the maximum totals for any response are 147 for 'very important', 98 for 'important', 49 for 'not very important' and 0 for 'unimportant'. The following table 4.7 shows these results in which greater values indicate higher importance (see Appendix VII for the full names of the following abbreviations):

**Q6.2 Specific Computer based Information and**

Communication Systems	Very Important	Important	Not Very Important	Unimportant	Total
OPAC	8	17	7	7	65
ARIAD	5	17	14	7	63
Current Research in Britain	7	15	11	6	62
ASLIB	7	14	8	9	57
Design & Applied Arts Index	4	13	15	7	53
British Reports, Transl. / Theses	5	11	12	7	49
Art Index	5	8	15	14	46
ADAM	5	8	13	14	44
BIDS	5	8	10	17	41
Current Technology Index	3	12	8	13	41
Art Bibliographies Modern	3	6	15	15	36
CTAI	3	6	8	20	35
Textiles Technology Digest	5	6	7	19	34
ERIC	1	9	12	12	33
British Education Index	1	6	17	10	32
BUBL	2	7	9	19	29
BLDS	1	5	10	20	23
MAID	1	2	9	21	16

table 4.7: Specific Computer based Information and Communication Systems and Resources used by Design Researchers when Searching for Previous and / or Current Research



This result indicates that research active subjects felt there was no specific computer based system or resource that was considered significantly important as a contributor to their research activity as they all scored below the halfway mark of the range between important and not very important. In addition to this, the BLDS and MAID computer systems were found to be unimportant since, they scored below the halfway mark of the range between not very important and unimportant.

#### *4.3.3.4 Examination of whether the Conceptual Model's Activities that Exist in the Real World are Good or Bad*

The aim of this section is to determine whether the form in which the activities of the conceptual model that exist in current and real world systems satisfy and / or dissatisfy the design research active subjects. Examinations of whether the activities in the conceptual model shown in figure 4.3 exist and in what form in current and real world systems indicate that although the activities exist, there is no single system which incorporates all these activities. The literature review in Chapter 2 (p. 59) identified that the ARIAD collects its content through paper forms and updates its content around every four to five years (as argued earlier in section 4.3.3.2, the subsequent changes in the field and therefore in the ARIAD for example are discussed in Chapter 7). OPACs and CRIB update their contents once per year, INSPEC and CTI once per quarter, EDINA once per month and BIDS twice per week. Although there is no evidence that such delays affect users' research activities, the question is raised particularly in relation to the ARIAD system, to what extent it can be considered effective when it relies on evidence which may be five years old.

In relation to what systems design researchers use for their research activities, findings from table 4.3 indicate that the research active subjects of this questionnaire heavily use both printed and computer based systems. Tables 4.4 and 4.5 indicate that subjects felt non-computer based information and communication systems were important in terms of their contribution to the subjects' research activities. In particular, subjects felt that literature, periodicals and books were very important, while articles / reviews, papers / proceedings, direct contacts / interviews, telephone / fax, mail, research theses, reports and abstracts / indexes / catalogues were slightly less but still important. Based on these findings and according to the SSM epistemology, the overall importance of non-computer communication and information systems as contributors to the subjects' research activities indicate a degree of satisfaction with these systems. On the other



hand, the subjects also heavily used computer based sources. Table 4.6 indicates that subjects felt E-Mail, WWW and CD ROM Databases were important as contributors to their research activities, however, they felt that the others and in particular, the OPACs, Telnet, FTP / Gopher, Newsgroups and Mailbase were not very important. Based on this result, table 4.7 showed the specific computer based communication and information systems and resources which design researchers use. This indicated that subjects felt that there was no specific computer based system which was important as a contributor to their research activities. According to the SSM epistemology in relation to computer based communication and information systems and resources, the findings therefore indicate a degree of dissatisfaction with these systems. However, in order to determine the degree of satisfaction and/or dissatisfaction with computer and non computer based sources the following paragraphs examine the relative importance between general and specific non computer and computer based sources.

In relation to the comparison between general non computer and computer based sources, results from tables 4.4 and 4.6 were compared and the following table 4.8 shows the relative importance and the degree of satisfaction and / or dissatisfaction with these systems. Since the results shown in tables 4.4 and 4.6 use a different number of subjects these were calculated on the basis of 100 respondents and then selected numerical values were assigned. The same numerical values were used as earlier. In particular, 'very important' was assigned 3, 'important' was assigned 2, 'not very important' was assigned 1 and finally, 'unimportant' was assigned 0. The score based on 100 respondents cannot then be either higher than '300' or lower than '0' in total. The following table 4.8 shows the total scores in which greater values indicate higher importance:

<b>General Computer &amp; Non Computer Sources</b>	<b>Total Score on a 100 basis</b>
<b>Literature / Periodicals</b>	<b>283</b>
<b>Conferences</b>	<b>222</b>
<b>Correspondence Contacts</b>	<b>219</b>
<b>E-Mail</b>	<b>217</b>
<b>Meetings</b>	<b>202</b>
<b>WWW</b>	<b>190</b>
<b>CD ROM Databases</b>	<b>185</b>
<b>Seminars</b>	<b>179</b>
<b>Workshops</b>	<b>167</b>
<b>Exhibitions</b>	<b>165</b>



OPAC's	140
Telnet	106
Mail-Base	94
Newsgroups	85
FTP / Gopher	79

**table 4.8: Comparison of the Relative Importance between General Non Computer and Computer based Sources**

This result indicates that non computer based systems were considered more important than computer based sources. In particular, literature and periodicals were the most important sources overall in terms of their contribution to the research activity and they scored above the halfway mark of the range between very important and important. The other non computer based sources along with E-Mail, WWW and CD ROM Databases computer based sources were less but still important as they scored either above the important mark or above the halfway mark of the range between important and not very important. Finally, the other computer based sources were considered not so important as they scored below the halfway mark of the range between not very important and unimportant. Based on these results, the comparison clearly indicates satisfaction with the use of all general non computer based systems and a relative degree of dissatisfaction with the use of general computer based sources.

In relation to the comparison between specific non computer and computer based sources, results from tables 4.5 and 4.7 were used and the following table 4.9 shows the relative importance, as well as, the degree of satisfaction and / or dissatisfaction with these specific systems. Since the results shown in these tables use different number of subjects these were again calculated on the basis of 100 respondents and then the same numerical values were used as above. Therefore, the score based on 100 respondents cannot then be either higher than the '300' value or lower than the '0' value in total. The following table 4.9 shows the total scores in which greater values indicate higher importance:

<b>Specific Computer &amp; Non Computer Sources</b>	<b>Total Score on a 100 basis</b>
<b>Books</b>	<b>260</b>
<b>Articles / Reviews</b>	<b>249</b>
<b>Papers / Proceedings</b>	<b>237</b>
<b>Direct Contacts / Interviews</b>	<b>230</b>



<b>Telephone / Fax</b>	<b>216</b>
<b>Mail</b>	<b>197</b>
<b>Research Theses</b>	<b>197</b>
<b>Reports</b>	<b>195</b>
<b>Abstracts / Indexes / Catalogues</b>	<b>167</b>
Questionnaires	143
Newsletters	141
OPAC	133
ARIAD	129
Current Research in Britain	127
ASLIB	116
Slides	114
Design & Applied Arts Index	108
British Reports, Transl. / Theses	100
Art Index	94
ADAM	90
BIDS	84
Current Technology Index	84
Microform	76
Tapes	75
Art Bibliographies Modern	73
CTAI	71
Textiles Technology Digest	69
ERIC	67
British Education Index	65
BUBL	59
BLDS	47
MAID	33

**table 4.9: Comparison of the Relative Importance between Specific Non Computer and Computer based Sources**

This result indicates that specific non computer based systems were considered more important than specific computer based sources. In particular, books were the most important sources in terms of their contribution to the research activity and they scored above the halfway mark of the range between very important and important. Other non computer based sources including articles / reviews, papers / proceedings, direct contacts / interviews and telephone / fax were also considered important sources as they scored above the important mark. In addition to this, mail, research theses, reports and



abstracts / Indexes / Catalogues were considered less important but still relevant as they scored above the halfway mark of the range between important and not very important. The highest score for specific computer based sources was achieved by OPAC which along with ARIAD, Current Research in Britain and ASLIB computer based sources and the non computer based sources including questionnaires and newsletters were all considered not very important in terms of their contribution to the research activity as they scored below the halfway mark of the range between important and not very important. Additionally, Slides, Microform and Tapes along with most of the other computer based sources including Design and Applied Arts Index and Britain Reports, Translations and Theses, Art Index, ADAM, BIDS, Current Technology Index, Art Bibliographies Index, CTAI, Textiles Technology Digest, ERIC, British Educational Index and BUBL scored less and were considered not very important as they scored below the halfway mark of the range between the important and not very important or even below the not very important mark but still above the halfway mark of the range between the not very important and unimportant. Finally, BLDS and MAID computer based sources were considered unimportant as they scored below the halfway mark of the range between not very important and unimportant. Based on the SSM epistemology, the results of this comparison clearly indicate satisfaction with the use of most of the specific non computer based sources and a high degree of dissatisfaction with the use of all specific computer based sources.

Following this conclusion the next question raised is what are the major weaknesses and / or strengths of computer based systems. Each activity of the conceptual model shown in figure 4.3 was assigned a feature (s) which the subjects of the questionnaire had to rate in terms of a strength and/or weakness in relation to these computer based systems. The activity of obtaining and collecting data was assigned the feature of 'updateability' (pp. 27 / 28) as earlier findings indicated that one of the major concerns with the collection of data was the need for up-to-date content. The activity concerned with assessing design research results was assigned the feature of 'information content' and the feature of 'reliability / validity' (pp. 27 / 28). In relation to the activity of holding design research results, the features of 'structure', 'classification' / 'taxonomy' and 'representation' of information content (pp. 30 / 31) were assigned. In relation to the activities of expressing an enquiry, performing the enquiry and receiving the results of this enquiry the 'search option' features (pp. 45 / 48) were assigned. In relation to the final activity of the conceptual model concerned with allowing communication for feedback and data criticism, the feature of 'communication' was assigned (p. 26).



Finally, the feature of 'extensibility' was included to the rating of these systems because it expresses the degree to which future abilities of computer systems may further support the communication activity of the model.

These results are from questions 8.2 and 8.3 and they are based on the 47 research active subjects who use computer based materials (see table 4.3) and answered these questions. In order to analyse the respondents two-point scaled indication, selected numerical values were assigned to each of the answers as follows: 'strength - S' assigned 1 and 'weakness - W' assigned -1. The total score can therefore be as high as 47 or as low as -47. The closer to the highest numerical value of 47, the greater the strength of the feature, while the closer to the lowest limit of -47 indicates the greater the weakness of the feature. The following table 4.10 demonstrates the 47 research active subjects rating of the strength / weakness of features of computer based communication and information systems. In addition to this, it provides the overall scores for each examined system in which the total score can be either as high as 423 or as low as -423. Bold numerical values represent agreement towards strength and italic represent an indeterminate response for the examined systems:

#### Q8.2 / 8.3 Strengths &

Weaknesses of Systems	OPAC	Telnet	CD ROM	E-mail	Mailbase	Newsgroups	FTP	WWW
Information Structure	-2	-6	20	19	1	1	2	15
Information Content	22	6	<b>26</b>	12	5	6	5	16
Classification / Taxonomy	18	3	22	-7	3	1	3	0
Representation	-9	2	14	-9	1	2	4	20
Reliability / Validity	18	7	15	<i>19</i>	3	-1	-1	<i>-16</i>
Search Options	1	0	11	<i>-13</i>	1	-5	-3	<i>21</i>
Communication	-2	4	5	<b>33</b>	5	9	3	<b>26</b>
Updatebility	2	3	<i>-13</i>	<b>25</b>	7	7	-1	<b>30</b>
Extensibility	-1	0	-7	15	6	4	2	<b>28</b>
<b>Overall Scores</b>	<b>47</b>	<b>19</b>	<b>93</b>	<b>94</b>	<b>32</b>	<b>24</b>	<b>11</b>	<b>140</b>

table 4.10: Review of Strengths / Weaknesses of Computer based Information and Communication Systems Features (highest, lowest= $\pm 47$ , cutoffs:  $\pm 23.5$ , highest / lowest overall= $\pm 423$ , cutoffs:  $\pm 211.5$ )

In general, these results indicate that there is no a single computer based system that is strong in all areas. The WWW had the highest overall score of 140 out of 423 which along with the other systems scored below the halfway mark (211.5) of the range



between strength and balance. However, they were not considered weak overall as they all were still above the 0 value that represented a balance. In relation to the individual scores, the findings indicate that subjects felt the strength of E-Mail was its communication and updateability features, the strength of WWW was its communication, updateability and extensibility features and the strength of CD ROM was its content feature.

The following table summarises the highest and lowest limits of strengths and weaknesses achieved in these systems in relation to the features assigned to the activities of the conceptual model:

Activity of the Conceptual Model	Features	S Y S T E M S	
		Strongest Score max	Weakest Score max
1. Obtaining design research	Updateability	WWW 30	CD ROMs -13
2. Assessing	Information Content Reliability / Validity	CD ROMs 26	FTP 5
		E-Mail 19	WWW -16
3. Holding	Information Structure Classification / Taxonomy Representation	CD ROMs 20	Telnet -6
		CD ROMs 22	E-Mail -7
		WWW 20	OPACs -9
			E-Mail -9
4. Expressing enquiry 5. Performing enquiry 6. Receiving results	Search Options (4, 5, 6)	WWW 21	E-Mail -13
7. Communicating for data feedback & criticism	Communication Extensibility	E-Mail 33	OPACs -2
		WWW 28	CD ROMs -7

Based on this table, E-Mail had the highest end limit (33) in relation to its communication feature and the WWW had the lowest end score (-16) in relation to its reliability / validity feature. These findings clearly indicate that there is no single system in which the activities of the conceptual model existing in the real world systems examined that are strong in all the respective features. Additionally some of the activities (3, 4, 5 and 6) are not particularly strong in any of the existing systems.

Based on these principles, the following section will now identify the real world feasible changes which along with the conceptual model as seen in figure 4.3 could provide a more effective and efficient means for the communication of design research results between design researchers.



#### *4.3.3.5 Identification of Feasible Alternatives that may Improve the Situation (key numbers: 10 and 11)*

Following these results, the next question raised is what may help remove the dissatisfaction design researchers have with current computer based communication and information systems in order to improve the communication of design research results. In accordance with SSM epistemology and the root definition formulated earlier in this chapter, this next section is concerned with the identification of research active subjects requirements and suggestions to improve the situation in relation to how design research results can more effectively and efficiently communicated amongst its peers. This identification of feasible alternatives that may improve the situation involves the examination of the:

- characteristics subjects feel should be featured in a new computer based system
- particular information content this new computer based system should communicate
- delivery method that should used to communicate the information content identified above

Incorporation of these findings will then be used to formulate a:

- refined rich picture *(key number: 10)*
- refined root definition *(key number: 11)*

Finally, integration of these outcomes along with the literature review (Chapter 2) and the conceptual model (key number: 6) will be synthesised in the form of a:

- new theoretical model concerned with how design research results can more effectively and efficiently communicated between design researchers *(key number: 12)*

#### **Identification of the Characteristics Subjects feel should be Featured in a New Computer based System**

In relation to the identification of which characteristics should featured in a new information and communication system, a list of different options (including the 'other' option) based on cutting edge technology (pp. 40 - 48) was provided to research active subjects in order to rate these characteristics in terms of their importance to their research activity and any future systems. These results are from question 9.1 and they are based on the 53 research active subjects who used computer based materials (see table 4.3) and answered this question. In order to analyse the subjects four-point scaled



indication, selected numerical values were assigned to each of these answers as follows: 'very important' assigned 3, 'important' assigned 2, 'not very important' assigned 1 and 'unimportant' assigned 0. Therefore for each question in this section the maximum totals for any response are 159 for 'very important', 106 for 'important', 53 for 'not very important' and 0 for 'unimportant'. The following table 4.11 shows individual scores and totals and it demonstrates the strength of support of the 53 research active subjects for specific features in a new computer based communication and information system (greater values indicate higher importance):

**Q9.1 Specific Non-Computer based Information &**

<b>Communication Systems</b>	<b>Very Important</b>	<b>Important</b>	<b>Not Very Important</b>	<b>Unimportant</b>	<b>Total</b>
<b>Speed</b>	<b>41</b>	<b>11</b>	<b>1</b>	<b>-</b>	<b>146</b>
<b>Updated</b>	<b>37</b>	<b>13</b>	<b>-</b>	<b>-</b>	<b>137</b>
<b>Keywords, Image Search System</b>	<b>35</b>	<b>15</b>	<b>1</b>	<b>-</b>	<b>136</b>
<b>On-line</b>	<b>36</b>	<b>11</b>	<b>3</b>	<b>-</b>	<b>133</b>
<b>Interactive</b>	<b>35</b>	<b>11</b>	<b>4</b>	<b>2</b>	<b>131</b>
<b>E-Mail</b>	<b>30</b>	<b>16</b>	<b>4</b>	<b>1</b>	<b>126</b>
<b>Indexed Classification System</b>	<b>32</b>	<b>13</b>	<b>3</b>	<b>1</b>	<b>125</b>
<b>Refereed Information Content</b>	<b>29</b>	<b>16</b>	<b>3</b>	<b>1</b>	<b>122</b>
<b>File Transfer</b>	<b>26</b>	<b>20</b>	<b>2</b>	<b>1</b>	<b>120</b>
<b>Graphical User Interface</b>	<b>28</b>	<b>15</b>	<b>4</b>	<b>1</b>	<b>118</b>
<b>Help Facility</b>	<b>17</b>	<b>26</b>	<b>5</b>	<b>-</b>	<b>108</b>
<b>Hyperlinks</b>	<b>25</b>	<b>13</b>	<b>7</b>	<b>1</b>	<b>108</b>
<b>Publication Facility</b>	<b>21</b>	<b>18</b>	<b>7</b>	<b>2</b>	<b>106</b>
<b>Extensible</b>	<b>22</b>	<b>16</b>	<b>3</b>	<b>-</b>	<b>101</b>
<b>Refined Intelligent System</b>	<b>17</b>	<b>23</b>	<b>4</b>	<b>1</b>	<b>101</b>
<b>Ordering System</b>	<b>12</b>	<b>17</b>	<b>16</b>	<b>3</b>	<b>86</b>
<b>2D Visual Representation</b>	<b>15</b>	<b>21</b>	<b>7</b>	<b>-</b>	<b>82</b>
<b>Application Sharing</b>	<b>8</b>	<b>21</b>	<b>16</b>	<b>1</b>	<b>82</b>
<b>Text Conferencing</b>	<b>8</b>	<b>24</b>	<b>10</b>	<b>3</b>	<b>82</b>
<b>White Board Facility</b>	<b>10</b>	<b>15</b>	<b>15</b>	<b>4</b>	<b>75</b>
<b>Video based Representation</b>	<b>3</b>	<b>20</b>	<b>20</b>	<b>2</b>	<b>69</b>
<b>Video Conferencing</b>	<b>4</b>	<b>17</b>	<b>19</b>	<b>4</b>	<b>65</b>
<b>Virtual Reality Representation</b>	<b>6</b>	<b>11</b>	<b>23</b>	<b>5</b>	<b>63</b>
<b>Voice Conferencing</b>	<b>3</b>	<b>17</b>	<b>20</b>	<b>4</b>	<b>63</b>
<b>Sound Representation</b>	<b>3</b>	<b>14</b>	<b>24</b>	<b>4</b>	<b>61</b>

**table 4.11: Rating of Features for an Improved Computer based Information and Communication System (highest=159, lowest=0)**



Based on these results, research active subjects were positive about the inclusion of most of the mentioned features. However, the characteristics which the subjects felt were most important in terms of their inclusion in a new system included:

- speed
- up-to-date information content
- keyword(s), image search system
- on-line

The scores for these features were above the halfway mark in the range from very important and important.

### **Identification of the Information Content which Subjects feel should be Communicated in a New Computer based System**

In relation to what particular information content this new computer based system should communicate to design researchers, a list of different options (including the 'other' option) in relation to design research results was provided in the questionnaire and respondents were asked to arrange them in order of importance to their research needs. These results are from question 9.2 and they are based on the 50 research active subjects who use computer based materials (see table 4.3) and answered this question. In order to analyse this question, selected numerical values were assigned to each of the options as shown in the following table. However, the 'other' option was not filled in so this option was not assigned a numerical value. The total score can therefore be as high as the numerical value of 300, or as low as 50. The closer to the highest numerical value of 300, the greater the support for inclusion of this content in a new system, while the closer to the lowest numerical value of 50, the greater the support for exclusion of this particular item. The following table provides the six-point scaled indication assigned numerical values, the calculation of these values in relation to the 50 responses, the relative maximum and minimum total cutoffs to which each indication corresponds:

<b>Scaled Indication</b>	<b>Numerical Assigned Value</b>	<b>Total</b>
1st choice	6	300
2nd choice	5	250
3rd choice	4	200
4th choice	3	150
5th choice	2	100
6th choice	1	50

**Numerical Assigned Values to the six-choice rating scale**



The following table 4.12 demonstrates the degree of support of the 50 research active subjects for inclusion of the information content arranged in order of importance to meeting design researchers needs:

<b>Q 9.2Arrangement of the Information Content</b>	<b>Total Score</b>
<b>Index of Completed Research within the Academic Design Area</b>	<b>244</b>
<b>Index of Current Research within the Academic Design Area</b>	<b>238</b>
Index of Individuals willing to Collaborate in Research Endeavour	184
Index of Professional Organisation and Research Relevant Bodies	160
Index of National & International Events & other Resources	154
Index of Standards for Product Testing & Quality Assurance	84

table 4.12: Identification of the Inclusion of the Information Content in a new improved Computer based Information and Communication System (highest=300, lowest=50)

In general there is an indication that the research active subjects of the questionnaire were positive in terms of most of the proposed information content. However, they were most positive towards the provision of the:

**Index of Completed Research within the Academic Design Area**  
**Index of Current Research within the Academic Design Area**

This is because, scores of these contents were above the halfway of the second and third indications cutoff and clearly more important than all the other provided options.

### **Identification of What is the Most Appropriate Delivery Method Subjects feel Information Content should Communicated in a New Computer based System**

In relation to what is the most appropriate delivery system for the Indexes of the Completed / Current Research, a list of media options (including the other option) was provided in the questionnaire and respondents were asked to arrange them in terms of their appropriateness. These results are from question 9.3 and based on 52 research active subjects who use computer based materials (see table 4.3) and answered this question. In order to analyse the subjects four-point scaled indication, the same numerical values were assigned to each of the answers as used for table 4.6. Therefore for each question in this version the maximum totals for any response are 156 for 'very appropriate', 104 for 'appropriate', 52 for 'not very appropriate' and 0 for 'inappropriate'. The closer to the highest value of 156 the greater the support for the use of such a delivery method (for an Index of Completed / Current Research content), while the



closer to the lowest limit of 0, the lower the support for this delivery method. The following table 4.13 shows individual scores and totals and demonstrates the degree of agreement and / or disagreement of the 52 research active subjects for using a particular delivery method in a new computer based communication and information system for communicating an Index of Completed / Current Research Content:

Q9.3 Delivery Method	Very Appropriate	Appropriate	Not Very Appropriate	Inappropriate	Score
On-line WWW based system	39	10	1	1	138
CD ROM based system	13	21	11	3	92
Mailbase system	5	22	10	4	69

table 4.13: Arrangement of Agreement Towards Appropriateness of a Delivery Method for an Index of Completed / Current Design Research Content

In general, these results indicate that there is a high agreement in the use of an on-line WWW based system as the delivery method for an Index of Completed / Current Design Research content. This is because, the '138' score is clearly the highest option. Its score is also above the halfway ('131') mark in the range very appropriate to appropriate and therefore is considered a very appropriate option. Based on this, the:

- **On-line WWW based method is considered the most appropriate option for delivering and communicating an Index of Completed / Current Design Research content**

The following section will incorporate findings related to the comparison of the conceptual model with perceived real world in order to produce a refined rich picture and root definition.

#### 4.3.3.5.1 A Refined Rich Picture (*key number: 10*)

Based on the literature review and the primary research results with regard to the comparison of the conceptual model with perceived reality, a refined rich picture (RP) can be built as shown in the following figure 4.4 on page 124. There are two main differences between this refined RP compared to the original illustrated on page 88.

The first difference relates to what research active subjects feel about current



communication and information systems in relation to communicating design research results (based on sections 4.3.3.1, 2, 3 and 4) and these are concerned with the:

- evidence that all activities of the conceptual model do not exist in a single system
- evidence that the activity of assessing design research work does not exist in a computer based system
- dissatisfaction with the use of most general computer based systems
- dissatisfaction with the use of all specific computer based systems
- dissatisfaction with the activities of the conceptual model in the form as it exists in most general real world computer based systems

The second difference to the original RP relates to what research active subjects feel would be an improvement and would allow design research results to be more effectively and efficiently communicated using a new computer based communication and information system (based on the section 4.3.3.5 of feasible alternatives). These suggestions include the following features for a new computer based communication and information system:

- speed
- updated  
(update rate / frequency)
- Keyword(s) / Image Search System
- On-line, WWW based system
- Indexes of Completed and Current Design Research Results

#### 4.3.3.5.2 A Refined Root Definition (*key number: 11*)

The findings illustrated in the refined rich picture (figure 4.4) are based on the literature review and the primary research results with regard to the comparison of the conceptual model with perceived reality, and therefore are more refined and more explicit than the original version presented earlier in this Chapter.

A new root definition can also be formulated in which the main difference from the original (section 4.2.6) provides the exact form of subjects' requirements based on the findings documented in the section of feasible alternatives (4.3.3.5) and listed above in the section on the refined rich picture. This new root definition is as follows:



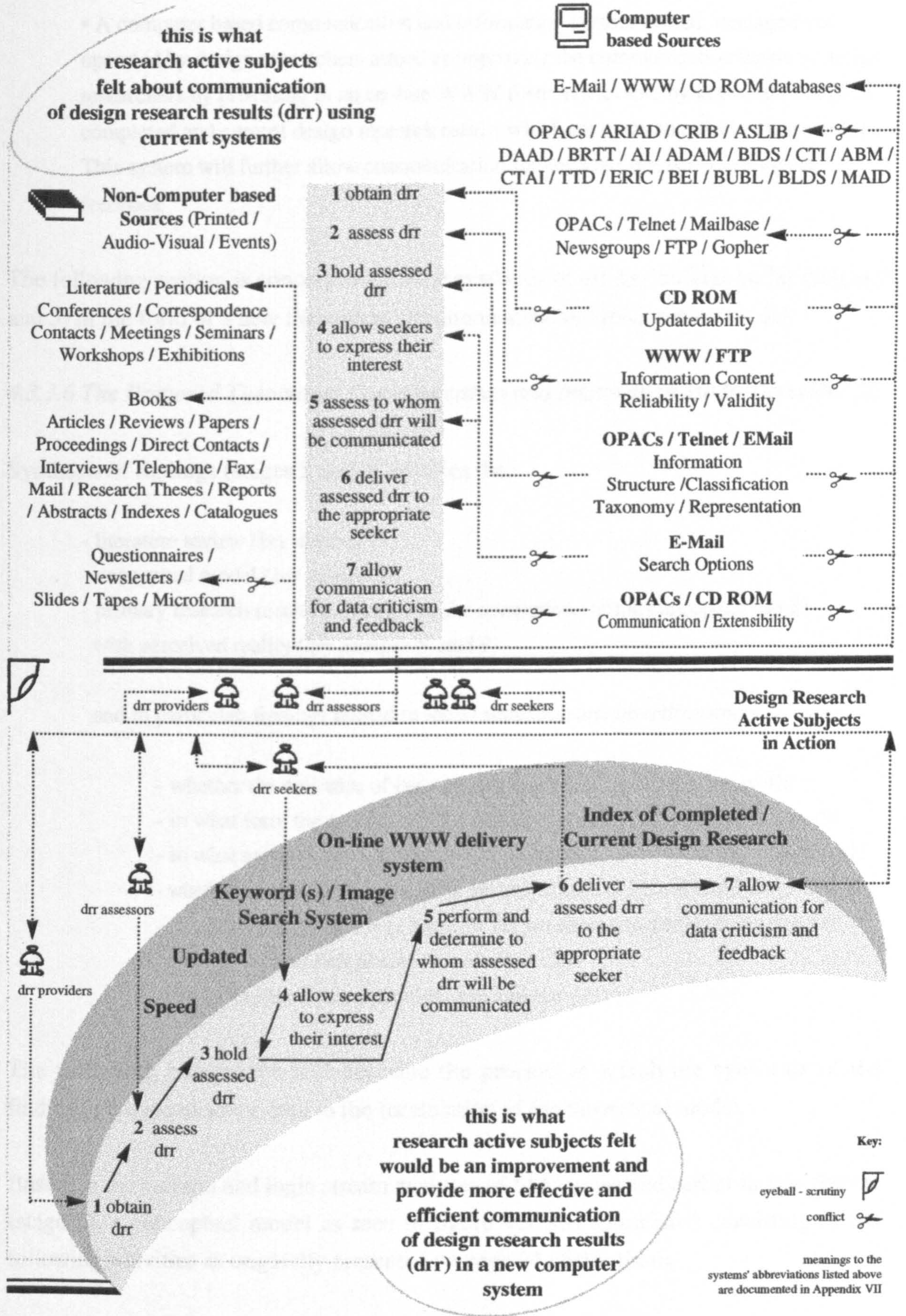


figure 4.4: A Refined Rich Picture about Communication of Design Research Results



- A computer based communication and information system owned, managed and operated by design researchers aimed at improving the communication between design researchers by providing in an on-line WWW form, retrievable by keyword / image of completed and current design research results which are updated quickly (frequently). This system will further allow communication for content criticism and support feedback

The following section is concerned with the synthesis of all the findings so far (stages 2 and 3) in the form of a new theoretical communication and information model.

#### ***4.3.3.6 The Proposed Theoretical Communication and Information Model (key number: 12)***

Synthesis of findings (stages 2 and 3) involves the:

- literature review (*key number 1*)
- conceptual model (*key number 6*)
- primary research results in relation to the comparison of the conceptual model with perceived reality (*key number 8 and 9*)

and in particular, findings related to the examination and identification of:

- whether the activities of the conceptual model exist in the real world
- in what form the activities of the conceptual model exist in the real world
- in what systems the activities of the conceptual model exist in the real world
- whether activities of the conceptual model that exist in the real world are good or bad
- feasible changes that may improve the situation and therefore involve the:
  - refined rich picture (*key number 10*)
  - refined root definition (*key number 11*)

The following paragraphs will describe the process in which the synthesis of the findings mentioned above lead to the formulation of the theoretical model.

Based on the cultural and logic stream analyses of SSM presented earlier in this chapter (stage 2), a conceptual model as seen in figure 4.3 was formulated consisting of the following activities as originally presented on page 94 of this thesis:

- obtaining design research results from providers
- assessing design research results by assessors



- holding assessed design research results in a storage system
- allowing seekers to express their interest in relation to assessed design research results
- performing and determining to whom assessed design research results will be communicated
- delivering assessed design research results as decided above
- allowing a communication ability to support feedback and data criticism

The comparison of this conceptual model with perceived reality and in particular, the examination of whether the activities of this conceptual model exist and in what form in the real world indicate that the activities in this model exist. However, there is no single system which supports all these activities (see sections 4.3.3.3.1 / 2). Further examination in relation to what form these activities of the model exist in the real world systems indicate the existence of both non-computer and computer based systems (see section 4.3.3.3.3). In the examination of whether the form in which the activities exist in these real world systems are good or bad for the purpose of communicating design research results effectively and efficiently, design research active subjects taking part in the primary research tool indicated a degree of satisfaction with the use of non-computer based sources, however, they also indicated a degree of dissatisfaction with the use of computer based systems (see section 4.3.3.3.4).

The examination of the causes of this dissatisfaction with the use of computer based systems in terms of the strengths and weaknesses of these systems highlighted the concern that there is no single system or any combination of existing systems' features in which all the activities of the conceptual model are strong. In addition to this, it highlighted a lot of weaknesses in the features assigned to the activities of the conceptual model (see section 4.3.3.3.5).

Then, based on the SSM epistemology in relation to the dissatisfaction with the use of these computer based systems, an examination of what feasible changes were possible that could remove this dissatisfaction and therefore improve the situation took place. This was based on the worldview of design research active subjects' requirements (see section 4.3.3.3.5.1). In particular, these examinations involved the identification of the:

- features for a new computer based system that may improve situation
- information content that should be communicated in this computer based system
- delivery method in which such findings identified above should be communicated to design researchers as the users of this new computer based system



The results of these three examinations are listed as follows:

- Features of the new computer based system:
- Speed
  - Updated  
(update rate / frequency)
  - Keyword (s) / Image Search System
  - On-line

Information Content to be communicated over the new computer based system:

- Indexes of Completed and  
Current Design Research Results

Delivery Method:

- On-line WWW based system

A refined rich picture illustrated these results in a real world situation and a new root definition was formed as discussed earlier. This defined what the design research active subjects felt would be an improvement in relation to their dissatisfaction in the use of current computer based systems. It can therefore be argued that in theory, any real world system incorporating all the activities of the conceptual model as seen in figure 4.3 with these results listed above would improve the situation and remove dissatisfaction in relation to communicating design research results. Moreover, such systems purely based on the incorporation of the findings of this SSM approach will be more effective and efficient in terms of communicating design research results between design researchers.

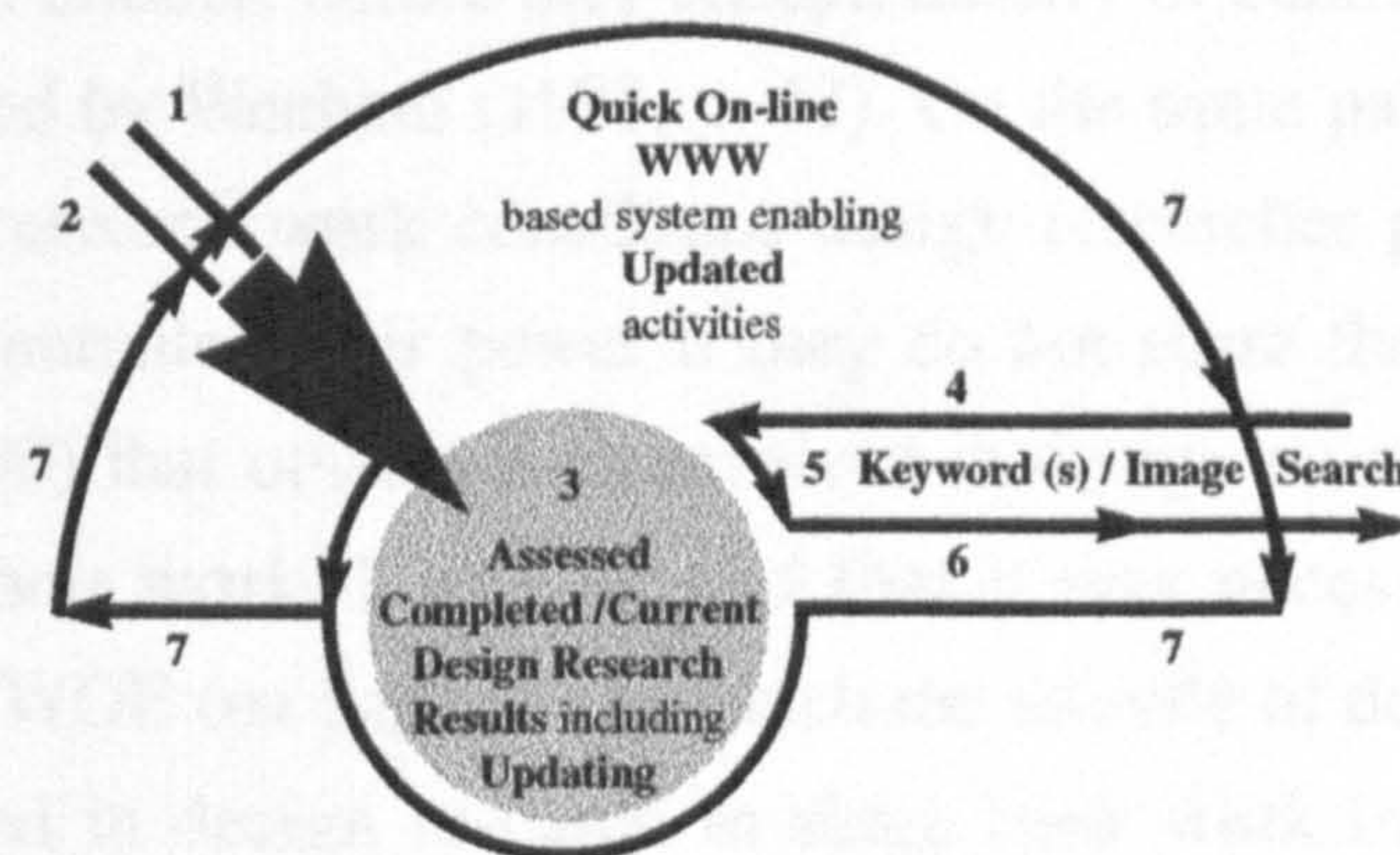
Based on this argument, the proposed theoretical communication and information model should consist of the activities of the conceptual model, as well as, the results related to the identification of feasible changes involving the features of the information content and the delivery method of such a combination, including: speed, regular updates, keyword(s) / image search system, on-line, completed and current design research results and WWW based system.

The following statement stands as the proposed theoretical communication and information model concerning how design research results could be more effectively and efficiently communicated between design researchers:



• An on-line WWW based communication and information system owned, managed and operated by design researchers in which, they should be able to act, react and / or interact, and communicate with each other their completed / current design research results with speed. In particular, a system in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The system should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search system (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the system should further allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results

The following figure 4.5 stands as a graphical representation of the proposed theoretical model, where numbers indicate the activities from the conceptual model:



Key:

1. obtaining completed / current design research results from contributors / providers
2. assessing contributed completed / current design research results by assessors
3. holding assessed completed / current design research results in a storage system
4. allowing seekers to express their interest in relation to stored assessed and completed / current design research results
5. performing & determining to whom stored assessed completed / current design research results will communicated
6. delivering stored and assessed design research results to the appropriate seeker based on 4 and 5
7. allowing communication ability for design researchers either as contributors, assessors or seekers to act, react and / or interact with each other based on activities 1, 2, 3, 4, 5, 6 and 7 for feedback & content criticism

figure 4.5: The Proposed Theoretical Communication and Information Model

However, as argued earlier in this chapter and in the five step methodology in Chapter 3, there is still a need to assess and test this model's validity, to ensure that it actually behaves as it is expected, and therefore, to judge whether this theoretical model provides an improved communication between design researchers based on design research results. Therefore, there is a need to identify what are the criteria, as well as,



what counts as an improvement in terms of the effectiveness and efficiency of this model. The following section will define these criteria based on literature definitions and the findings so far (stages 2 and 3) through which the model mentioned will be tested (stage 5) in order to evaluate its validity.

#### *4.3.3.7 Identification of the Criteria through which the Proposed Theoretical Model will be Validated*

##### **Background Review**

In the section 4.2.3 it was clearly explained that design researchers need to be aware of what has been done in their area of research, and to disseminate their results to others in order that others are aware of what research has been done. Therefore, design researchers need to be able to communicate with each other based on their available and accessible design research results. On page 90 (the values sub-section), the benefit of making design research work available and accessible was stated in order for others to examine, observe and criticise before they accept, modify or contradict it. This is based on the paradigm stated by Wenham (1998, p. 63). On the same page, it was also stated that sharing design research work constitutes design researcher power and therefore, there is nothing to guarantee their power if they do not share their work. It was also explained (on page 90) that other people involved in design research such as referees should also share their work. It was argued that it was necessary to build a root definition and a CATWOE (on page 92) in which the attitude of design researchers and other people involved in design research to share their work is assumed. This was further explained and stated in the section on the formulation of the conceptual model on pages 93 - 95. In addition to this and in particular in section 4.3.2 (on pages 102 - 105), it was shown that research active subjects involved in the primary research tool of this research are interested in seeking design research work and they are the main group in which design research work is communicated.

The literature review in Chapter 2 and in particular on pages 18, 50 and 55 defined that research is useless if it is never communicated, transferred or applied. As was also explained design research lacks evidence in relation to communicating design research results and in particular in terms of their availability and accessibility within the design research discipline. It was then explained that good practice in relation to communicating design research based on the post-Popperian paradigm is concerned with calculating and exposing new observations or explanations and therefore, research



data should be recorded in order for later observers to check. Research should also be published or exposed to critical appraisal by other researchers. It is then, much more like a report on progress, that others may accept, modify and / or contradict (Wenham, 1998, p. 63). It was also stated that there was a need for the development of a rich theoretical framework as a basis for communication within the design research community and that incorporation of these principles led to the need for the formulation of the theoretical model in which the availability and accessibility of design research work should be provided for the communication purposes mentioned. Based on the need to be aware of what research has been done as well as what research is currently in progress, the intent of the theoretical model to communicate both completed / current design research work depends on the availability and accessibility of what research has been done and what research is currently ongoing in relation to design research.

However, it was explained that in general information is an increment of knowledge (Tsichritzis and Lochovsky, 1982, Marchionini, 1995, pp. 5 - 6 and Madix, 1990, p. 50) and therefore, Lucey (1991, p. 19) and Aiken (1996, p. 35) argued that information in order to create value to their seekers should include the qualities of: relevance, accuracy, completeness, consistency, confidence in the source, communication to the right person, timing, detail, reliability, validity, and understandability (pages 27 /28).

In particular, when design research work is presented in a particular manner and at an appropriate time, it improves the knowledge of the person receiving it in such a way that he / she is better able to undertake a (required) activity or make (required) decision (Galliers, 1987, p. 4). Therefore, the updating aspect of the theoretical model is concerned with keeping design researchers informed of the latest completed / current contributions and corresponds to the degree of awareness which design researchers have of subsequent research. It therefore ensures that these design researchers will be aware of current relevant design research, completed or undertaken, which may help prevent possible mistakes or duplication in regard to their subsequent research activities. The aspect of assessing design research work is also concerned with the availability and accessibility of communicating valid and reliable design research as well as providing confidence in the source by communicating design research work with speed that is accurate, relevant and currently available. However, the action of assessing research will apply only to that which has been submitted in whole and not the descriptions. Additionally, the action of assessing research will not take place when submitted research work has been already assessed by an examination / referee board as happens



with completed MA / MSc / MPhils / PhDs or published refereed articles and papers. Finally, the aspects of the theoretical model concerned with accessing design research work world-wide (on-line and WWW features), as well as the ability to communicate with each other (to act, react and / or interact) without regard to geographical location can provide a greater degree of communication.

The literature review in Chapter 2 (pp. 28 / 29 and 45 - 48) defined gaps or needs where there is no information or resources to proceed in a given situation and this results in the process of seeking information relevant to that need / gap. This involves a search query according to the gap / need whereby the seeker examines the relevance of the retrieved items in relation to the gap / need (Marchionini, 1995, p. 50). Therefore, the aspect of the theoretical model relating to keyword(s) / image search system is concerned with the relevance of retrieving assessed completed / current design research work. However, as design research is not all about written descriptions, this aspect is also concerned with the relevance, accuracy, detail, completeness and understandability of communicating part or the whole of the research itself in both textual and audio-visual form.

Finally, the aspect of speed is concerned with how quickly processes in relation to all the activities of the theoretical model can be achieved. In particular, it is concerned with how quickly providers can contribute, assessors can assess and seekers can receive results of an enquiry. In addition to this, it is concerned with how quickly the latest updates can be communicated to the appropriate seekers, as well as, how quickly design researchers either as contributors, assessors or seekers can act, react and / or interact with each other for further communication purposes in relation to design research. However, speed is not directly concerned with the bandwidth issues of the WWW medium since this is a separate technological problem.

### **Determination of the Criteria**

The criteria used to validate the proposed theoretical model in terms of whether it provides a more effective and efficient means for communication of design research results between design researchers is concerned with the degree of satisfaction and improvement with this proposal for communicating design research work between design researchers. This clearly involves the degree, speed and convenience which design researchers are made aware of what is available in relation to assessed completed and current design research work. It also involves the degree and the speed



with which world-wide accessibility and availability, relevance and accuracy of communicating design research can be achieved. In addition to this, it involves the degree and the speed with which world-wide accessibility and availability, relevance and accuracy of communicating with each other regarding design research can be achieved. In conclusion, the evaluation will validate the aspects of the proposed theoretical model based on the assumption that design researchers wish to share their work by evaluating the following criteria:

- the degree of satisfaction with the way completed and current design research is communicated
- the quality with which completed and current design research work is communicated
- the speed with which all the aspects of the proposed theoretical model can be achieved
- the degree to which the completed and current design research work is available and accessible
- the degree to which the communication of completed and current design research work is relevant and accurate
- the degree to which design researchers are able to communicate with each other

The following figure 4.6 summarises the criteria through which the proposed theoretical communication and information model will be validated in terms of its efficiency and effectiveness:

<b>EFFECTIVENESS</b>				
<b>Availability of</b>	<b>Accuracy of</b>	<b>Relevance of</b>	<b>Quality of</b>	<b>Convenience of</b>
<ul style="list-style-type: none"> <li>• what research has been done</li> <li>• what research is currently going on</li> <li>• what work is done subsequently</li> <li>• communication with each other</li> </ul>				
<b>EFFICIENCY</b>				
<b>Speed of</b>				
<ul style="list-style-type: none"> <li>• communicating what research has been done</li> <li>• communicating what research is currently going on</li> <li>• communicating what work is done subsequently</li> <li>• communicating with each other</li> </ul>				

figure 4.6: The Criteria in which the Proposed Theoretical Model will be Evaluated

However as also argued in Chapter 3, in order to test this model's outcome, to ensure that it actually behaves as it is expected there is a need to formulate a specification



framework and ultimately a prototype. Based on this prototype, the theoretical model will be tested in relation to its efficacy (according to the SSM epistemology on page 65 of this thesis, efficacy is concerned with whether the means is working), as well as, in relation to its efficiency and effectiveness using the criteria defined above. The process in which the specification framework which is based on the proposed theoretical model is documented in the following chapter and represents stage 4 of the research framework shown on page 82 of this thesis.

#### **4.4 Summary**

This chapter was concerned with stages 2 and 3 and in particular described how the Soft Systems Methodology (SSM) was used to investigate the problem situation. In particular, stage 2 described how a conceptual model was produced based on the SSM using a rich picture, analyses one, two and three, relevant systems - root definition and CATWOE. This conceptual model consisted of the following activities:

- obtaining design research results from the providers
- assessing design research results by assessors
- holding assessed design research results in a storage system
- allowing seekers to express their interest in relation to assessed design research results
- performing and determining to whom assessed design research results will be communicated
- delivering assessed design research results as decided above
- allowing communication ability for feedback and data criticism support

Then, it described (stage 3) how a questionnaire was used as the primary research tool for this research and examined attitudes in relation to how design research is currently communicated, as well as, what systems for communication design researchers are employed or needed and it examined the strengths and weaknesses of those communication systems already used. These findings along with the literature review were used to compare the conceptual model against perceived reality and to suggest feasible changes. Synthesis of these findings along with the literature review were then, compiled in the form of a theoretical model concerned with how design research results can more effectively and efficiently communicated between design researchers and this is as follows:

- An on-line WWW based communication and information system owned, managed and operated by design researchers in which, they should be able to act, react and / or



interact, and communicate with each other their completed / current design research results with speed. In particular, a system in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The system should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search system (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the system should further allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results

Based on this theoretical model, the criteria in relation of what counts as an improvement were defined in order to evaluate the validity of such theoretical model:

- the degree of satisfaction with the way completed and current design research is communicated
- the quality with which completed and current design research work is communicated
- the speed with which all the aspects of the proposed theoretical model can be achieved
- the degree to which the completed and current design research work is available and accessible
- the degree to which the communication of completed and current design research work is relevant and accurate
- the degree to which design researchers are able to communicate with each other

Based on these findings so far (stages 2 and 3), the next chapter describes stage 4 of the five step methodology involving the process in which Human Computer Interaction parameters are considered along with further analysis of the primary research tool in the formulation of a specifications' framework in order for a working prototype to be implemented as the manifestation of the theoretical model so that it may be validated.



## Chapter 5: Specification Framework Modelling

### 5.1 Introduction

Chapter 5 is concerned with stage 4 of the proposed five step methodology and in particular with key numbers 1, 6, 7, 12 and the 13 - 16 shown originally in fig. 3.6 of the research framework on page 82 of this thesis. This is also shown in figure 5.1 on the next page for reference purposes and it clearly illustrates the relationship of those parts involved and conducted within this chapter. These include:

- human computer interaction considerations *(key number: 13)*
- stage 2 and 3 findings *(key numbers: 6 and 12)*
- literature review *(key number:1)*
- further analysis of the primary research tool *(key numbers: 7 and 14)*
- structured interviews *(key number:15)*

In particular, this chapter concerns the examination of key numbers 7, 13, 14 and 15 and it describes the process in which, along with key numbers 1, 6 and 12 from previous chapters, they are integrated and used to develop and formulate the:

- specification framework *(key number: 16)*

which will be based on the theoretical model (*key number: 12*). The following paragraph describes the aim of this process.

As was proposed in the five-step methodology presented in Chapter 3, it was decided that in order to evaluate the validity of the proposed theoretical model, there was a need to develop an appropriate specification framework and experimentally implement and test a real world working prototype which would stand as the manifestation of the theoretical model. Therefore, this chapter will consider these proposed developments.



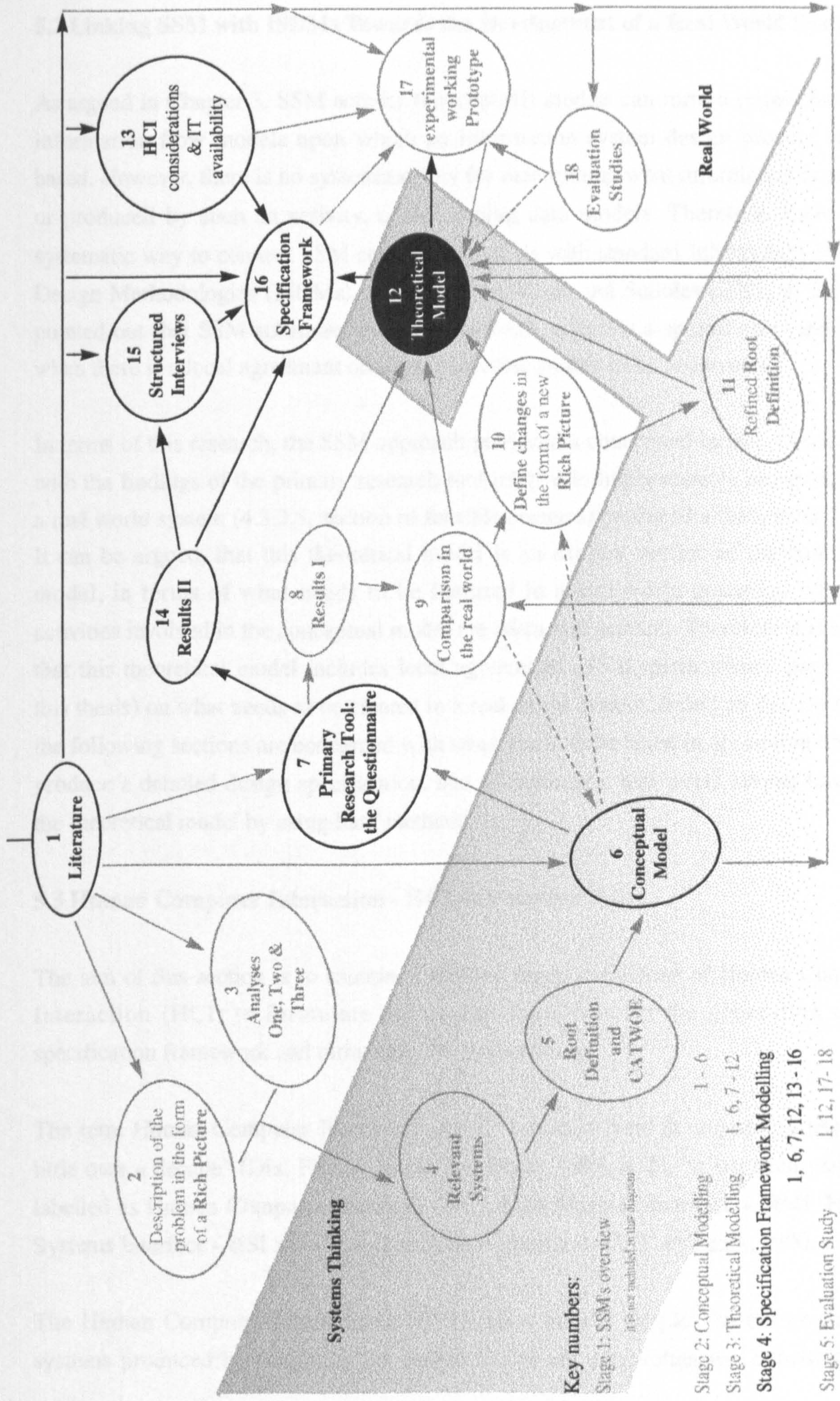


figure 5.1: Part of the Research Framework concerning the formulation of the Specification Framework Modelling



## **5.2 Linking SSM with ISDMs Towards the Development of a Real World System**

As argued in Chapter 3, SSM activity (conceptual) models can form a cogent basis for information flow models upon which an information system design process can be based. However, there is no systematic way for determining what information is needed or produced by such an activity, or developing data models. Therefore, there is no systematic way to connect SSM conceptual models with standard Information Systems Design Methodologies (ISDMs). However, Checkland and Scholes (1991, p. 25) have pointed out that SSM subsumes the hard approach, which is a special case, and arises when there is a local agreement on some particular system to be engineered.

In terms of this research, the SSM approach produced a conceptual model, which along with the findings of the primary research tool relative to improvements incorporated in a real world system (4.3.3.5, section of feasible changes) produced a theoretical model. It can be argued, that this theoretical model is an explicit version of the conceptual model, in terms of what needs to be featured in a real world situation, when the activities involved in the conceptual model are taken into account. Therefore it is argued that this theoretical model includes local agreements (SSM epistemology, page 70 of this thesis) on what needs to be created in a real world system. Based on this argument, the following sections are concerned with what needs to be taken in account in order to produce a detailed design specification, and to engineer a real world system based on the theoretical model by using hard methods.

## **5.3 Human Computer Interaction - HCI (*key number: 13*)**

The aim of this section is to examine literature based definitions of Human Computer Interaction (HCI) to formulate the design objectives for the generation of the specification framework and ultimately the prototype.

The term Human Computer Interaction (HCI) "has only been in widespread use for a little over a decade" (Dix, Finlay, Abow, and Beale, 1993, p. 2). "It has been variously labelled as Human Computer Interface - HCI, Man Machine Interface - MMI, Human Systems Interface - HSI and Computer Human Interface - CHI" (Maddix, 1990, p. 9).

The Human Computer Interaction's (HCI) major goal is simple: "to ensure that the systems produced by designers for people to use are comprehensive, consistent and



usable" (Maddix, 1990, p. 9). As a discipline, it is "concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them", thus, it is "concerned with the joint performance of tasks by humans and machines;" including "the structure of human-machine communication; the human capabilities to use machines; and the process of specification, design and implementation of these interfaces;" (Dix, Finlay, Abow, and Beale, 1993, p. xi).

Based on these principles, "interactive system design is concerned with the various ways of measuring how well people perform activities with the aid of systems" (Newman and Lamming, 1995, p. 7) in which, the description of such measurements with the term 'usability' has been used by many authors. Dix, Finlay, Abow, and Beale (1993, p. 163) argued that the term usability is concerned with the "effectiveness, efficiency and satisfaction with which users achieve their goals in a system's particular environment". Newman and Lamming (1995, p. 7) pointed out that since "there is no single way of measuring it" some of the ways for measuring the performance of systems include the factors of: speed, ease of learning and use, while Maddix (1990, p. 200), includes the factors of: effectiveness, learnability, flexibility and attitude.

Newman and Lamming (1995, p. 30) list several factors in more detail, as follows:

- the speed of performance of the activity
- the incidence of errors while performing the activity
- the users' ability to recover from errors that occur
- the magnitude of the users' task in learning to use the system
- the users' retention of learned skills
- the users' ability to customise the system to suit their way of working
- the ease with which people can reorganise activities supported by the system
- the users' satisfaction with the system

In addition to this, Newman and Lamming (1995, p. 16 and 20 - 33) provide the guidelines in relation of an interactive system design as follows:

- the activity to be supported
- the user
- the usability factors
- the form of the solution

Newman and Lamming (1995, p. 16) also argued that "these four aspects of the



problem can be expanded into a statement of requirements which in turn leads to a specification of the design and ultimately to a working interactive system". The following paragraphs describe what these four aspects are concerned with:

- **The Activity to be Supported**

This is concerned with the identification of the activities to be supported in a system by presenting the tasks and the processes as the sequence of steps which contribute towards the overall goal of an end-user, and is illustrated in the form of a process flow chart (Newman and Lamming, 1995, p. 20). However, in terms of this research, the SSM approach as described in stages 2 and 3 identified a conceptual model consisting of the activities that should be supported in a real world system. It also formulated a theoretical model that features real world characteristics for a new improved real world computer based system relating to the incorporated activities of the conceptual model. It can therefore argued, that there is no need to identify the supported activities of a real world system since, they have been identified within the theoretical model and therefore, extraction of these processes in a flow chart diagram is straightforward. Based on these principles this task will be concerned with the:

- description and illustration of the processes in the theoretical model (process flow chart)

- **The User**

This task is concerned with the identification of the supported activities of the system in relation to the understanding of the user's needs and requirements (Newman and Lamming, 1995, p. 29). However, in terms of this research, identification of design researchers' needs and requirements have also been identified in stage 3 and therefore, this task will be concerned with the:

- justification of whether design researchers can operate the system in the real (test) environment for the purposes as described in the theoretical model

- **The Usability factors**

Newman and Lamming (1995, p. 30) point out that designing a system is not just a matter of supporting activities as presented in a process flow chart and therefore, there is a need to identify how to improve the performance of these activities. Based on this, these sections (5.3.3 and 5.3.4) will conduct:

- an examination of usability factors in systems currently used by design researchers



- an identification of factors from the literature review that may augment performance of processes as illustrated in the initial flow chart diagram.

Incorporation of these findings will be used to formulate a:

- refined version of the initial process flow chart identified earlier, aimed to augment performance of the theoretical model processes

- **The Form of the Solution**

This task leads to the formation of a real world specification framework by integrating all findings identified by the above examinations (Newman and Lamming, 1995, p. 32).

Therefore, this section will be concerned with the formulation of the:

- specification framework

However, as argued in Chapter 3 (3.2.3) and as will be described later in section 5.3.5.2, after the formulation of the specification framework, one-to-one structured interviews with five subjects in the field will be conducted in order to:

- evaluate the validity of the proposed specification framework prior to the development of the prototype

Based on these principles, the following sections will examine these issues in detail, as follows:

- The Activity to be Supported / Process Flow Chart
- The User
- The Usability Factors
- The Refined Version of the Process Flow Chart
- The Form of the Solution

### ***5.3.1 The Activity to be Supported / Process Flow Chart (part of the key number: 13)***

As argued earlier, this section is concerned with the description and illustration of the theoretical model process flow chart. It presents those tasks and processes that lead to the overall goal of design researchers, which is to communicate with each other based on completed / current design research results as described in the theoretical model. The following paragraph presents the theoretical model as a reminder to the reader:

**The Theoretical Model (key number: 12, p. 128)**



- An on-line WWW based communication and information system owned, managed and operated by design researchers in which, they should be able to act, react and / or interact, and communicate with each other their completed / current design research results with speed. In particular, a system in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The system should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search system (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the system should further allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results

The real world features and activities of the conceptual model are also presented below:

**The Real World Features (*p. 127*)**

- Speed
- Update frequency
- Keyword (s) / Image Search System
- Indexes of Completed and Current Design Research Results
- On-line, WWW based system

**The Activities of the Conceptual Model (*key number: 6, p. 94*)**

- obtaining design research results from the providers
- assessing design research results by their assessors
- holding assessed design research results in a storage system
- allowing seekers to express their interest in relation to assessed design research results
- performing and determining to whom the assessed design research results will be communicated
- delivering the assessed design research results as decided above
- allowing a communication ability for feedback and data criticism

The following paragraphs will describe the process in which the theoretical model consisting of real world features and the processes of the conceptual model will be modelled in the form of a process flow chart diagram:

- The first task of the theoretical model based on the activities of the conceptual model concerns the provision of completed / current design research results where the providers will be design researchers. Then, in terms of communicating completed / current design research results, the on-line WWW system feature needs to be



addressed. Based on these principles, design researchers, as potential users of the on-line WWW based system, should be able to firstly access the on-line WWW system. A background review in terms of the criteria needed for the evaluation of the theoretical model (section 4.3.3.7) indicated that the provision of completed / current design research results is related to the availability of what research has previously been done and what research is currently being undertaken. Therefore, providers should be able to submit details of their research work to the on-line WWW system in order to make them available to others. The following summarises these processes:

- providers should be able to access the on-line WWW based system
- providers should be able to submit details of completed / current design research to the on-line WWW system

• The second task of the theoretical model involves the assessment of completed / current design research results which will be held in the system's storage container. In particular, when completed / current design research has been submitted to the on-line WWW system, this data should be made available and accessible to a number of appropriate assessors who may then critically assess the submitted content. It is assumed that appropriate assessors will be chosen according to relevant criteria. To do this, potential assessors should be able to access the on-line system, and provide personal details and request that they wish to be considered as assessors. The system should then nominate successful assessors in relation to the nature of the submitted material. These successful qualified assessors need to be able to access the submitted material, and the criteria against which they will assess and decide whether the submitted material should be made available for communication to design researchers. When the decision takes place and in particular, if the assessment approves the submitted work, the data should be held in the storage system. Otherwise, if the decision disapproves of the submission, the data should not be held in the storage system. In such a case, the system should inform the submitter the reason for non approval. However, the submitter should be able to resubmit a refined version. The following summarises these processes:

- potential assessors should be able to access the on-line WWW based system
- potential assessors should be able to submit their details to the on-line WWW system
- assessors should be able to access the on-line WWW based system
- assessors should be appropriately qualified in relation to the submitted material
- assessors should be able to access the submitted material requiring assessment



- assessors need to be able to access the criteria in order for a decision to be taken
- only approved submitted material should then be held
- the system should inform submitters of the reason for non approval
- the system should also allow submitters to be able to resubmit a refined version

• The next task of the theoretical model concerns the processes in which the approved text and audio-visual based completed / current design research results are held on the on-line system and are available, accessible and retrievable through the use of a keyword (s) search system. In particular, interested seekers should be able to access the on-line WWW system and then be able to submit their request. Based on this request, the system should be able to react to the seeker's enquiry and determine whether there is any submission matching these criteria. Finally, if matches are found, then the system should be able to deliver these matches to the appropriate seeker. However, design researchers have expressed the preference for communicating up-to-date completed / current design research results and therefore, the system should be able to inform and deliver updated submitted material to appropriate interested parties. The following summarises these processes:

- approved submitted material held on the system should be in a form that can be communicated to interested seekers through the keyword(s) search system
- seekers should be able to access the on-line WWW system
- seekers should be able to express a request
- the system should be able to determine whether matches can be found in relation to the request
- the system should be able to deliver matches relating to the seeker's request
- the system should be able to inform and deliver updated matches to interested seekers

• The last task of the theoretical model is concerned with the two-way communication of design researchers and in particular, with design researchers' (either as contributors, assessors or seekers) ability to act, react and / or interact with each other using the on-line WWW system' environment. Design researchers therefore interested in communicating with each other should be able to access the on-line system. Then, based on a keyword(s) search system they should be able to find each other in order to communicate further. The following summarises these processes:

- design researchers should be able to access the on-line WWW system
- design researchers should be able to find each other based on a search system
- design researchers should be able to act, react and / or interact with each other



Finally, the feature of speed is important for all these activities and processes. These activities and processes as described above are diagrammatically represented in the following figure 5.2 in the form of a process flow chart:

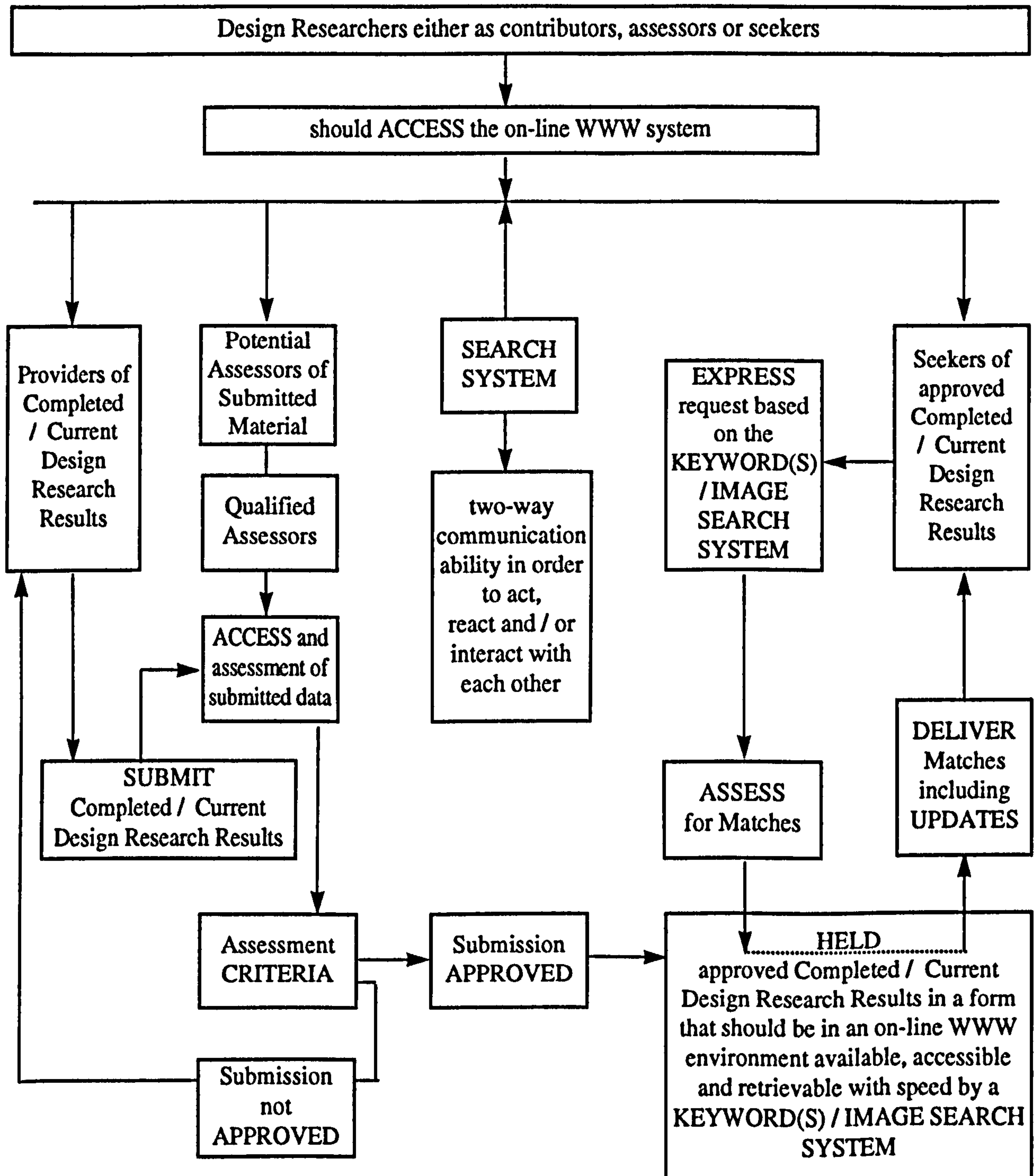


figure 5.2: Process Flow Chart for the Communication between Design Researchers

The next section is concerned with design researchers as the end-users of a system as illustrated in this process flow chart diagram.



### 5.3.2 *The User (based on 7, 14 key numbers)*

As stated earlier, this task is concerned with the:

- justification of whether design researchers can operate the system in the environment for the purposes as described in the theoretical model

The justification mentioned is concerned with the examination of design researchers skills and experience in using Computer Technology since the proposed communication and information system is computer based. It will examine their general use of computer technology and on-line services in particular since the system as described in the theoretical model is on-line WWW based. Following this, it will then examine what criteria is used to search for relevant material. Based on these principles, the following sub-sections will therefore be concerned with these issues as follows:

- Examination of design researchers' experience of using computer technology
- Identification of criteria used for searching for relevant material

In order to do this, the same primary research tool, the questionnaire used in stage 3 of Chapter 4 was used. As already explained (section 4.3), this questionnaire had multiple purposes one of which was concerned with the formulation of the specification framework in stage 4. Therefore, questions used in relation to this stage differ from those examined in the previous stages. The following paragraphs describe the particular questions that were asked specifically for this stage. It is also worth noting that the questions used in this stage were asked of the same subjects used in stage 3 (for more information about this questionnaire see Chapter 3, as well as, in Appendix I where a copy of the questionnaire and full statistical data are documented).

The questionnaire was closed-form and structured including the 'Other' option where it was considered necessary. Questions were fixed alternative, including the options of:

'Yes' or 'No'	(two-point scaled)
'Less than Five hours per week' to 'More than Twenty hours per week'	(four-point scaled)
'Very Experienced' to 'Not Experienced'	(four-point scaled)
'Very Useful' to 'Not Useful'	(four-point scaled)
'Strength' or 'Weakness'	(two-point scaled)



In addition to this, the questionnaire was divided in to nine sections of which only the following sections were related to stage 4:

Section 3	Computer Technology
Section 7	Database Search Categories
Section 8	Review: Strengths and Weaknesses of Selected Data and Communication Systems

In relation to the:

- **examination of design researchers' experience of using computer technology**
- **identification of the criteria used for searching relevant material**

the following questions (section 4) were involved:

Q3.1 Does your institution use computer technology?

Q3.5 How often do you use computer technology?

Q3.6 For what purpose(s) do you use computer technology in your work?

Q3.7 Please rate the following type of applications in terms of your experience

Q3.8 Do you have access to the Internet?

Q3.9 How often do you use the Internet?

Q3.10 What type of information do you usually search for on the Internet?

Q3.11 Which of the following Internet tools do you use frequently?

Q3.12 Which of following WWW search engines do you use most?

Q7.1 Please rate the following references in terms of their usefulness in your computer based search activity?

Q8.1 Please rate the relevant features of any of the following systems in terms of their strengths / weaknesses

Q8.3 Please rate the relevant features of any of the following systems in terms of their strengths / weaknesses  
(this question will examine only the 'interactivity' term as this was not examined in stage 3)

These questions will be analysed for the research active subjects who use computer based materials for searching relevant material to their enquiry (see table 4.3). The next three questions were not analysed:

Q3.2 Do you directly use computer technology?

Q3.3 Which of the following computer systems do you work on?

Q3.4 Does your computer have a CD ROM facility?



This is because in terms of question 3.2 it is expected that all examined research active subjects using computer sources will obviously use computer technology. In relation to the questions 3.3 and 3.4, the theoretical model implies an on-line system which is cross-platform and therefore not dependent on specific computer operation systems, or CD ROM based.

Although S.P.S.S. was used to provide general calculations of the subjects, in most cases selected numerical values were assigned to each of the answers in which the total score indicates the balance and the tendency towards agreement or disagreement.

### *5.3.2.1 Examination of Design Researchers' Experience of Using Computer Technology*

In order to design an on-line WWW based system as described in the theoretical model there is a need to examine whether design researchers as the end-users of such a system feel confident in terms of using computer based systems. Therefore, this section is concerned with the analysis of the questionnaire mentioned and examines design researchers' experience using current computer based systems and applications.

In response to question 3.1 which was concerned with the availability of computer technology in institutions, the following table 5.1 shows the result based on 54 research active subjects:

<b>Q3.1 Computers Available in Institutions</b>	<b>Count</b>	<b>%</b>
<b>Yes</b>	<b>53</b>	<b>98.1 %</b>
<b>No</b>	<b>1</b>	<b>1.9%</b>

**table 5.1: Availability of Computer Technology in Institutions**

This result indicate a high availability of computer technology in the institutions. The question was then raised with what frequency do design research active subjects use computer technology. In order to analyse the responses five-point indication, selected numerical values were assigned to each of the answers. The following table 5.2 indicates the individual assigned numerical values, the counts, the percentages and the total score in terms of research active subjects frequency regarding use of computer technology. These results are from question 3.5 and they are based on the 54 design research active subjects:



Assigned Value	Q3.5 Frequency of Computer Use	Count	%	Total
0	NA	1	1.9%	0
1	Less than five hours per week	2	3.7%	2
2	Five to Ten hours per week	16	29.6%	32
3	Ten to Twenty hours per week	16	29.6%	48
4	More than Twenty hours per week	19	35.2%	76
				158

table 5.2: Design Researchers Frequency of the Use of Computer Technology

The result of this examination indicates that the 94.4% of research active subjects use computer technology for more than five hours per week. However, based on the numerical values assigned on the sample of 54, the total score can not be either higher than the value of '216' or lower than the '0' value. The above result indicates that on an average research active subjects use computer technology for around ten to twenty hours per week because, division of the '158' total score with the '54' respondents closely matches the assigned numerical value '3'.

The next question raised is to determine for what purposes research active subjects use computer technology. This analysis, is also based on the sample of 54 and the results produced from question 3.6 as shown in the following table 5.3:

Q3.6A/6B/6C/6D Purpose of Computer Use	Count	%
Research and Development	51	94.4%
Administration	38	70.4%
Teaching	28	51.9%
Design Practice	21	38.9%

table 5.3: Design Researchers Purpose for Computer Technology Usage

The results indicate that research active subjects use computer technology mainly for research and development purposes.

The next examination involves the degree of design researchers experience of particular computer based systems and applications. In order to analyse the respondents four-point scaled indication, selected numerical values were assigned to each of the answers as follows: 'very experienced' assigned 3, 'experienced' assigned 2, 'not very experienced' assigned 1 and 'not experienced' assigned 0. As a result of these assigned numerical



values, the score of all the 54 responses can not be either higher than the '162' value or lower than the '0' value in total. Therefore for each question in this version the maximum totals for any response are 162 for 'very experienced', 108 for 'experienced', 54 for 'not very experienced' and 0 for 'not experienced'. The closer to the highest numerical value of 162, the greater the experience with the particular item, while the closer to the lowest limit of 0 indicates the the greater the inexperience with this particular item. The following table 5.4 indicates the scores for particular computer based systems and applications. These results are from Question 3.7:

<b>Q3.7 Computer Based Applications</b>	<b>Score</b>
<b>Word Processing</b>	<b>130</b>
<b>E-Mail</b>	<b>121</b>
<b>WWW Browsing</b>	<b>100</b>
<b>Page Layout</b>	<b>83</b>
Image Manipulation	77
Spreadsheet	72
CAD / CAM	69
Databases	67
Multimedia	59
Newsgroups	47
Mailbase	44
FTP / Gopher	42
WWW Authoring	34

table 5.4 Degree of Design Researchers' Experience of Using Computer based Systems and Applications

In general this result shows that research active subjects are experienced in Word Processing, E-Mail, WWW browsing and Page Layout, since the '130', '121', '100' and '83' scores respectively are either higher than the experienced indication cutoff (108) or above the halfway mark in between the range of experienced and not very experienced (81). Scores for the rest of the systems indicate that research active subjects are not very experienced in using them. The results of the above examination indicate research active subjects are experienced in using the on-line applications of E-Mail and WWW browsing which was implied in the theoretical model. The next question raised is to what extent do research active subjects have access to the Internet and to other on-line services. Additionally, the frequency of use of the Internet, the types of information searched for and the frequency with which particular tools are used to search is also examined.



In response to question 3.8 which was concerned with the degree to which research active subjects have access the Internet the following table 5.5 shows the result based on 54 research active subjects:

<b>Q3.8 Access to the Internet</b>	<b>Count</b>	<b>%</b>
<b>Yes</b>	<b>52</b>	<b>96.3%</b>
<b>No</b>	<b>1</b>	<b>1.9%</b>
<b>NA</b>	<b>1</b>	<b>1.9%</b>

**table 5.5 Degree of Design Researchers Accessing the Internet**

The score of 96.3% indicates that research active subjects had a high degree of access to the Internet. The next question raised is how frequently they use it. The following table 5.6 shows this result produced from question 3.9 which is also based on the sample of 54. In order to analyse the respondents five-point indication, selected numerical values were assigned to each of the answers as shown in this table:

<b>Assigned Value</b>	<b>Q3.9 Frequency of Internet Use</b>	<b>Count</b>	<b>%</b>	<b>Total</b>
0	Not at All / NA	3	5.6%	0
1	Less than five hours per week	33	61.1%	33
2	Five to Ten hours per week	13	24.1%	26
3	Ten to Twenty hours per week	3	5.6%	9
4	More than Twenty hours per week	2	3.7%	8
				<b>76</b>

**table 5.6 Design Researchers' Frequency of Use in relation to Internet Access**

In general, this result indicates that 85.2 % of research active subjects access the Internet for up to ten hours per week. The next question raised is what type of information do research active subjects usually search for on the internet. The table 5.7 shows these results from question 3.10 which is also based on the sample of 54:

<b>Q3.10 Types of Information</b>	<b>Count</b>	<b>%</b>
<b>Academic / Higher Education</b>	<b>44</b>	<b>81.5%</b>
<b>Technological</b>	<b>25</b>	<b>46.3%</b>
<b>Commercial</b>	<b>20</b>	<b>37.0%</b>
<b>Scientific</b>	<b>17</b>	<b>31.5%</b>
<b>Governmental</b>	<b>12</b>	<b>22.2%</b>
<b>Social</b>	<b>12</b>	<b>22.2%</b>
<b>Not at All / NA</b>	<b>3</b>	<b>5.6%</b>

**table 5.7 Types of Information Design Researchers Usually Search for on the Internet**



This result indicates that research active subjects mainly search for academic / higher education information when they access the internet.

The next question raised is what Internet tools are used by research active subjects in order to find information on the Internet. This result shown in the table 5.8 is from question 3.11 and it is also based on the sample of 54:

<b>Q3.11 Internet Tools</b>	<b>Count</b>	<b>%</b>
<b>E-mail</b>	<b>49</b>	<b>90.7%</b>
<b>WWW</b>	<b>47</b>	<b>87.0%</b>
<b>FTP / Gopher</b>	<b>10</b>	<b>18.5%</b>
<b>Newsgroups</b>	<b>5</b>	<b>9.3%</b>
<b>Not at All / NA</b>	<b>3</b>	<b>5.6%</b>

table 5.8 Frequency of Tools used by Design Researchers Searching on the Internet

These results indicate that research active subjects mainly used E-mail and the WWW tools for finding information on the Internet. These results confirm the results of table 5.5 which found that research active subjects were most experienced in using these systems.

The final question raised is what search engines are used most by research active subjects in order to find information on the WWW. This result shown in the table 5.9 is from question 3.12 and it is also based on the sample of 54:

<b>Q3.12 Search Engines</b>	<b>Count</b>	<b>%</b>
<b>Yahoo</b>	<b>33</b>	<b>61.1%</b>
<b>Lycos</b>	<b>19</b>	<b>35.2%</b>
<b>Other</b>	<b>17</b>	<b>31.5%</b>
<b>Altavista</b>	<b>14</b>	<b>25.9%</b>
<b>NA</b>	<b>3</b>	<b>5.6%</b>

table 5.9: Search Engines Most Used by Design Researchers for Searching on the WWW

This result indicates that research active subjects mainly use the yahoo search engine for searching the WWW.

The following points summarise the results from this section related to research active subjects experience of using computer technology. In particular, these findings indicate that research active subjects:



- have a high degree of availability of computer technology in their institutions (table 5.1)
- have a high degree of access to computer technology (table 5.2)
- spend around ten to twenty hours per week for general computer based purposes (table 5.3)
- use computer technology mainly for research and development purposes (table 5.4)
- have a high degree of access to internet (table 5.5)
- spend for up to ten hours per week to access the internet (table 5.6)
- search the internet for academic and higher's education information (table 5.7)
- use the WWW and the E-Mail facilities most frequently for finding information on the Internet (table 5.8) and along with word processing and page layout applications have the most experience of these systems (table 5.4)
- use mostly the yahoo search engine to find information on the WWW (fig. 5.12)

In conclusion, it can therefore argued that design research active subjects would be able to operate the system in the real environment for the purposes described in the theoretical model. This is due to the following. Findings from table 5.1, indicate that there is a high degree of availability of computer technology in the subjects' institutions. Tables 5.2 and 5.3 indicate that there is a large proportion of research active subjects who access and frequently use them. Research active subjects also indicate that they used computer technology mainly for research and development purposes (table 5.3) and these findings support the design of a computer based system for the purpose of communicating completed / current design research results. In addition to this, findings shown in table 5.5 indicate that design researchers have a high degree of access to the internet, as well as, to on-line services and according to table 5.6 a large proportion of them access the internet for up to 10 hours per week. Findings from table 5.4 indicate that research active subjects are experienced in using WWW and E-Mail applications and these were found to be the most frequently used tools (table 5.8) for finding information on the internet which is mainly academic and higher education information (table 5.7). Finally, table 5.9 indicates that research active subjects use a variety of search engines to find information on the WWW, however, the most frequently used is 'Yahoo'. All these findings indicate that design researchers would have the experience to use a system as described in the theoretical model and the process flow chart (fig. 5.2) which would be operated in an on-line WWW environment for the purpose of communicating completed / current design research results.

The next section describes the process in which identification of criteria used for searching for relevant material will help to provide the basis of the search system as described and illustrated in the theoretical model and process flow chart.



### 5.3.2.2 Identification of the Criteria Used for Searching Relevant Material

The examination of how research active subjects rate available criteria in relation to searching for relevant material on computer based sources will identify their usefulness and therefore, their inclusion or exclusion in a new system based on the theoretical model. These results are based on the sample of 51 design research active subjects who use computer based sources for their searches and answered question 7.1. In order to analyse the responses four-point scaled indication was used and selected numerical values were assigned to each of the answers. In particular, 'very useful' was assigned 3, 'useful' was assigned 2, 'not very useful' was assigned 1 and 'not useful' was assigned 0. The score for all the 51 responses cannot be either higher than the '153' value or lower than the '0' value in total. Therefore for each question in this section the maximum totals for each response are 153 for 'very useful', 102 for 'useful', 51 for 'not very useful' and 0 for 'not useful'. The closer to the highest numerical value of 153, the more useful the item, while the closer to the lowest numerical value of 0, the less useful the item. The following table 5.10 shows the individual and total scores for research criteria used in terms of their usefulness in computer based systems' search activity:

<b>Q7.1 Search Tools</b>	<b>Very Useful</b>	<b>Useful</b>	<b>Not Very Useful</b>	<b>Not Useful</b>	<b>Total Score</b>
<b>Abstract / Summary</b>	35	13	2	-	<b>133</b>
<b>Keyword</b>	33	14	2	-	<b>129</b>
<b>Title of Research</b>	28	17	4	-	<b>122</b>
<b>Author</b>	26	19	3	1	<b>119</b>
<b>Subject / Discipline</b>	26	16	4	1	<b>114</b>
<b>Aims &amp; Objectives / Brief</b>	21	13	7	-	<b>96</b>
<b>Visual Material</b>	19	12	7	4	<b>88</b>
<b>Publication Type</b>	11	19	12	2	<b>83</b>
<b>Resource Type &amp; Award achieved</b>	5	18	12	2	<b>83</b>
<b>Methodology</b>	12	21	4	6	<b>82</b>
<b>Chronological &amp; Demographic Determination</b>	4	15	14	8	<b>56</b>
<b>Collaboration &amp; Sponsor Body</b>	3	15	17	6	<b>56</b>

table 5.10: Search Criteria employed for Searching on current Systems

This result indicated that the following criteria were of high value in terms of usefulness:

- Abstract / Summary



- Keyword
- Title of Research
- Name of the Author
- Subject / Discipline
- Aims and Objectives / Brief
- Visual Material
- Publication Type
- Resource Type and Award achieved
- Methodology

The Abstract / Summary and Keyword options were both considered very useful criteria for searching on the internet since they both scored above the halfway mark between the range very useful and useful (127.5). The other were considered as useful criteria since they all scored above the halfway mark between the range useful and not very useful (76.5). However, the chronological and demographic determination, and the collaboration / sponsor body were not considered very useful options, since the '56' score achieved was below the halfway mark between useful and not very useful (76.5).

In conclusion to this section, the results produced from the examination in relation to the usefulness of current and available criteria for computer based search activities support the inclusion of the above mentioned criteria in the real world search system featured in the theoretical model and its process flow chart. The following section will now examine computer based systems usability factors.

### ***5.3.3 The Usability factors (based on 7, 13 and 14 key numbers)***

Newman and Lamming (1995, p. 30) have pointed out that designing a system is not just a matter of supporting activities as presented in the process flow chart, in this case the process flow chart in figure 5.2. There is also a need to further identify how to improve the performance of these activities by examining the usability factors of systems currently used by design researchers for their communication purposes.

As proposed by Newman and Lamming (1995, p. 30), Dix, Finlay, Abow, and Beale (1993, p. 7, 363-364) and Shneiderman (1992, p. 33, 72, 78, 134 and 304), the following usability factors need to be examined:

- easy to learn
- ease of use



- speed
- functionality
- terminology
- help screens
- layout
- graphical user interface
- overall interactivity

This examination is based on the results of questions 8.1 and 8.3, which are shown in the following table 5.11. They are based on a sample of 47 design research active subjects who use computer based sources for their searches and answered these questions. In order to analyse the responses two-point scaled indication was used and selected numerical values were assigned to each of the answers. The two-point scaled indication consisted of the 'strength - S' and 'weakness - W' options in which, 'S' was assigned 1 and 'W' was assigned -1. The total score can therefore be as high as 47 or as low as -47. The closer to the highest numerical value of 47, the greater the strength for the feature, while the closer to the lowest limit of -47 indicates the the greater the weakness for the feature. The following table demonstrates the 47 research active subjects rating of the strengths / weaknesses of the usability factors of computer based communication and information systems. In addition to this, it provides the overall scores for each system examined in which total score can be either as high as 423 or as low as -423. Bold numerical values represent agreement towards strength and italic represent an indeterminate response for the examined systems:

#### Q8.1 / 8.3 Strengths & Weaknesses of Systems'

Usability Factors	OPAC	Telnet	CD ROM	E-mail	Mailbase	Newsgroups	FTP	WWW
Functionality	16	<i>1</i>	<b>35</b>	<b>39</b>	6	7	2	<b>35</b>
Easy to Learn	16	<i>-3</i>	<b>28</b>	<b>35</b>	6	1	0	<b>41</b>
Easy to Use	17	<i>-1</i>	<b>34</b>	<b>38</b>	7	3	4	<b>35</b>
Help Facility	<i>-3</i>	<i>-10</i>	7	<i>-8</i>	<i>-4</i>	<i>-8</i>	<i>-8</i>	1
Graphical User Interface	<i>-18</i>	<i>-17</i>	<i>21</i>	<i>-9</i>	<i>-4</i>	<i>-9</i>	<i>-7</i>	<i>19</i>
Layout	<i>-9</i>	<i>-12</i>	<i>22</i>	4	<i>-2</i>	<i>-5</i>	<i>-6</i>	<i>16</i>
Terminology	<i>-2</i>	<i>-6</i>	<i>14</i>	1	0	1	<i>-1</i>	5
Speed	7	<i>-2</i>	<b>35</b>	<b>35</b>	4	<i>-3</i>	2	<i>-9</i>
Interactivity	<i>-5</i>	<i>-3</i>	14	17	1	5	2	<i>20</i>
Overall Scores	19	<i>-53</i>	210	152	14	<i>-8</i>	<i>-12</i>	163

table 5.11: Review of Strengths and Weaknesses of Computer based Information and Communication Systems Features (highest, lowest= $\pm 47$ , cutoffs:  $\pm 23.5$ , highest, lower overall= $\pm 423$ , cutoffs:  $\pm 211.5$ )



In general, these results indicate that there is no a single computer based system that is strong in all aspects of usability. CD ROMs, WWW and E-Mail had the highest overall score of 210, 163 and 152 out of 423 but along with the other systems they scored below the halfway mark (211.5) of the range between strength and balance. In relation to the individual scores, findings indicate that subjects felt that the strength of CD ROMs and E-Mail were their functionality, ease of learning / use and speed while, the strength of WWW was its functionality and ease of learning / use. The following table summarises the highest and lowest limits of strengths and weaknesses achieved in these systems in relation to the usability:

Usability factors	<u>S</u>	<u>Y</u>	<u>S</u>	<u>T</u>	<u>E</u>	<u>M</u>	<u>S</u>
	Strongest		Score		Weakest		Score
Functionality	E-Mail		39		Telnet		1
Easy to Learn	WWW		41		Telnet		-3
Easy to Use	E-Mail		38		Telnet		-1
Help Facility	CD ROMs		7		Telnet		-10
Graphical User Interface	CD ROMs		21		OPACs		-18
Layout	CD ROMs		22		Telnet		-12
Terminology	CD ROMs		14		Telnet		-2
Speed	CD ROMs/E-Mail		35		WWW		-9
Interactivity	WWW		20		OPACs		-5

These findings indicate that there is no single system in which the assigned usability factors constitute only strengths or only weakness. However, CD ROMs were found strongest and Telnet weakest compared to other systems in terms of several usability factors. In addition to this, the speed feature concerned with the downloading / processing time was found to be particularly weak on the WWW and therefore, this is one aspect described in the theoretical model that requires careful consideration (section 4.3.3.7). Based on these findings, the following section is concerned with the identification of additional factors from literary sources which can augment the performance and speed in relation to the processes of the system as described in the theoretical model and its process flow chart.

#### ***5.3.4 The Refined Process Flow Chart (based on 13 and the initial process flow chart)***

As argued earlier and in particular on pages 139 / 140, the process flow chart shown in figure 5.2 illustrates only the minimum activities and processes based on the theoretical model. It was also argued, that incorporation of factors identified from literary sources which can augment usability performance of the system will result in a:



- refined version of the process flow chart shown in figure 5.2

In order to augment performance of the activities supported by the proposed system, a number of general performance factors have to be taken into account. Kerr and Hiltz, (1982, p. 17-19), Houghton (1986, p. 57) and Shneiderman (1992, p. 78-81) list some of these factors which are briefly presented below:

1. Human help, the ability of the system to supply human help directly to users
2. Control, the ability of users to feel in control of the computer system
3. Closure, the ability of informing users when an operation has been successfully or unsuccessfully completed
4. Modifiability, the ability of users to adapt the system to serve their needs
5. Indirect Communication Channels, the ability to set up indirect communication linkages between users
6. Document Distribution, the ability which allows the distribution of documents to interested users
7. Voting, the provision of voting scales which may be associated with items for responses by others
8. Accurate and Up-To-Date data, which is concerned with the systems robustness
9. User Simulations, the ability of a system to develop tailored programs to simulate users' behaviour

In relation to the information itself which the system will process the following factors should be also be taken into account to augment the data process. Shneiderman (1992, p. 78-81) pointed out, that such factors are concerned with the format and consistency of data entry / display transactions. These are briefly presented below:

10. Compatibility of data display with data entry, which is concerned with the format of displayed information that should be linked clearly with the format of the data entry
11. Flexibility for user control of data entry / display, which is concerned with the user's convenience to the task on that they currently work

Shneiderman (1992, pp. 33, 70 / 71) is also concerned with different interaction styles in relation to data entry format including the menu selection and form filling methods. The following describes them and shows their advantages and disadvantages:

- 12a. In menu selection style, users read a list of items, select the one most appropriate to their task, apply the syntax to indicate their selection, confirm the choice, initiate the action and observe the effect. Advantages of this style include: shortened learning, reduction of keystrokes and error handling. Disadvantages of such a style are: danger of too many menus, may slow frequent users, consume too much screen space and require rapid display rate. This style is appropriate for novice and intermittent users while, it can be appealing to frequent users



12b. In form filling style, users see a display of related fields, move the cursor among the fields and enter the data where desired. The only disadvantage is that it may consume too much screen space. Advantages of this style include the simplification of data entry. This style is most appropriate for knowledgeable or frequent users

The following section will describe how the process flow chart of the theoretical model (shown in figure 5.2 and discussed in section 5.3.1) will incorporate the factors presented above in order to augment the usability performance of the system. This incorporation (numbering in relation to these performance factors is provided for easy reference) will lead to the description of a refined version of the process flow chart.

- The first task of this process flow chart is concerned with the processes as seen on page 141 of this thesis and these are as follows:
  - providers should be able to access the on-line WWW based system
  - providers should be able to submit details of completed / current design research to the on-line WWW system

However, in order to augment the performance of the system, the following factors have been considered for their inclusion in the system. The activity of providers in relation to submitting details of their research work in order to make them available on-line to others is concerned with the data entry form (factor 10). However, in order for a provider to feel in control of the submission process (factor 2), the submission form should suit the task required by each provider (factor 11). The submission method could be either menu selection, form filling or a combination (factors 12a and 12b). Then, when data is submitted, the provider should be informed via a confirmation message (factors 2 and 3) of whether the submission operation has been successful or unsuccessful. The following summarises all these processes:

- providers should be able to access the on-line WWW based system
- providers should be able to submit details of completed / current design research to the on-line WWW system (factor 10)
- the submission form should suit the task required by each provider (factors 2 and 11)
- the submission method could be either menu selection, form filling in or a combination (factors 12a and 12b)
- providers should be informed via a confirmation message of whether the submission operation has been successful or unsuccessful (factors 2 and 3)



• The second task of this process flow chart is concerned with the processes as seen on page 137 of this thesis and these are as follows:

- potential assessors should be able to access the on-line WWW based system
- potential assessors should be able to submit their details to the on-line WWW system
- assessors should be able to access the on-line WWW based system
- assessors should be appropriately qualified in relation to the submitted material
- assessors should be able to access the submitted material requiring assessment
- assessors need to be able to access the criteria in order for a decision to be taken
- only approved submitted material should then be held
- the system should inform submitters of the reason caused disapproval
- the system should also allow submitters to be able to resubmit a refined version

With respect to the process whereby suitable parties may become qualified as assessors of appropriate submitted data, the same processes and factors, as described in the first task should be employed. When completed / current design research results has been submitted to the on-line system, this data should be made available and accessible to a board of appropriate assessors who will critically assess its content. This process is concerned with data display (factor 10) and therefore, the data submitted by the providers should be compatible with data displayed to the assessors as this is also concerned with the compatibility of data entry and data display (factor 11). However, in order to help assessors to feel in control of the assessment process (factor 2), a data entry form should be provided which is scaled and allows assessors to specify the quality level of the submitted data (factor 7). During this assessment process, a calculation to sum up the assessors opinions should also be applied (factor 9) in order to determine whether the submitted material will be made available on the system. Whatever the decision, data providers should be informed via a confirmation message (factors 2 and 3) stating whether the submission has been approved or not. If the assessment process approves the submission it should be held on the storage system and a confirmation message of acceptance should be sent to the providers. However in the case where the assessment process does not approve the submission, the data should not be held on the storage system and therefore, should be sent back to the provider with comments and suggestions. In this case, the data provider should be able to re-submit a refined version of the data, in which the procedure should be repeated. Finally, the data held on the system should be compatible with the data submitted and assessed (factor 10). The following summarises all these processes:

- potential assessors should be able to access the on-line WWW based system and submit details to the on-line WWW system in order to qualify (factor 10)



- the submission form should suit the task required by each potential assessor (factors 2 and 11)
  - the submission method could be either menu selection, form filling in or a combination (factors 12a and 12b)
  - potential assessors should be appropriately qualified in relation to the submitted material
  - potential assessors should be informed via confirmation messages of whether the submission operation has been successful or unsuccessful, as well as, whether they qualified or not (factors 2 and 3)
  - assessors should be able to access the on-line WWW based system
  - the submitted material requiring assessment should be made available and accessible to the appropriate assessors in the same form as submitted (factors 2 and 10)
  - assessors need a data form with criteria in order to be able to assess submitted material requiring assessment (factors 2, 7, 10, 11, 12a and 12b)
  - the system need to calculate and sum up assessments to determine whether submitted content is approved or not (factor 9)
  - providers be should informed of submission that is approved (factors 2 and 3)
  - disapproved submitted material should be sent back to their providers with comments and suggestions (factors 2 and 3)
  - the system should also allow providers to be able to re-submit a refined version
  - approved submitted material only should be held on the system and should be compatible with data submitted and assessed (factor 10)
- The next task on the flow chart (as seen on p. 143) is concerned with the processes of:
    - approved submitted material held on the system should be in a form that can be communicated to interested seekers through the keyword(s) search system
    - seekers should be able to access the on-line WWW system
    - seekers should be able to express a request
    - the system should be able to determine whether matches can be found in relation to the request
    - the system should be also able to deliver matches related to the request
    - the system should be able to inform and deliver updated matches to interested seekers

These processes are concern with completed and / or current design research results that have been approved and held on the on-line system and are available, accessible and retrievable. As described in the theoretical model, communication of this data will be based on a keyword(s) system searching both textual and audio-visual submitted material (section 4.3.3.7). Design researchers as potential seekers of this data should be able to access the on-line system and thereafter to enter and submit an enquiry through a keyword(s) search data entry form. It is important that this data request should be in the same form and compatible with the data submitted by the original providers, assessed by the assessors and held in the system's storage container (factor 10).



Additionally, in order for seekers to feel in control of what they are looking for, this search data entry form should be adaptable to the seekers needs and the enquiry (factors 4 and 11). The method for entering this enquiry could be through menu selection, form filling or a combination of them (interaction style, factors 12a and 12b). When seekers submit their request, the system should assess the seeker's enquiry and check as to whether any submission matches the search criteria. If matches are found, then the system should deliver these matches to the seeker in the same form as originally submitted, assessed and held on the system (factor 10). If the system cannot match the seeker's search criteria, then the system should deliver an appropriate message to the seeker (factors 2 and 3). However, one of the features of the theoretical model is the communication of updated completed / current design research results. Houghton (1986, p. 57) argued that some of the key factors in successfully designing a system are those of providing accurate and up-to-date data, which concerns the systems robustness. He pointed out that inaccurate data will cause users to lose confidence in a system and repeated inaccuracies may cause them to abandon it. The user simulation performance factor mentioned by Kerr and Hiltz (1982, p. 19) is important when considering the update feature of the theoretical model. In particular, the user simulation factor is the ability of a system to develop tailored programs to simulate aspects of users' communication behaviour, and thereby to extend communication capabilities by acting as a substitute. To explain this factor Kerr and Hiltz (1982, p. 19) provided a simple example. This example refers to a tailored program which carries out searches while users are off-line. This example shows how the design researchers' requirement of being kept informed of updated design research results can be met. Therefore, in order for the system to simulate the search enquiries, seekers should be able to submit (data entry factor in which the data entered should flexibly suit each user's preference and be compatible with the data originally submitted, assessed and held on the system - factors 10, 11, 12a and 12b) and allow requests stating what they want to continue to be kept informed of. This type of request also incorporates the factors of modifiability and flexibility, since it provides the users with the ability to adapt the system to serve their particular needs (factors 4 and 11). The simulation mode itself should carry out searches and check whether later submissions of design research results match the seeker's initial enquiry and search criteria. If matches are found in this simulation mode, the system should inform the user of the matches (factors 2, 3, 8 and 9). Matches displayed in relation to the enquiry should be compatible with data entry initially requested (factor 10). This user simulation factor also incorporates the factor of document distribution since user simulation will allow automatic distribution of



requested documents to interested seekers (factor 6). The following summarises all these processes:

- approved submitted material held on the system should be in a form that can be communicated to interested users through the keyword(s) search system
  - seekers should be able to access the on-line WWW system
  - seekers should be able to express a request (factors 4, 8, 10 and 11)
  - the method of enquiry could be either menu selection, filling in form or a combination of (interaction style, factors 12a and 12b)
  - the system should be able to determine whether matches can be found in relation to the request
  - the system should be able to deliver matches in relation to the request (factors 2, 3, 8 and 10)
  - the system should be able to inform and deliver updated matches to interested seekers (factors 2, 3, 4, 8, 9, 10, 11, 12a and 12b)
- The last task of the theoretical model based on the process flow chart shown in figure 5.2 is concerned with the two-way communication that is concerned with the action, interaction and / or reaction between design researchers either as contributors, assessors and / or seekers via the environment of the on-line WWW system. To augment the two-way communication and in particular, in order to allow such communication with each other there is a need to provide communication linkages between users (factor 5). In order to achieve this, users should be able to search for others who wish to be contacted for communication purposes through the keyword(s) search system. As users should be kept informed and decide whether to act, react, interact with each other the factors of control, closure and flexibility are involved (factors 2, 3 and 11). In addition to this, searching for others involves the factors of data compatibility and interaction style (factors 10, 12a and 12b). The following summarises all these processes:

- users should be able to access the on-line WWW system
- users should be able to search for each other in order to be able to act, react and / or interact with each other (factors 2, 3, 5, 10, 12a and 12b)
- users should be able to decide whether they will act, react and / or interact with each other (factors 2, 3 and 11)

In addition to these factors, a help facility should be always provided from any part of the system in order for users to feel in control. Finally, in relation to the feature of speed, it is argued that speed as a factor can be improved by augmenting the performance of the processes in the on-line environment. Based on the processes and factors described above, the following figure 5.3 shows the refined process flow chart:



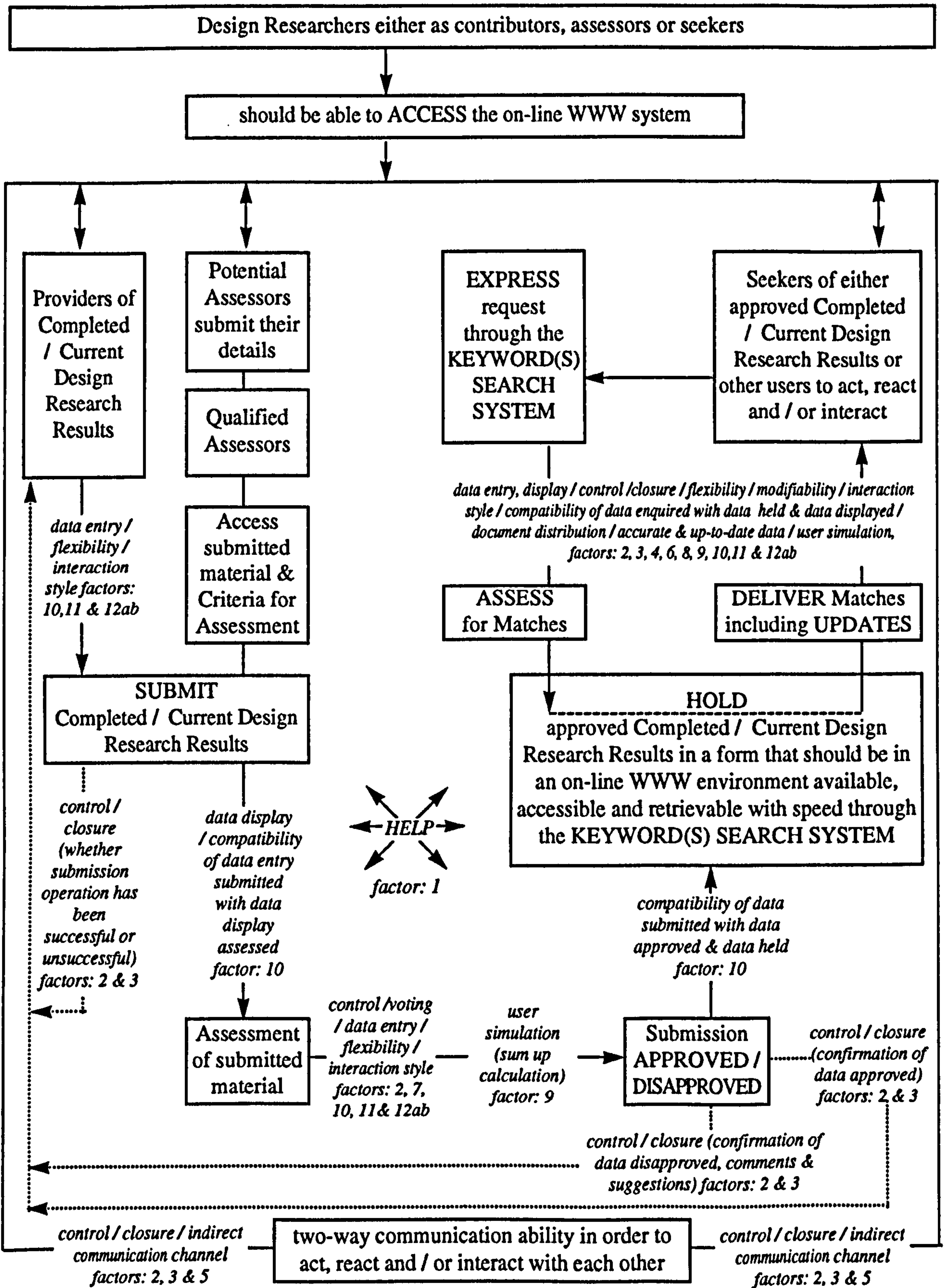


fig. 5.3: The Refined Process Flow Chart

The following section is concerned with the form of the solution based on the integration of all the findings so far.



### ***5.3.5 The Form of the Solution (key numbers: 1, 6, 7, 12, 13, 14, 15)***

According to Newman and Lamming's (1995, p. 32) guidelines, this task leads to formation of a specification framework and a prototype. This section is therefore concerned with the integration of findings discussed in previous sections in order to form the specification framework and the basis for a prototype as the manifestation of the theoretical model. However in Chapter 3, it was argued that structured interviews with experts in the field will be employed after the formulation of the specification's framework in order to evaluate the proposed framework prior to the development of the prototype in terms of its reliability and validity. Validation of the specification framework will then lead to the development of a refined version, as well as, ultimately a real world working prototype. These issues are summarised as follows:

- Integration of findings into the form of a specification framework
- Evaluation of the validity of the specification framework
- Refinement of the specification framework
- Use the framework as a basis for an appropriate real world working prototype.  
(This will be covered in section 6.2 as it is considered part of the main evaluation study)

#### ***5.3.5.1 Integration of Findings into the Form of a Specification Framework***

The integration of the findings involves the:

- literature review (Chapter 2)
- theoretical model (Chapter 4)
- design researchers' experience of using computer technology (5.3.2.1)
- identification of the tools used for searching relevant material (5.3.2.2)
- examination of current systems usability factors (5.3.3)
- refined version of the process flow chart (5.3.4)

The following paragraphs describes how these findings are used to generate the specification framework:

Findings shown in the section 5.3.2.1 concluded that design research active subjects would be able to operate an on-line WWW based system for the purposes of communicating completed / current design research results, and therefore, these



findings support the proposed theoretical model formulated in Chapter 4. However, in terms of how completed / current design research results should be communicated, Sheiderman (1992, p.78 - 81) pointed out that in relation to formatting data within a computer based system in general, data display should be compatible with data entry. Based on this principle, the processes of submitting, assessing, holding, searching and retrieving design research results via the on-line WWW system should be compatible as these actions are data entry and / or data display actions.

In particular, design researchers as potential contributors of design research results are involved with data entry action when they enter and submit data to the on-line WWW system. Design researchers as assessors are involved with both data entry and data display actions. In particular, assessors are involved twice with data entry actions, the first one is concerned with when they contact the system and submit their request to qualify and become assessors (this qualification process is described within this section, p 165-167). The second time is when they submit their assessment of the validity of the submitted design research results. They are also involved with the data display simply because the content that is being assessed needs to be displayed to them. Design researchers as seekers are also involved with both data entry and data display actions because, they must also enter and submit enquires for their search (data entry). If matches are found as illustrated in the process flow chart the system will display them. Further a seeker may be involved for second, third or fourth time with the data display action if they wish to display description, full content or relevant submitted audio-visual material of these matches. This can be summarised as follows:

- **Data Entry**
  - Submission (Potential Contributor's) Form**
  - Submission (Potential Assessor's) Form**
  - Voting Form**
  - Search Forms**
- **Data Display**
  - Assessment Display**
  - Search Matches Display**
  - Description Content Matches Display**
  - Full Content Matches Display**
  - Audio-visual Matches Display**
- **Other Data Entry / Data Display Actions**

The literature review in Chapter 2 was also concerned with the ways in which other computer based systems index design research results. This informed the examination



of how design researchers rate current criteria in terms of their usefulness in relation to their search activities (section 5.3.3.2). Findings from this examination (table 5.10) along with Sheiderman's factor concerned with compatibility of data entry / data display indicate the criteria of how completed / current design research results should be formatted and indexed. These indexing criteria (p. 154) are listed below as a reminder to the reader:

- Abstract / Summary
- Keyword
- Title of Research
- Name of the Author
- Subject / Discipline
- Aims and Objectives / Brief
- Visual Material
- Publication Type
- Resource Type and Award achieved
- Methodology

Although findings in table 5.10 indicate that the options of chronological / demographic determination and collaboration / sponsor body had been found not to be very useful options, these were included in the proposed system because, these options are included in other relevant computer based systems. In addition to this, particular values of the indexing criteria are based on both the questionnaire responses (section 4.3.1.1) and existing systems such as the ARIAD and the Design Studies journal since, a separate identification of these values is considered beyond the scope of this research. Indexing format will be based on both menu selection and filling in forms (Shneiderman, 1992, p. 33, 70 / 71) as presented earlier. The following section firstly presents the indexing forms for submitting and searching for design research results. Particular values which indicate 'free' require form filling, while the rest use a menu selection interaction style:

### **Submission (Potential Contributor's) Form / Data Entry**

#### *Contents Form*

#### *Particular Values*

Title and Name of the Author

Prof, Dr, Miss, etc...

Identity / Status

Supervisor, Examiner, Researcher, etc...

Membership

CSD, DRS, EAD, RSA, etc...

Correspondence Postal Address and Acceptance of whether contributor wished to be contacted or not

Telephone, Fax, E-Mail

Free

Current Area of Activity

Free



Current Area of Interest	Free
Identification of whether contributor wish to become assessor (N/A to those not interested)	
Title of Research	Free
Abstract / Summary of Completed / Current Research	Free
Full Research	Free
Delivery method of completed / current research	MA, MSc, MPhil, PhD, etc...
Deliverable Status	Completed / Current
Status of completed / current research	Published / Unpublished
Keyword (s)	Free
Method	Free
Subject / Discipline	Fashion, Management, Multimedia, etc...
Audio-Visual Material	Image, Animation, Video, Sound, etc...
Institution Host, Collaboration Body / Sponsor	Free
Year of Completion	1990,....2000, 2001, etc...
Geographical Location	Europe, North USA, etc...

### **Search (Seeker's) Form / Data Entry**

<i>Contents Form</i>	<i>Particular Values</i>
Data Record Identification Number	Free
Name of the Author	Free
Title of Research	Free
Delivery method of completed / current research	MA, MSc, MPhil, PhD, etc...
Deliverable Status	Completed / Current
Status of completed / current research	Published / Unpublished
Keyword (s)	Free
Method	Free
Subject / Discipline	Fashion, Management, Multimedia, etc...
Audio-Visual Material	Image, Animation, Video, Sound, etc...
Institution Host, Collaboration Body / Sponsor	Free
Year of Completion	1990,....2000, 2001, etc...
Geographical Location	Europe, North USA, etc...

However it was argued in the theoretical model that one of the features that design researchers require is continued access to updated completed / current design research results. As tables 5.4, 5.5, 5.7 and 5.8 indicate that design researchers often access on-line services and in particular the WWW for searching academic and higher's education information, the question is raised to what extent design researchers' repeated attempts lead to success, as well as, whether these attempts are efficient, effective and



satisfactory. Although there is no argument to support that their repeated effort leads to unsuccessful results, inaccurate data will cause users to lose confidence in the system and consequently, repeated inaccuracies may cause them to abandon it (Houghton, 1986, p. 57). There is a need therefore to design a mechanism to repeatedly simulate user's search attempts (Kerr and Hiltz, 1982, p. 19) for the retrieval of updated design research results to ensure efficiency, effectiveness and satisfaction in relation to design researchers' attempts to retrieve data. This mechanism involves the behaviours which are described next:

- **Subscription to Updates Search (Seeker's) Form / Data Entry**
- **Subscription to Updates Matches display / Data Display**

#### **Subscription to Updates Search (Seeker's) Form / Data Entry**

This data entry form will be similar to the Search (Seeker's) Form presented earlier. This form will provide the ability for design researchers to subscribe and tailor their request in terms of what they looking for and for how long they wish to be kept informed of updated material in order to ensure that the users of the system always feel in control (Kerr and Hiltz, 1982, p. 17), as well as, to provide flexibly in the system's capabilities to meet their own particular needs (Shneiderman, 1992, p. 78-81).

#### **Subscription to Updates Matches display / Data Display**

This data display will inform subscribers of any matches in relation to the criteria entered in the subscription to updates search (seeker's) form described above. Findings shown in tables 5.4, 5.8 and 4.10 indicate design researchers high level of experience in using e-mail, as well as, its importance as a feature for inclusion in the new system. Based on these findings, notification of these matches will be via e-mail. Therefore, subscribers should also provide their e-mail addresses to the system in the subscription to updates search (seeker's) form described above.

A brief description of how the mechanism of subscribing for updates will work is as follows. The user accesses the system and locates the subscription to updates search (seeker's) form described above. The user then enters enquiries related to what he / she is looking for, for how long they wish to be kept informed of the updated data and e-mail address. Finally the user submits this data to the system. The system then repeatedly searches for new submissions. If matches are found, the system notifies subscribers of these matches by sending an e-mail. The subscriber then can access the search (seeker's) form and searches for the Data Record Identification Number(s) (ID)



provided in the e-mail notification. At this point the subscriber reaches the search matches display discussed later in this section. Hereafter, this entire simulation mechanism as described above, will be referred to as the 'push method'. The literature review in Chapter 2 described the method of providing changes in information to the seeker by utilising 'push technology'. Also, the data entry search (seeker's) form presented earlier will now be referred to as the conventional search method.

### **Communicating with each other Search (Seeker's) Form / Data Entry**

It was argued in the theoretical model that one of the features that design researchers require is the ability to communicate with each other in order to act, interact and / or react. The features of an e-mail and publication facility had been found to be important characteristics in terms of their inclusion in the system and this is shown in table 4.10. Therefore, e-mail will be used as the way in which users as contributors, assessors or seekers will communicate with one other. It can therefore be argued, that an E-Mail function will support two-way communication for design researchers allowing them to act, interact and / or react. Design researchers will be able to search for each others work, and they will also be able to search for each other when they wish to be make contact (having filled in the submission form). Based on this principle, a special data entry form consisting of some of the contents contributed in the Submission form is used, in particular:

<i>Contents Form of the User looking for</i>	<i>Particular Values</i>
Title	Prof., Dr, Mr, Mrs, etc...
Name	Free
Identity / Status	Supervisor, Examiner, Researcher, etc...
Membership	CSD, DRS, EAD, RSA, etc...
Current Area of Activity	Free
Current Area of Interest	Free
Keyword (s)	Free
Subject / Discipline	Fashion, Management, Multimedia, etc...
Geographical Location	Europe, North USA, etc...

### **Search Matches Display / Data Display**

This will display the particular values which match the seeker's criteria entered in the Search (Seeker's) Form. For example, if someone searched for the particular values of: MA, Published, and Fashion, then for a match, it will display the match and these



values. It will also provide the ability to link and display the brief description and / or the full content of the corresponding match as follows. Finally, it will display the author's e-mail if any for the ability to act, interact and / or react.

#### **Brief Description Content Matches display / Data Display**

This will display the description of the assessed research work as contributed in the Submission's Form excluding the whole document of the research work itself .

#### **Full Content Matches display / Data Display**

This will display the whole assessed document of the research work itself as contributed in the Submission's Form.

#### **Audio-Visual Matches display / Data Display**

This will display any submitted audio-visual material relevant to matches of the submitted research work as contributed in the Submission's Form.

Based on the indexing forms for submitting and searching for design research results described above, the following section presents the data entry / display actions in relation to submitted material requiring assessment. However, it should be made clear at this point (section 4.3.3.7), that assessment will not take place on submitted research work that has been already been assessed by examination boards as happens with MA / MSc / MPhil and PhD work. In addition to this, assessment cannot also take place on submitted descriptions of research work and therefore, assessment procedures will only take place on a completed research work. Based on this principle, the following section will describe the Submission (Potential Assessor's) Form, the Voting Form and the Assessment Display:

#### **Submission (Potential Assessor's) Form / Data Entry**

In relation to how design researches will be approved by referees, potential assessors will submit their data in the submission form described above by indicating their willingness to become assessors. The system then will assess their appropriateness according to criteria used by current refereed journals and conferences since, a separate identification of these criteria is considered beyond the scope of this research. A calculation as described in the section 5.3.4 will allow summing up, verifying and determining whether potential assessors are qualified. Qualified referees will be then notified through an e-mail. In order for referees to be kept informed of relevant



submissions for their assessment, the same push method as described above is proposed and in particular:

- **Subscription to Submission Updates Assessor Form / Data Entry**
- **Matches display / Data Display**

#### **Subscription to Submission Updates Assessor Form / Data Entry**

This data entry form will be the same as the Subscription to Updates Search (Seeker's) Form presented earlier however, the first time it will be automatically generated according to the values entered originally in the submission form because referees were qualified for a particular set of values. As this set of values will not be modifiable, referees will be allowed to specify how long they wish to be kept informed of submissions for assessment because as users of the system they should always feel in control (Kerr and Hiltz, 1982, p. 17), and to provide flexibility according to their own particular needs (Shneiderman, 1992, p. 78-81).

#### **Matches display / Data Display**

This data display will be the same as the Subscription to Updates Matches display / Data Display presented earlier.

A brief description of how this mechanism will work is given as follows. The qualified assessor needs to access the system and in particular the subscription to submissions updates assessor form. The assessor enters an e-mail address, how long they wish to be kept informed of relevant submission for assessment, and then submits this data to the system. As described earlier, the system repeatedly searches for new submissions. If matches are found, then the system notifies the assessor of these matches by sending an e-mail. The assessor can then access the system and search for the identification number (ID) provided in the e-mail notification. At this point the assessor reaches the voting / assessment form presented below.

#### **Voting Form / Data Entry**

In terms of assessing the whole of a submitted work itself, the system will utilise the current method employed in non-computer systems which provide refereed information content. The system could electronically use the blind referee system which is currently used by conferences or refereed journals such as Design Studies and the International Refereed Journal for all Aspects of Design. Based on such refereed journals /



conferences criteria, assessor(s) will specify the quality level of the submitted data in an appropriate scaled data entry form. In case of more than one assessor, the calculated average mean will determine approval or disapproval of submitted data.

### **Assessment Display / Data Display**

This will display all the provider's data as originally submitted in the Contributor's Submission Form including the description, the whole research work itself and audio-visual material if any.

### **Other Data Entry / Data Display Actions**

The provision of help is proposed (section 5.3.4) so that users can feel in control in a situation where they are not experienced. This will include a help Index with keywords description, examples and synonyms which will assist users to overcome possible problems within the process as proposed. In addition to this, the rich picture (fig. 4.2) illustrated findings from the literature review, indicating the design researchers' need for communication of design research in general through a variety of other resources. Provision of the following information resources in support of these needs (based on this rich picture) are proposed:

- research groups or individuals (research students, supervisors, examiners, etc...),
- research societies (DRS, EAD, etc...),
- professional organisations (CSD, RSA, etc...),
- research publications (Journals, Conference Proceedings, etc...),
- forthcoming events (Conferences, Seminars, Exhibitions, etc...),
- governmental (Design Council, Funding Bodies, EU, etc...), and finally
- other non-design research link (OPACs, BIDS, CRIB, EEVL, etc...)

Based on the list presented above, these resources may facilitate their communication through both the conventional retrieval method, as well as, the same push method proposed for keeping seekers and referees informed of updated data.

In conclusion to this section, the following paragraph describes the initial proposed specification framework:

The proposed system is based on the theoretical communication and information model formulated in Chapter 4 as the communication gateway for people within the design discipline involved in research actively, and will facilitate access to high quality



information in terms of both completed and current research within the design research discipline, as well as, discussion with other individuals / users and / or groups. It does not aim to replace other available design research tools, but hopes to bridge current communication gaps and to facilitate bespoke services to users, as well as, to link researchers in design all over the world, with the aim of providing them with an updated information resource and a discussion environment in order to act, react and interact with each other. Finally, the proposed nomenclature for this proposed specification framework is 'nereid' which stands for the abbreviation of the NETworked REsearch In Design. In addition to this, nereid is a name from hellenic mythology referring to young girls which inhabiting any water, salt or fresh, and are benign towards humanity. The following figure 5.4 on the next page illustrates the initial nereid proposed specification framework that is based on the theoretical model.

### *5.3.5.2 Evaluation of the Validity of the Initial Specification Framework*

One to one structured interviews with five experts in the field were employed with the aim of evaluating the initial specification framework prior to the development of the prototype. This exercise was designed in order to examine:

- whether the system would be useful to design researchers
- whether there is a need for improvements and / or modifications
- what will be the key core elements of this system

Subjects of this evaluation method were all related to design research and included:

Prof. B. Allison, Editor of the ARIAD, De Montfort University

Prof. R. Cooper, Head of Research, University College Salford

Prof. J. Myerson, Head of the Contemporary Research Centre, De Montfort University

Prof. J. Woodhuysen, Forecasting Market Research, Seymoul - Powell

Dr N. Flint, Research Fellow, Johns Moore University

A description of the specification framework was given to the subjects and a dictation machine recorded their oral feedback in response to the provided structured questions, in which the term structured interviews refers to those interviews which "are rigidly standardised and formal, that is the same questions presented in the same manner and order" (Van Dalen, 1979, p. 158). These questions were as follows:



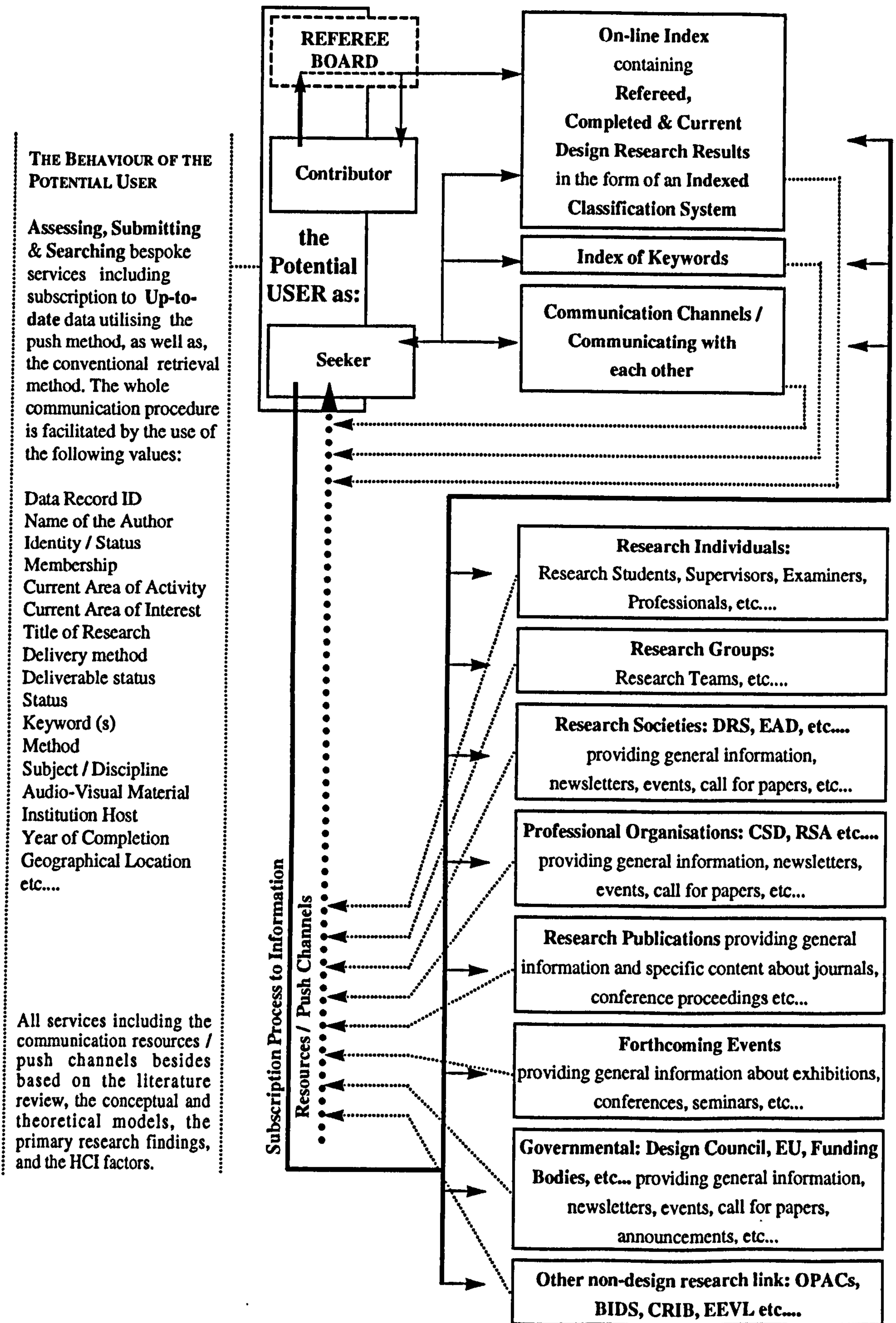


fig. 5.4 The initial *ne•REiD* (NETworked REsearch In Design) Specification Framework



- How useful would such a system be?
- How important is it that information available in the system is refereed?
- What facilities should the communication channels provide?
- How important are the Push-Channels to the system and what facilities should they provide?
- How should research be represented?
- How important is the proposed system's ability to match the user with other users or users with information?
- Are the keywords sufficient to match the user with other users or the user with information?
- What categories of keywords will be most important (users' identity / status, subject, etc...)?
- Besides keywords in what other ways could matching be achieved?
- What do you consider are the most important features of a such a system?
- What features if any are missing?
- Can you see any weaknesses or problems with such a system? Any other comments?

Free written transcriptions were made of the oral discussion and the author takes full responsibility for any misinterpretation documented in Appendix II. The following paragraphs highlights the major issues:

**• In terms of the question of how useful such a system will be**

All five subjects pointed out that the system as presented to them would be very useful. Four out of five pointed out that the system would also be excellent for postgraduate and PhD students for searching for relevant information. One of them also indicated this system would also be useful for supervisors in directing people just beginning research and PhD students because it is difficult in design to find the appropriate people, the appropriate places and the appropriate research results. The same subject also said the system would enable research students not to rely on only what the supervisors know, as it will provide a way of finding about relevant new information. Another subject pointed out that currently since the WWW provides no way of ensuring the quality of information, this WWW system will be very useful in terms of its speed, relevance and quality of information, as well as, accessibility and easy navigation. Finally, one of the subjects highlighted the system's feature for providing current / unpublished research which makes this system extremely useful in terms of eliminating the procedure of people involved in professional and research fields to be kept informed and access new research.

**• In terms of the question of how important is it that information available in the system is refereed**

Four out of five were agreed it was useful. In particular, one of them argued that in order for any member to be accepted by the CSD he / she should have to show a portfolio and therefore for such a system refereeing of work is essential. A similar attitude was expressed by the rest of the subjects. They argued that it is very important to build up a wide network of people who are



capable of producing critical output. One of them argued that these people are usually in Universities, or are editors, associate editors, co-editors of journals. Another subject argued design research is a very broad subject and some people have a very narrow view of it, they think design research is all about the written word. This subject suggested a very large panel of advisors and experts in every subject that should cover most of the major areas of design and when something new comes onto the system, it should be sent to the appropriate expert(s) for assessment. The same subject argued that these people have to be experts in both practical and theoretical issues. The fifth subject although not agreeing, did not disagree either.

**• In terms of the question of what facilities should the communication channels provide**  
One subject did not answer while the rest provided different opinions. In particular, one of the subjects argued the way to identify people should be structured and formal. Another subject argued that the contact mechanism should not be based on a very casual procedure to ensure users contact the right person before starting the communication procedure and thus avoid unnecessary contacts which may prove inconvenient. Another subject argued that content is the key and the environment in which information is facilitated should be innovative. The final subject said the environment should be warm, friendly and icon based.

**• In terms of the question of how important are the Push-Channels (including subscription to Updates) to the system and what facilities they should provide**  
All subjects agreed about their great usefulness. However, two of the subjects argued that although push-channels are a great idea they should not be treated as being of fundamental importance.

**• In terms of the question of how should research be represented and besides keywords in what other ways could matching be achieved**  
One of the subjects did not answer. The rest of the subjects agreed that the system should support both verbal and visual material as an enriched representation method. They said that the proposed method of keywords as an index method including name, title, subject, method, completion time, abstract, keyword, visuals, etc... seem the only way for the identification of the work. One of them also argued that contributors should fit their work into a set of predefined categories.

**• In terms of the question of how important is the proposed system's ability to match the user with other users or users with information**  
All subjects agreed that it is very important. Three out of five thought that matching users with information was more important than matching users with other users. The other two subjects thought it was of equal importance. However, one of them said that may give a slight priority to the ability of the system to match users with other users and this subject also argued for the additional help / wanted sector as the social networking aspect of the system may be interesting.



- **In terms of the question of whether keywords are sufficient to match user with user and user with information**

Subjects were agreed that a general set of categories have to be predefined but in-depth keywords should be defined by the authors themselves who submit their work because it is their own work. Another subject argued that a group of keywords in which the first will define the generic design such as industry sector, medical, toys, etc., then a second with the discipline such as information design, furniture design and finally, a third which may identify the research further like: commercial, ergonomics, health. He argued that this may improve the way in which information can be represented.

- **In terms of the question of what categories of keywords will be the most important**

Subjects found all of them equally important. However, one of them pointed out that experience in the subject of activity may enhance reliability of information.

- **In terms of the question what do you consider are the most important features of such a system**

Although all subjects found them of equal importance. They all gave a slightly greater importance to the facility for providing and matching information about current and completed research. One subject pointed out that knowing and understanding where you are and making users feel in control of the system is very important. Another subject argued that the environment and the navigation should gives satisfaction as well being functional. Finally one subject suggested that the social aspect of networking was also a very important feature.

- **In terms the question of whether there are missing features or major weaknesses or problems with such a system**

The subjects found the proposed system very comprehensive and extremely useful in general. Subjects thought this system covered most of the ground and had no missing parts. In particular, one of them pointed out that although there could be problems with filling forms and referees, the overall attempt could be a great step forward.

- **In the commentary section**

Subjects were agreed that the system was extremely useful and very important for the design research community. Subjects' view in relation to the 'nereid' nomenclature of the system was divided. Two of them asked for a better name, another two did not have any particular problem with that name while the fifth liked it. In relation to the system's diagrammatic form as shown in figure 5.16, the subjects' feedback was that system seemed very logical, and very solid.

This evaluation indicates that initial specification framework needs only minor changes. As the minor changes are not related to the underlying theory (the proposed theoretical model formulated in Chapter 4) of this specification framework, it can therefore be



argued that this specification framework and its underlying theory is considered as valid. Modifications therefore based on the evaluation will shape the final version to be presented in the following section.

However, throughout this thesis, it has been argued that there is a need for an appropriate prototype that is based on this framework and ultimately on the theoretical model. This is because, there is a need to test the validity of the underlying thinking of the model in terms of its effectiveness, efficiency and satisfaction. The final version of the specification framework will be formulated in terms of the core elements of what needs to be implemented and prototyped and therefore, it will be presented in the form of an operational structure.

### *5.3.5.3 Production of the Final Version of the Specification Framework*

As argued earlier, this specification framework will be used to implement a prototype in order to test further the validity of the underlying theoretical model. Based on the evaluation presented above, most of the minor changes are directly relevant to the aspect of assessing submitted material which was not considered for implementation on the prototype. In addition to this, subscription to information resources / push channels was not also considered for implementation on the prototype. This was because, all subjects gave a higher priority to the system's ability to provide and match information and also because of lack of time and feasibility limitations. These reasons concerning time and feasibility limitations are described in greater detail in sections 6.4.1.1, 6.4.1.2 and 6.5. The following suggestions will therefore not be implemented however, they are worth recording:

- For refereeing consistency, it was suggested that the referee's experience in the area is important
- For refereeing consistency, most of the subjects suggested the use of a wide network as a large panel consisting of advisors and experts in every subject which will cover most of the major practical and theoretical aspects of design
- In relation to the prototype's environment, two of the subjects argued that the interface should be innovative, friendly and icon based. This idea of an innovative graphic representation was not employed since it is not the primary aim of the study however, usability of the system in terms of its proper working order is applied since this may adversely affect the primary aim of this research
- In relation to the subject's suggestion to the provision of a section facilitating help and information for social networking, this was not also implemented since, this was not the primary aim of this research



The following paragraphs stand as a description of the final version of the specification framework in relation to the prototype that needs to be implemented. It has been stated the refereeing procedure will not be implemented and therefore, this aspect of the theoretical model will be not prototyped. However, the limited final framework will assume that contribution of data is assessed prior to retrieval and it will be simulated and tested as explained in Chapter 6. The following section will therefore describe the two-way communication ability in which design researchers are able to act, react and / or interact, as well as, to contribute and search completed / current design research results in both the conventional and push method forms through an index. Although the refereeing process will not be included within the real world prototype, it is included in the following description as it is necessary in order to fully illustrate the complete system. This can be described as follows:

- 1. Data Submission System**
- 2. Data Referee System (not implemented)**
- 3. Data Holding System**
- 4. Data Search System**
- 5. Subscription to Updates System**
- 6. Communicating with each other System**

### **1. Data Submission System**

Users accessing the prototype nereid system as potential contributors will be asked to describe and represent themselves and their design research work in a keyword form as follows:

<b>ID:</b>	this identity number is automatically generated by the system when a contribution is submitted
<b>Title:</b>	Professor / Dr / Mr / Mrs / Ms / Miss
<b>Name:</b>	the First name and Surname of the contributor
<b>Identity / Status*:</b>	the current identity of the contributor, such as: Professional, Supervisor, Examiner, Researcher
<b>Membership*:</b>	the name of the organisation or society in which contributor is member with such as: CSD, DRS, EAD, RSA
<b>Title of Research:</b>	the Title of Research being submitted
<b>Project Status*:</b>	the status in relation to whether the research work being submitted is either Completed or Current (ongoing)
<b>Research Status*:</b>	the status in relation to whether the research work being submitted is either nereid based Refereed or examination board based Refereed



<b>Deliverable Status•:</b>	the status in relation to whether the research work being submitted is either Published or Unpublished
<b>Delivery method•:</b>	the level at which the research being submitted is being conducted, such as: Artifact, Article, Paper, Publication, MA / MSc, MPhil, PhD, Post-Doct
<b>Subject of Research•:</b>	the area in which the research being submitted is conducted, such as: Fashion / Textiles, Industrial / Product, Interior, Graphics / Multimedia, Management
<b>Year•:</b>	the year in which research being submitted was either completed or contributed if it refers to ongoing research work
<b>Institution Host:</b>	the Institution with in which the research being submitted was conducted
<b>Collaboration Body / Sponsor:</b>	the name of the body, organisation or institution which collaborated with or sponsored the research being submitted
<b>Geographical Location•:</b>	the place in which research being submitted was conducted such as: Europe, North America, South America, Asia, Oceania, Africa
<b>Aims and Objectives:</b>	the aims and objectives of the research being submitted
<b>Abstract / Summary:</b>	a short description of the research being submitted
<b>Method:</b>	the research method undertaken for the research being submitted
<b>Keyword(s):</b>	the free text word(s) that represents the research work being submitted
<b>Audio-Visual Material•:</b>	the additional media representation of the research being submitted (Yes, No)
<b>Type of Audio-Visual File•:</b>	Image (JPEG / Gif), Animation / Movies (mov), Video (avi), Sound (wav), Virtual Reality Sets (vr)
<b>Full Research Content•:</b>	the complete research content being submitted (Yes, No)
<b>Type of Research Content File:</b>	WWW (htm), Microsoft Word (doc), Quark XPress (qxd), Text (txt)
<b>Current Research Activity:</b>	the area in which the contributor mainly researches
<b>Current Research Interest:s:</b>	the area in which the contributor is mainly interested
<b>Experience•:</b>	the amount of experience in years such as: 1-3 / 3-5 / 6-10 / +10 years
<b>Correspondence Address:</b>	the address which the contributor wishes to be contacted
<b>Telephone, Fax, E-Mail:</b>	telephone, fax and e-mail which the contributor wishes to contacted
<b>Contact•:</b>	the field in which contributor states whether wishes to be contacted or not, (Yes, No)

In return for the data submission, the provider receives a confirmation acknowledgment. The '•' indicates the use of the menu selection interaction style, while the rest will use a text form.

## 2. Data Referee System

This process between data submission and data being held involves assessment and it will be assumed that data held has been already been refereed.



### 3. Data Holding System

This is where the nereid system holds refereed completed / current design research results from the form as submitted (described above). It is also from where seekers retrieve this data based on the keywords entered and submitted in the data search form. Every time a new submission is held on the nereid system, a new identification number (ID) for the new data record is generated.

### 4. Data Search System

Seekers of completed / current design research results access the search facility and enter enquiries through the form provided which is also based on keywords as follows:

<b>ID:</b>	this is identification number for each data record
<b>Name:</b>	the First name and / or the Surname of the contributor / author
<b>Title of Research:</b>	the Title of Research Work being sort
<b>Project Status*:</b>	the status in relation of whether sort after research work is either Completed or Current (ongoing)
<b>Deliverable Status*:</b>	the status in relation of whether sort after research work is either Published or Unpublished
<b>Delivery method*:</b>	the level at which the sort after research is conducted, such as: Artifact, Article, Paper, Publication, MA / MSc, MPhil, PhD, Post-Doct
<b>Subject of Research*:</b>	the area in which the sort after research is conducted, such as: Fashion / Textiles, Industrial / Product, Interior, Graphics / Multimedia, Management
<b>Year*:</b>	the year in which the sort after research is either completed or sorted
<b>Keyword (s):</b>	the free text word(s) to search for the research work
<b>Method of Research:</b>	the research method(s) undertaken for the sort after research
<b>Institution Host:</b>	the Institution in which the sort after research is conducted
<b>Collaboration Body / Sponsor:</b>	the name of the body, organisation or institution which collaborated with or sponsored the sort after research
<b>Geographical Location*:</b>	the place in which the sort after research was conducted such as: Europe, North America, South America, Asia, Oceania, Africa
<b>Audio-Visual Material*:</b>	the additional media representation for the sort after research (Yes, No)
<b>And / Or:</b>	Seekers have to select how matching process will take place. This is based on the boolean logic described in literature review in Chapter 2. The 'and' value corresponds to the exact matching of the keywords, and the 'or' indication to any matched combination of the keywords.

The '\*' indicates the use of the menu selection interaction style, while the rest will use a text form. Although it is not necessary for seekers to fill the entire search form as



illustrated above, it is assumed that they will enter some in order for their task to be accomplished. Based on this enquiry the nereid system will search the held data and if it finds matches it displays them to the seeker. If matches are not found, nereid displays an error message. If matches are found, these are initially displayed on the enquiry form. However, an appropriate link is provided in order for the seeker be able to get brief and / or full details of this data.

### 5. Subscription to Updates System

Seekers who wish to be kept informed of the latest submissions and thus be updated of specific design research results need to fill the following form. This form is similar to the data search form illustrated above, however it also provides the ability to enter e-mail address and the time intervals which seekers wish to be kept informed. Based on the entered keywords combination, the nereid system will repeatedly search every new submission and if matches are found, the system using the push method described earlier will inform seekers of these matches by e-mailing them. Seekers should then access the conventional search method and enter the ID provided in the e-mail to retrieve these updated matches. The subscription to updates form is as follows:

<b>Subject of Research•:</b>	the area in which the sort after research is conducted, such as: Fashion / Textiles, Industrial / Product, Interior, Graphics / Multimedia, Management
<b>Delivery method•:</b>	the level at which the sort after research is conducted, such as: Artifact, Article, Paper, Publication, MA / MSc, MPhil, PhD, Post-Doct
<b>Deliverable Status•:</b>	the status in relation of whether sort after research work is either Published or Unpublished
<b>Project Status•:</b>	the status in relation of whether sort after research work is either Completed or Current (ongoing)
<b>Keyword (s):</b>	the free text word(s) to search for the research work
<b>Method of Research:</b>	the research method(s) undertaken for the sort after research
<b>Geographical Location•:</b>	the place in which the sort after research was conducted such as: Europe, North America, South America, Asia, Oceania, Africa
<b>Institution Host:</b>	the Institution in which the sort after research is conducted
<b>Audio-Visual Material•:</b>	the additional media representation for the sort after research (Yes, No)
<b>E-Mail:</b>	the e-mail of the subscriber
<b>Subscriber's Name:</b>	the name of the subscriber

The '•' indicates the use of the menu selection interaction style, while the rest will use a text form. Although it is not necessary for seekers to fill the entire search form, it is assumed that they will enter some in order for their task to be accomplished.



## 6. Communication with Each Other System

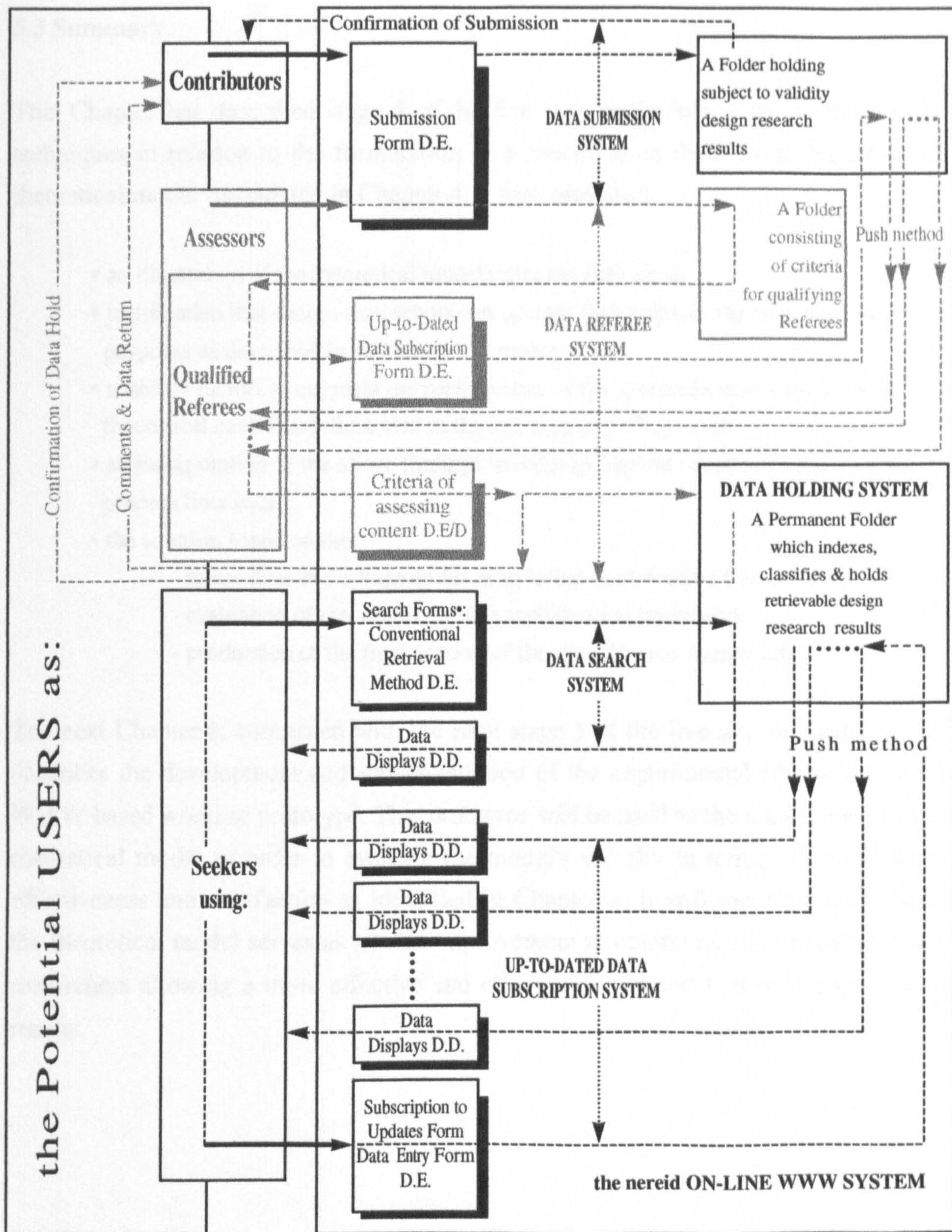
Seekers for other users access the search facility and enter enquiries in relation to who they are looking for through the form provided which is also based on keywords:

<b>Title:</b>	the title of the user, such as: Professor / Dr / Mr / Mrs / Ms / Miss
<b>Name:</b>	the First name and / or the Surname of the User
<b>Identity / Status•:</b>	the current identity of the User, such as: Professional, Supervisor, Examiner, Researcher
<b>Membership•:</b>	the name of the organisation or society in which user is member with such as: CSD, DRS, EAD, RSA
<b>Subject of Research•:</b>	the area in which the user is expert, such as: Fashion / Textiles, Industrial / Product, Interior, Graphics / Multimedia, Management
<b>Current Research Activity:</b>	the area in which the user mainly researches
<b>Current Research Interest:</b>	the area in which the user is mainly interested
<b>Experience•:</b>	the amount of experience in years such as: 1-3 / 3-5 / 6-10 / +10 years
<b>Geographical Location•:</b>	the place which user acts such as: Europe, North America, South America, Asia, Oceania, Africa

The '•' indicates the use of the menu selection interaction style, while the rest will use a text form. Although it is not necessary for seekers to fill the entire search form, it is assumed that they will enter some requirements in order for their task to be accomplished. Based on this enquiry the nereid system will search the held data and if it finds matches it displays them to the seeker. If matches are not found, nereid displays an error message. If matches are found, these are displayed on the enquiry form. It also provides an appropriate link in order for the seeker be able to send e-mail to the found user.

Based on this, the refined but limited version of the specification framework is illustrated in figure 5.5 in the form of an operational structure.





key points:

D.E.: Data Entry

D.D.: Data Display

Search Forms: for search either design research results or authors' details and their e-mail in order to enable design researchers to communicate with each other

Types, Boxes and Lines in Grey indicate the referee process which it is however not implemented on prototype will simulated for testing

fig. 5.5 The final version of the Specification Framework in the form of an Operational Structure (where Data refers to either Completed / Current Design Research Results or Authors' Profiles)



### 5.3 Summary

This Chapter has described stage 4 of the five step methodology by examining HCI techniques in relation to the formulation of a specification framework. Based on this theoretical model formulated in Chapter 4, it then provided:

- an illustration of the theoretical model's process flow chart
- justification that design researchers can operate the system in the environment for the purposes as described in the theoretical model
- usability factors to augment the performance of the system as described in the theoretical model and illustrated in the initial process flow chart
- an incorporation of the above findings in order to illustrate a refined version of the process flow chart
- the solution based on the:
  - integration of findings so far in an initial specification framework
  - evaluation of the validity of this specification framework
  - production of the final version of the specification framework

The next Chapter is concerned with the final stage 5 of the five step methodology and describes the development and implementation of the experimental real world on-line WWW based working prototype. This prototype will be used as the manifestation of the theoretical model in order to evaluate the model's validity in terms of its efficiency, effectiveness and satisfaction as identified in Chapter 4. It will therefore test whether the theoretical model serves as a valid improvement to communication between design researchers allowing a more effective and efficient communication of design research results.



## Chapter 6: Evaluation Studies

### 6.1 Introduction

Chapter 6 is concerned with stage 5 of the proposed five step methodology presented in Chapter 3 and in particular with key numbers 1, 12, 15, 16 and 17 - 18 shown originally in fig. 3.6 of the research framework on page 82 of this thesis. This is also shown in figure 6.1 on the next page for reference purposes and it clearly illustrates the relationship of the parts involved within this chapter. These include:

- literature review and stage 4 findings *(key numbers: 1 and 16)*
- theoretical model *(key number: 12)*
- real world working prototype *(key number: 17)*
- evaluation studies *(key number: 18)*

Based on the literature review (key number: 1) and from stage 4 findings (key number: 16) this chapter describes the initial process from which the real world prototype (key number: 17) based on the theoretical model was formed. It then describes how the methods of formative and summative evaluation (key number: 18) were used to test this prototype and evaluate the validity of the theoretical model (key number: 12) through the prototype. As the primary aim of this study is to evaluate the validity of the theoretical model, evaluation in relation to the prototype itself is considered a secondary exercise. Based on these principles, the secondary evaluation exercise of the prototype is concerned with refining the prototype by testing its efficacy, as well as, its functionality and usability in terms of its efficient working order and includes:

- one-to-one evaluation review with five experts in content, design and technical matters
- user group based evaluation with fifteen participants as end - users to assess the efficient working order of the prototype
- check list features to ensure that the prototype is a manifestation of the theoretical model and unique compared to other similar systems currently used by design researchers

Then, the primary evaluation exercise of the prototype involved:

- one-to-one authoritative evaluation review with five participants, experts in the design research issues employed to assess the validity of the theoretical model in terms of its effectiveness and efficiency



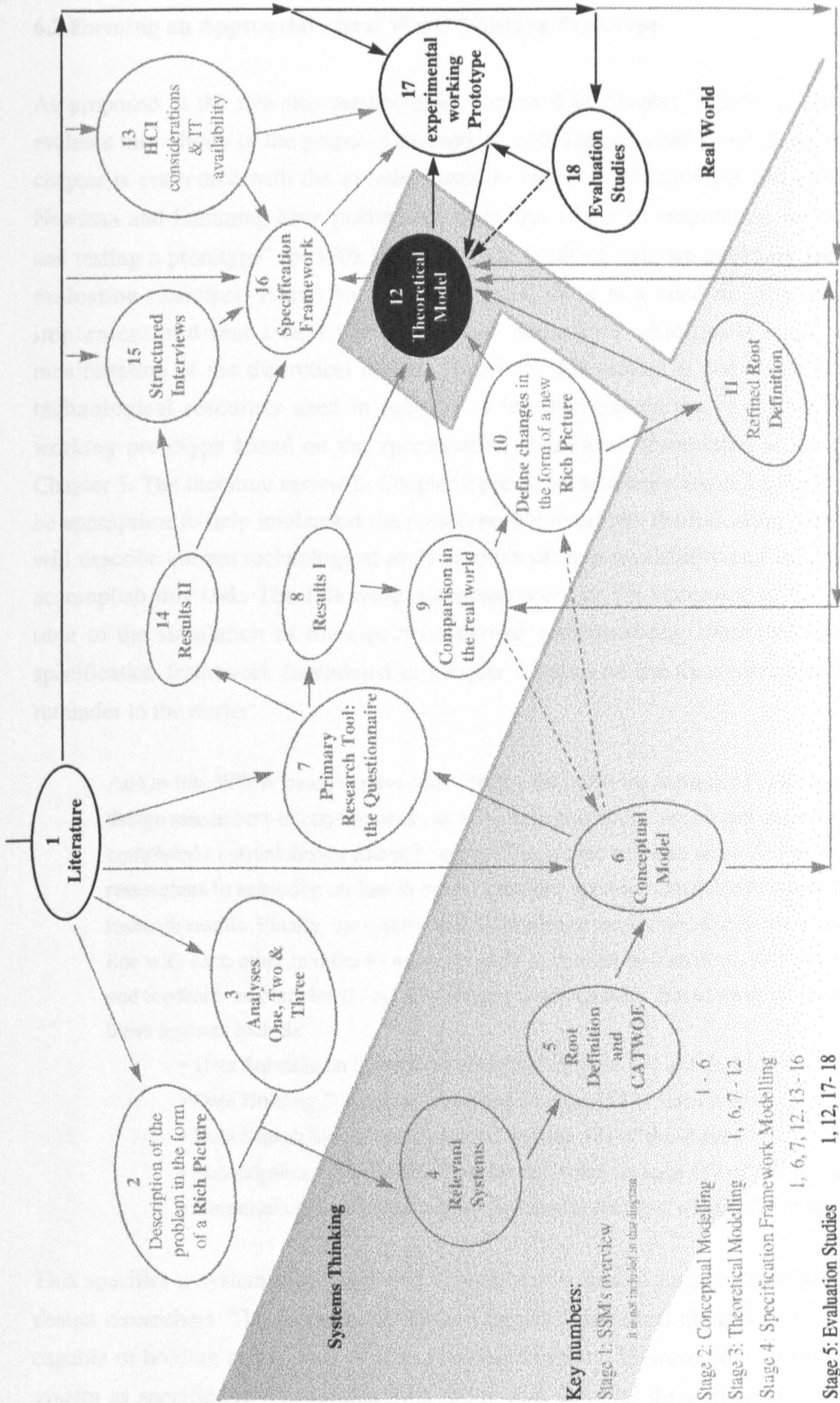


figure 6.1: Part of the Research Framework concerning the Evaluation Studies



## 6.2 Forming an Appropriate Real World Working Prototype

As proposed in the five-step methodology presented in Chapter 3, there is a need to evaluate the validity of the proposed theoretical model appropriately, and therefore, this chapter is concerned with the exercises used to judge its effectiveness and efficiency. Newman and Lamming have pointed out that: "this is solved empirically, by building and testing a prototype" (p. 190), in which these kinds of tests are generally known as evaluation exercises. Based on these principles, there is a need to experimentally implement and test a real world working prototype which will stand as the manifestation of the theoretical model. Therefore, this section is concerned with the technological resources used in relation to the implementation of the real world working prototype based on the specification framework formulated at the end of Chapter 5. The literature review in Chapter 2 presented numerous technologies that may be appropriate to help implement the prototype and therefore, the following paragraphs will describe current technological tools in terms of their availability and suitability to accomplish this task. The following paragraph presents the statement of the limited (due to the simulation of the aspect concerned with assessing submitted material) specification framework formulated in Chapter 5 based on the theoretical model as a reminder to the reader:

An On-line WWW based system consisting of the following features in order to allow design researchers to communicate, as well as, to contribute, search and retrieve on-line completed / current design research results. The system will also allow design researchers to subscribe on-line in order to retrieve updated completed / current design research results. Finally, the system will allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results. Based on these principles, these features include:

- Data Submission System (as described on page 179 of this thesis)
- Data Holding System (as described on page 181 of this thesis)
- Data Search System (as described on page 181 of this thesis)
- Subscription to Updates System (as described on page 182 of this thesis)
- Communication with each other System (as described on page 183 of this thesis)

This specifies a system that stores and communicates design research results between design researchers. The literature review in Chapter 2 described the ability of a system capable of holding and storing data as a database system. However, the abilities of the system as specified in this specification framework involves three important functions



requiring implementation in this prototype. The first function involves the ability of design researchers to contribute data and therefore, the system needs to allow users to write to the system. The second function involves the ability of design researchers to search and subscribe in order to interrogate the system. Finally, the third function involves the ability of the system to display matches to these searches and subscriptions, and therefore, the system needs to allow users to read the system. Additionally, the system should provide these three functions through an on-line WWW environment. Incorporation of these principles, leads to the need for the development of a database supporting the functions of writing, interrogation and reading within an on-line WWW environment.

The literature review in Chapter 2, presented different types of databases, as well as, appropriate software to create an on-line WWW database system. Software included the Oracle, Sybase, mSQL, Microsoft SQL, FoxPro, Microsoft Access and FileMaker Pro. Although some of these software packages are capable of handling the three functions mentioned in an on-line WWW environment, FileMaker Pro is the one that will be used. This is because, most of these software packages are either very expensive or UNIX / NT based and the author had no access to these resources. The author did however have access to a G3 Power Macintosh running at 233 Mhz with a MacOS 8.1 operating system and AppleShare IP 5.03, and also a Pentium 200MMX operating with Windows 95. Therefore, version 4 of File Maker Pro which is a cross-platform database software functioning on both Windows and Apple Macintosh operating systems was chosen for the implementation of the system.

Using FileMaker Pro software, a database system was developed. This database consisted of menu submission and filling in interaction format styles (these terms are used by Shneiderman, 1992, p. 132) and includes all the content presented in the submission form on page 182 of this thesis. Based on this content, the forms of submission, search and subscription (using both menu submission and filling in interaction format styles) were made as described on pages 182 -186 of this thesis.

The following section describes the possible processes for publishing this database on the WWW. Feiler (1999, pp. 3 - 4) describes these ways as follows:

- Instant Web Publishing
- Custom Web Publishing with CDML
- Custom Web Publishing with Claris Home Page
- CGI Publishing



• Instant Web Publishing (IWP) is the simplest and fastest way to put databases on the WWW. It only requires a few steps and does not require either Web authoring tools or HTML coding. These steps as described by Feiler (1999, pp. 105 and 133) include:

- create or select a database to publish
- select standard templates layouts and associate them with FileMaker Pro Web companion functions
- set database-specific FileMaker Pro Web companion parameters

• Custom Web Publishing (CWP) with CDML is the easiest way for WWW designers who are adept at using HTML to put databases on the WWW. It is ideal for designers with WWW experience and limited database experience. In particular, this method is the same as the one described above, however, "it allows designers to customise the appearance and functionality of the WWW pages" (Feiler,1999, p. 169) by the use of HTML and CDML (Claris Dynamic Markup Language).

• Custom Web Publishing (CWP) with Claris Home Page is the same as the one described above, however instead of the use of HTML, customisation of the appearance and functionality of the WWW pages (Feiler,1999, p. 353) is achieved through the use of the Claris Home Page which is a WYSIWYG (What You See Is What You Get) software package.

• Common Gateway Interface (CGI) Publishing is a standard method of exchanging information and commands between applications, such as databases. It allows different databases to run and interact with one another in many different environments, as well as, to communicate with each other based on tailored scripts and programs (Feiler,1999, p. 492).

The following paragraph describes which of these four methods mentioned is used in publishing the database on the WWW and why:

Instant Web Publishing was not used since the selection of standard template-layouts does not allow enough flexibility to implement the functionality and usability of a system described in figures 5.3 (the refined process flow chart, page 166 of this thesis) and 5.5 (the final version of the specification framework in the form of an operational structure, page 184 of this thesis). The Common Gateway Interface (CGI) Publishing method was also not used since, it required extensive programming abilities which



author did not possess. Therefore, a combination of the CWP methods was used since, this offered greater flexibility in terms of implementing the system's functionality and usability as described and illustrated in figures 5.3 and 5.5. In particular, this CWP combination involved HTML and CDML which are relatively simple programming languages, as well as, Claris Home Page version 3 which is a Web editing software package. This combination allowed the author to customise the database for the WWW environment. However, the limitations of both HTML, CDML and Claris Home Page 3 in relation to the system's functionality and usability (as illustrated in figures 5.3 and 5.5) within the WWW environment required the additional use of Macromedia Dreamweaver version 1.2 which is also a WYSIWYG Web editing software package incorporating DHTML (Dynamic HyperText Markup Language) elements.

Although this combination of software provided the tools to implement the prototype including the abilities on-line to contribute, hold, search and retrieve completed / current design research results in the form described in the specification framework, none of these tools allowed the users to:

- contribute full content of research work, such as a report, a thesis, or an article
- contribute audio-visual material, such as image, video, animation or virtual reality files
- subscribe to the push method in order to retrieve updated design research results
- act, react and / or interact with each other

In relation to the on-line contribution of the full content of a research work and audio-visual material, File Transfer Protocol (FTP) was used. In particular, two specific folders to hold the full content of research work and the audio-visual material were created on the server, besides the database folder, to enable the FTP transactions. This technique, allowed contributors to drag and drop their full content document or the audio-visual material files located on their personal computer desktop into the system's full research content and audio-visual folders. However, in a real world situation, when users want to contribute such material they will need to be informed (via an e-mail ) of the exact name under which the file needs to be submitted in order to avoid possible duplication of file names which would result in files being overwritten.

In relation to the push method, the literature review in Chapter 2 described the development of a new system called push technology or Webcasting. This technique delivers requested content to the viewer's desktop using intelligent agents to find information without the user having to continually search. The delivery method varies



from e-mail to screen savers. Some of the software used to do this include Castanet Marimba, Autonomy AgentWare, Pointcast, Intermind, Microsoft's Active Channels and Netcaster from Netscape. However one of the technology's major disadvantages includes the user's inability to choose the specific information that they may desire and thus then "have inundated users with a flood of ill-defined, useless documents" (Shimmin, 1998, p. 57). To overcome this problem, an advanced tailored FileMaker Pro script was authored in order for users to subscribe to requested enquiries in the same way as described in the specification framework. This script allows users to be kept informed of any new submissions that match subscribed search criteria via an e-mail within specified time intervals. However, in order for the system to be self aligned and autorun the authored script mentioned, the schedule-it plug in, version 1 was used. In addition to this, as Claris E-Mailer (LT version) the built-in AppleShare IP 5.03 server software e-mailer application experienced problems with Claris FileMaker Pro, Eudora version 4.3 was used in order to send e-mails as appropriate. This compatibility problem is also stated by Dyce (2000, p. 71) in which he confirmed that the built-in 'Send E-Mail[]' script command provided in FileMaker Pro works only with the use of Claris E-Mailer, Eudora or with Outlook Express 5 if an additional Apple Script is written.

In relation to the ability of users to act, react and / or interact with each other, E-Mail was used. In particular, a simple CDML command was also employed in order to enable users to communicate with each other via E-Mail. In relation to the graphics creation, Adobe Photoshop version 5.0 was used and images saved as JPEGs in order to save space and downloading time over the WWW.

Finally, as stated in the specification framework formulated in Chapter 5, the nomenclature for this prototype is 'nereid' and stands for 'NETworked REsearch In Design'. From hereafter, this prototype will be referred as nereid. Using the software mentioned, the first nereid prototype was created and consists of the following interrelated screens:

- Welcome Screen of the nereid prototype and forward link to the main menu.
- Main Menu providing a brief explanation of what the system is and how it works, as well as, links to these services and in particular links to the screens for contributing, searching, subscribing and communicating with others. It also provides a link to contact the system via e-mail (fig. 6.3).
- Contribution Screen provides the form that enable design researchers to contribute



textual and audio-visual details and full content of their research work, as well as, their personal details, as seen on page 179 of this thesis. This screen also provides a link back to the main menu (fig. 6.4).

- Search Screen provides the form that enable design researchers to search both textual and audio-visual details and the full content of others submitted research work as seen on page 181 of this thesis. It also enable design researchers to search for others in order to communicate with each other as discussed on page 183 of this thesis. Finally, it provides a link to the main menu (fig. 6.5).
- A screen that displays the results of the searches, as well as, the Brief Matches Display including, the name of the author, the title of research, the year of completion, the status and the delivery form of the research work and the links to description, full content and the audio-visual material if any. If matches were not found then, it displays the reasons that caused this error. Finally, all these screens provide links back to the search and main menu screens.
- The Detailed Matches Display provides all the description of the submitted research work as seen in the submission form on page 179 of this thesis. As this screen does not display the full content of the research work and the audio-visual material if any, it provides appropriate links to these documents and materials. In addition to this, it provides the e-mail address of the contributing author as a link in order for seekers of this research work to be able to act, react and / or interact with contributor for further communication purposes. Finally, this screen provides links back to the search and main menu screens.
- The Full Content Matches Display provides the whole document of the submitted research work itself. Since this is based on FTP transaction, this screen does not provide links to e-mail the contributing author or links back to the brief matches display, search and main menu screens and therefore, users need to hit the back button of the browser to go back.
- The Audio-Visual Matches Display provides the audio-visual material of the submitted research work. Since this is also based on a FTP transaction, this screen does not provide links to e-mail the contributing author or links back to the brief matches display, search and main menu screens and therefore, users need to hit the back button of the browser to go back.
- The Subscription to Updated completed / current design research results Display provides the form that enable design researchers to subscribe to both textual and audio-visual details and full content of any new submitted research work as seen on page 182 of this thesis. It also provides a link back to the main menu (fig. 6.6).
- A screen displaying whether the contribution or subscription was successfully or unsuccessfully completed. If it is unsuccessful, it displays the reasons caused this error. This screen also provides the links to submit on-line audio-visual and the research document itself.



- Finally, for matches under the subscription to updated submissions, an e-mail is sent to the appropriate subscribers. This screen is an acknowledgement message to users of this service and provides them with the matched identification numbers (ID). It also provides the user with guidelines of how to retrieve these matches using the Search Screen of the nereid prototype.

The following section shows the guidelines used in relation to the design layouts and appearance of the screens elements such as text, forms, colour and graphics. Shneiderman (1992, pp. 78 - 79) presented guidelines in relation to organising screen displays which include:

- Consistency of data display (familiar terminology when the standard is not used)
- Efficient information assimilation by the user (format should be related to the tasks required to be performed with these data)
- Minimal memory load on user (users should not be required to remember information from one screen for use on another screen)

Christie (1985, pp. 158 & 160) in relation to text formatting presented some general conclusions and recommendations as follows:

- Text legibility is affected by character height and distance of the user from the screen
- Legibility is affected by brightness, particularly the rate between text and background
- Optimal spacing between letters also depends on brightness
- Relative brightness is affected by ambient illumination
- Headings should be in upper case
- Body of the text should be a mixture of upper and lower case
- Text character is affected by colour; in general the "brighter" the colour the more legible and therefore, the best colours for text are white, yellow, cyan and green

In relation to the forms, Shneiderman (1992, pp. 133 - 134) presented the following guidelines:

- Use of meaningful titles
- Use of logical grouping and sequencing fields
- Use of familiar field labels
- Use of consistent terminology and abbreviations

In relation to the use of colours in the displays, Shneiderman (1992, pp. 325 - 330) presented the following recommendations:



- Use colour conservatively: limit the number and amount of colours (from 4 to 7 in the entire sequence of displays)
- Recognise the power of colour to speed or slow tasks (for instance, red colour can be used for urgent or first priority elements)
- Use colour to help in formatting, as well as colour changes to indicate status changes (use of similar colours can be used to group related items)
- Be alert to the problems with colour pairing (for instance, use of red and blue colours at the same time may be difficult for users to absorb the information)
- Beware of the loss of resolution with colour displays (for instance, very close colour tints may be poorly displayed in a lower resolution monitor that can result in the users' confusion)

In relation to the use of graphics, Christie (1985, p. 156) pointed out that graphical information is useful for:

- showing syntheses and abstractions
- displaying atmosphere
- expressing a feeling
- representing visio-spatial relationships

All the guidelines presented above were considered in relation to the implementation of the nereid prototype, however, it is not possible to document all of them in this thesis in particular in relation to the elements' alignment, margins and spacing. However based on these principles, the following section presents the major design specifications and rationale in relation to the layout of the screens and in particular, the use of colour, typefont, size, navigation and graphics in this prototype:

- The first real world working nereid prototype consists of eleven screens and each of these screens (windows) has a resolution of 800 by 600 pixels, using the maximum of 256 colours that is currently, the most commonly used.
- One colour is used for the background of all the system screens in order to be consistent. In particular, black was used in the welcome, main menu, contribution, search, subscription and communicating with other screens. The black was chosen in order to differentiate from the white contribution, search and subscription forms. In relation to the forms, meaningful titles, logical grouping and sequence fields, familiar labelling of the fields and finally menu selection and form filling interaction styles were used.
- The typefont used is Arial (a popular default font for WWW pages). The style varies from plain to bold and italics. The size for the headings is 18 points, while the size for



the main body text used is 12 points. The text colour is mainly in light orange.

- A customised graphic is created for the logo of the nereid nomenclature which consists of a light orange coloured oval shape with black colour lettering. The logo in the welcome screen is placed on a black background colour.
- For text legibility in relation to the Search Results and Detailed Matches Displays, the black background colour was replaced by white. In addition to this, the full content and audio-visual materials displays were entirely replaced by a white background.
- The graphic based links used in the prototype are customised images created by the author. In particular, they are simple headings in light orange colour which when moused over change to the same shape as the nereid logo. However, consistent graphics for the screens of searching, subscribing and communicating with each other screens were used.

The flow chart in figure 6.2 presents the sequence and linkage of the nereid prototype screens. In addition to this, the major screens of the first nereid prototype are shown in the next 4 figures. In particular, figure 6.3 shows the main menu, figure 6.4 shows the on-line contribution form, figure 6.5 shows the on-line WWW search forms and figure 6.6 shows the subscription to updates form.

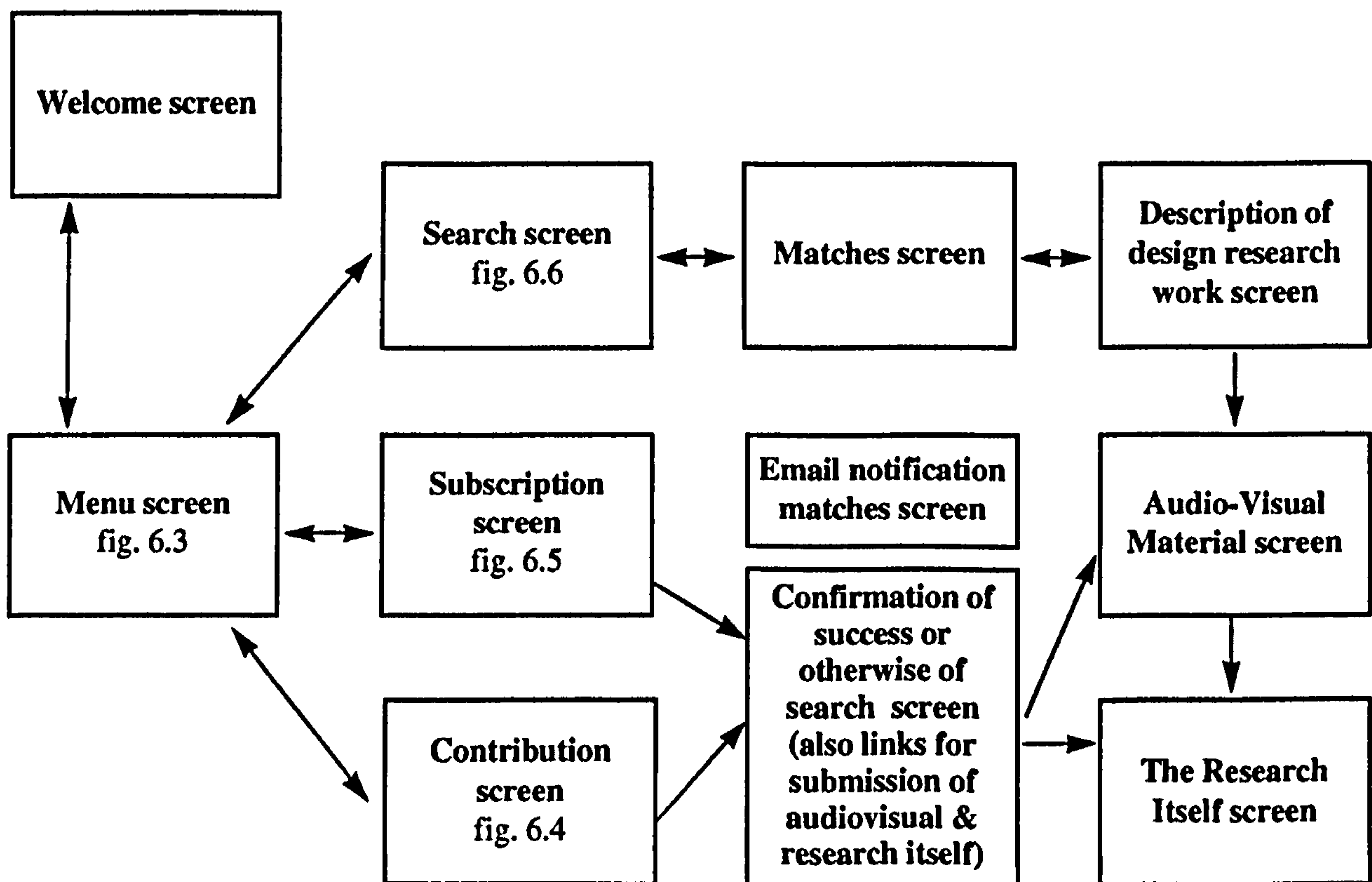


fig.6.2: The screens flow chart of the first nereid prototype (arrows indicate linkage between screens based on nereid links and not on the back browser button)



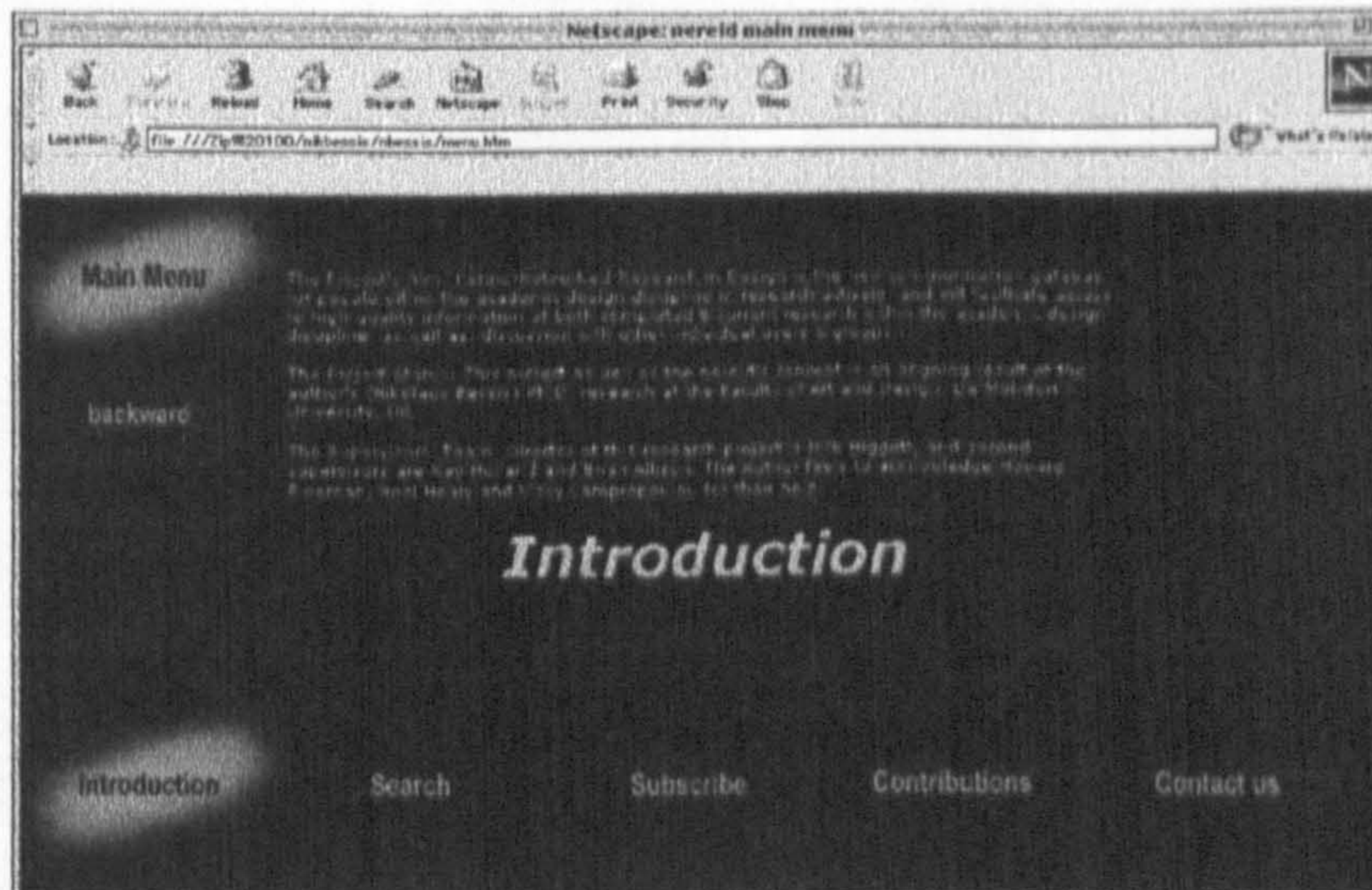


figure 6.3: The main menu screen of the first nereid prototype

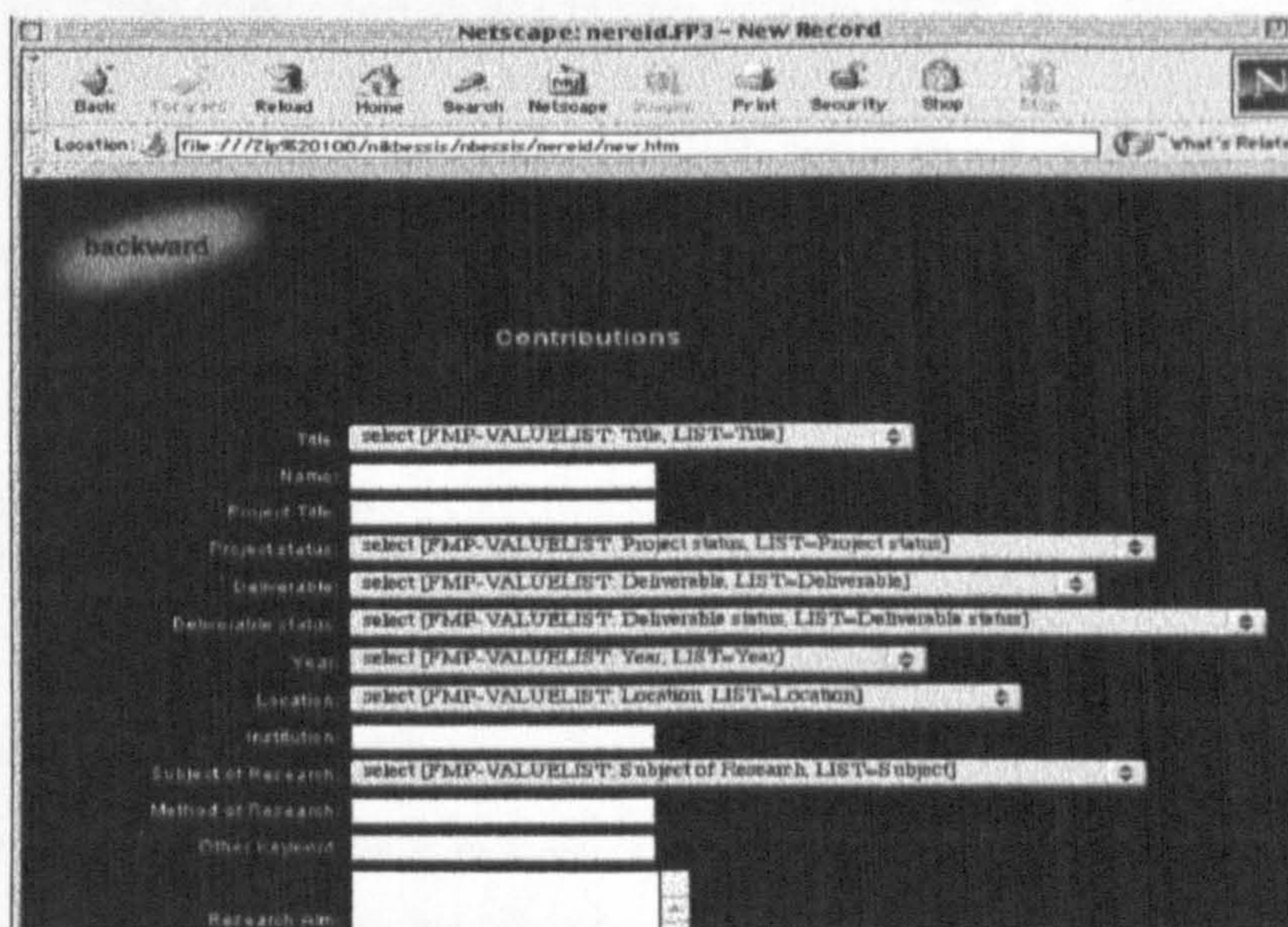


figure 6.4: The contribution screen of the first nereid prototype

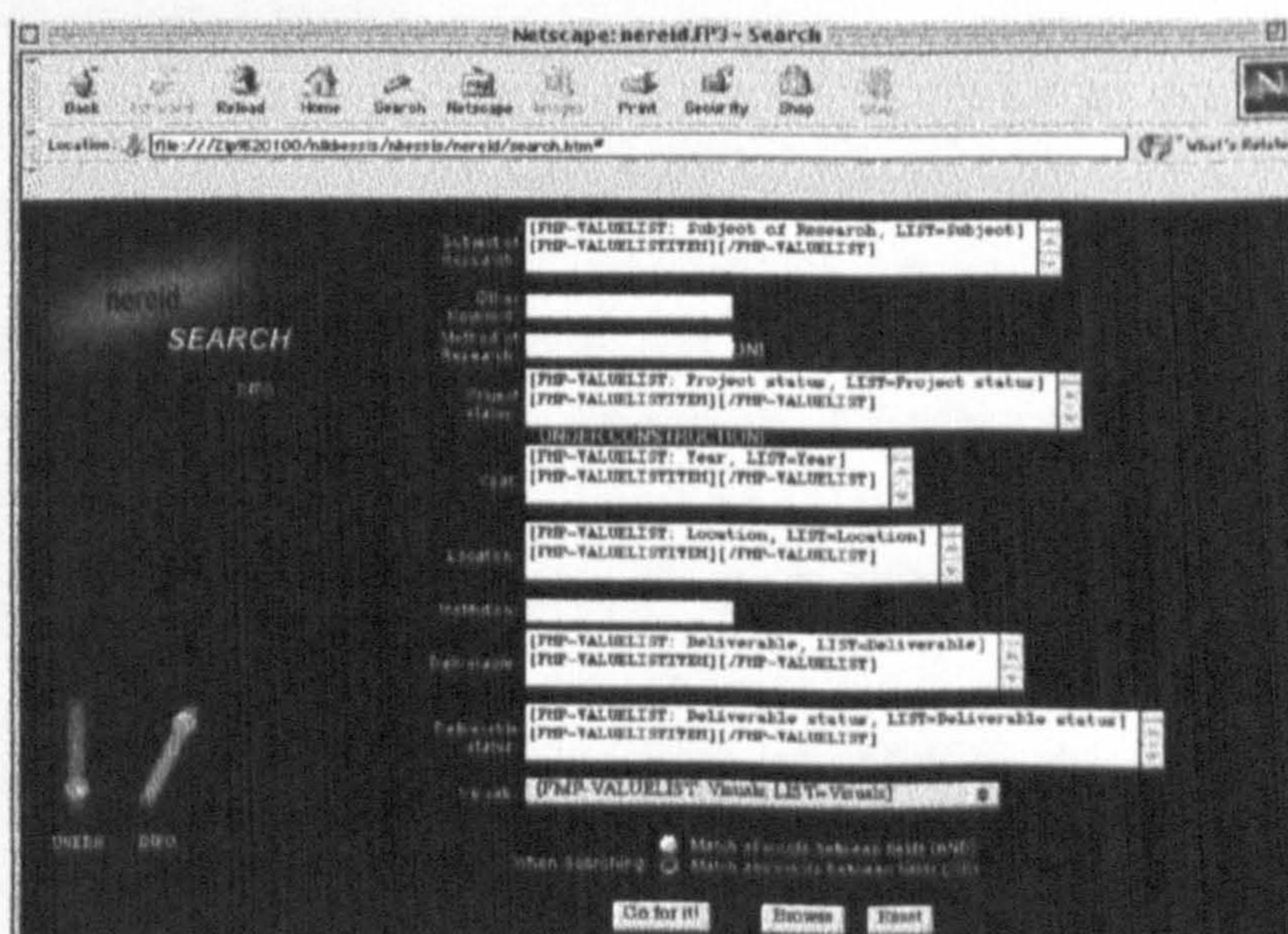


figure 6.5: The search screen of the first nereid prototype



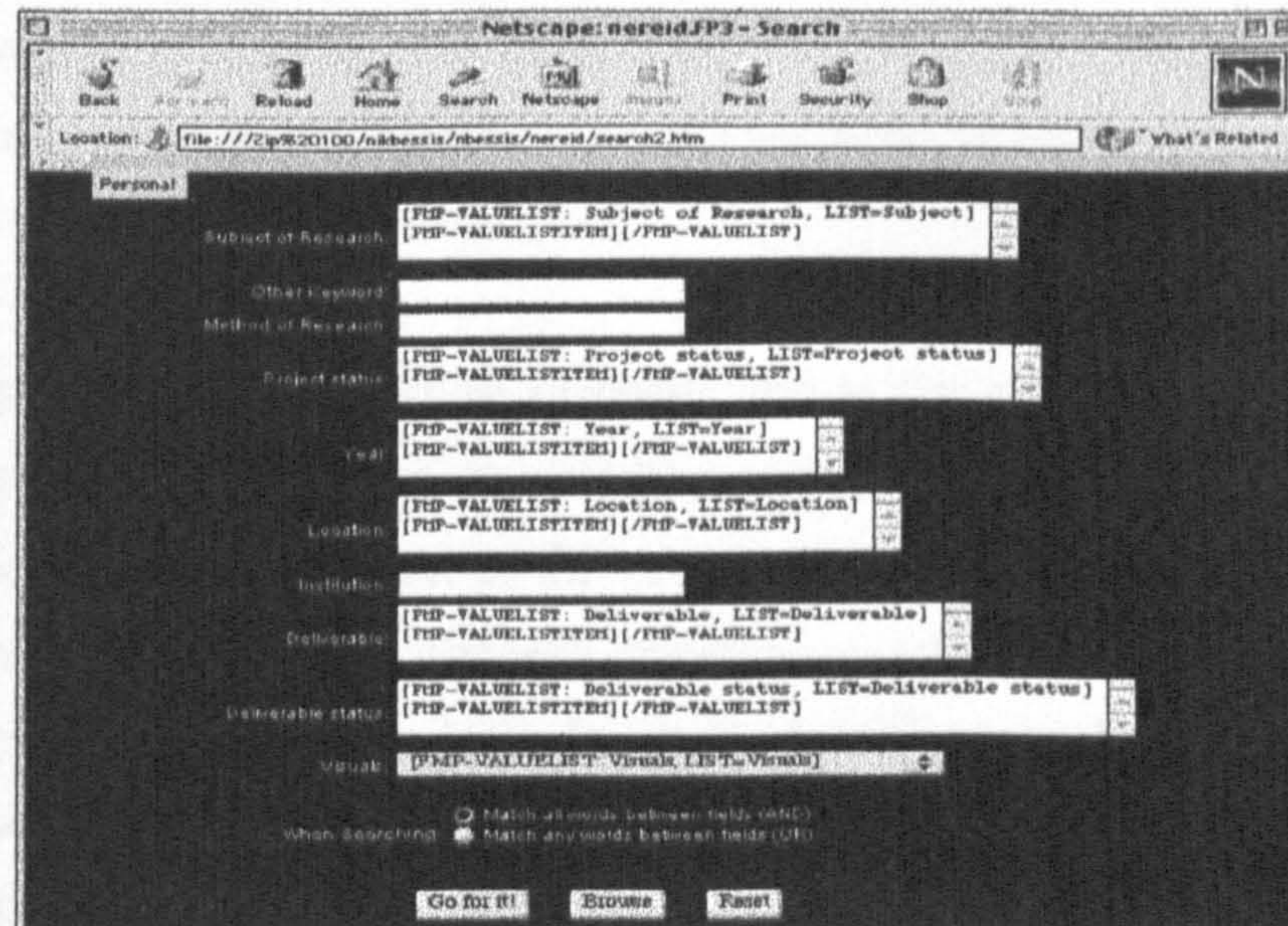


figure 6.6: The subscription to updates screen of the first nereid prototype

The following sections are concerned with how the formative and summative evaluations are used to test this nereid prototype in order to refine it and ultimately evaluate the validity of the theoretical model using the refined prototype.

### 6.3 The Evaluation Exercises

These exercises assisted the evaluation of both the prototype and the theoretical model. One aim was to assess the efficacy of the nereid prototype. According to the SSM epistemology (page 70), efficacy is concerned with whether the means is working and therefore, is concerned with assessing the usability and functionality of the prototype. However, this is considered a secondary exercise since, the primary one is to assess the validity of the theoretical model.

The following sub-sections will describe these evaluation exercises as follows:

- evaluation exercise in relation to the real world prototype (secondary)
- evaluation exercise in relation to the validity of the theoretical model (primary)
- **Evaluation Exercise in relation to the Real World Prototype (Secondary)**

This type of evaluation assisted the process of refining the first nereid real world prototype described earlier. In particular, these exercises will ensure that the prototype is an accurate manifestation of the theoretical model and thus will support all aspects described in the theoretical model. In addition to this, these exercises will also ensure



that the prototype is designed in such a way that does not adversely affect users' productivity in relation to the functions supported in the theoretical model which would then interfere with the primary evaluation.

These exercises were made both at intervals and at the end. In particular, the nereid prototype was tested in terms of its usability and functionality and these results were used to develop a refined version of the prototype. In this process, "the acquisition of data useful for improving the system's components and performance as an ongoing activity" (Kerr and Hiltz, 199, p 162) has been described "as formative evaluation and this is because it is oriented towards helping form the solution to the design problem" (Hix and Hartson, 1993, p. 190).

Based on these exercises, a more refined and efficient working version of the real world prototype as the manifestation of the theoretical model was implemented. The primary summative evaluation exercise was then employed in order to assess the validity of the proposed theoretical model in terms of its effectiveness and efficiency which is described next.

**• Evaluation Exercise in relation to the Validity of the Theoretical Model (Primary)**

The aim of this type of exercise is to assess whether or not the proposed theoretical model meets the aim of this research and therefore, to validate as to whether this model provides a more effective and efficient means for the communication of design research results between design researchers.

In order to achieve such validation, the method of acquiring feedback from experts in the field was employed. In addition to this, the one-to-one expert evaluation exercise with five subjects documented in Chapter 5 (section 5.3.5.2) was a partial attempt to demonstrate the validity of the theoretical model. However to completely demonstrate the validity of the theoretical model, one-to-one evaluation with experts in the field was employed at the end of the prototype implementation (section 6.5) as a summative evaluation exercise.

These secondary and primary evaluation exercises will now be described in detail.



## **6.4 Formative Evaluation as a Secondary Exercise (*involved key numbers: 1, 17 and 18*)**

This type of evaluation assisted the process of developing the prototype and involved three exercises as follows:

- one-to-one evaluation review with five experts in content, design and technical matters
- user group based evaluation with fifteen participants as end - users to assess the efficient working order of the prototype
- check list features and comparison with other similar systems to ensure that the prototype is an accurate manifestation of the the proposed theoretical model

### **6.4.1 One-to-One Expert Formative Evaluation Method (*Secondary Exercise 1*)**

A one-to-one evaluation review with five experts in terms of the content, technical and design matters was employed with the aim of assessing the first working version of the prototype developed based on the specification framework and the available technological resources. The prototype was assessed in relation to its efficient working order as well as to its functionality and usability. This exercise ensured that users of the prototype were able to perform all functions supported in the theoretical model.

#### **Participants**

Participants of this evaluation method were all related to design research and included:

Ray Holland, MA / MSC Programme Leader, Design and Manufacture, De Montfort University  
(also second supervisor)

Nick Higgett, Principal Lecturer in Multimedia Design, De Montfort University  
(also director of studies)

Joseph Amoah-Nyako, Supervisor, Graduate School, Design & Manufacture, De Montfort University  
Ed Chester, Lecturer in Multimedia Design, De Montfort University

Rob Snow, Lecturer in Multimedia Design, De Montfort University

#### **Aim, Procedure and the Instrument used**

In particular, this exercise was designed in order to examine the following:

1. overall reaction
2. screen layouts
3. terminology
4. functionality
5. speed



The aim of this exercise was simply to assess the efficacy, that is whether the means is working (SSM epistemology, p. 70 of this thesis), i.e. to assess the efficient working order of the prototype and to draw conclusions in relation to general satisfaction or dissatisfaction. However, as the aspect of assessing submitted material had not been implemented in this prototype, all evaluation exercises used MA / MSc / MPhil, PhD research work that had already been refereed by an examination board. The exercise was interview based and participants' feedback was documented in a questionnaire (see Appendix III). Questions employed were fixed alternative five point scaled and based on the evaluation strategies of Shneiderman (1992, p. 478 and 483). In addition to the fixed alternative five point scale items, a space for comments was also provided. The exercise consisted of a brief introduction and demonstration of the prototype's functions after which the participants were allowed to browse and explore the system themselves. The participants were then asked questions relating to whether they were satisfied or dissatisfied with the use of this prototype. Then, numerical values were assigned to the five point scaled items in which, strong dissatisfaction was assigned '-2', dissatisfaction was assigned '-1', neutral was assigned '0', satisfaction was assigned '1' and strong satisfaction was assigned '2'. Based on the participants' responses the questionnaire were filled in by the author himself. At the same time comments were also typed in by the author in the appropriate commentary section. The following section shows the assigned values and the questions that were asked:

**Q1. Overall Reactions to the System:**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q2. Screen Layout:**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q3. Terminology:**

- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the							



requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q4. Functionality of System:**

- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy

<b>Q5. Speed of System:</b>	too slow	-2	-1	0	1	2	fast enough
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**Q6. Overall comments in relation to the efficient working order of the prototype***6.4.1.1 Results of One-to-One Expert Formative Evaluation Method*

The results from this exercise are shown in the following tables (6.1 - 6.5) and are based on the 5 subjects responses. Based on the numerical assigned values, the score for all the 5 responses can be as high as '10' or as low as the '-10'. The closer to the highest numerical value of '10' the greater the tendency for satisfaction with a particular item, the closer to the '0' value indicates a balance and the closer to the lowest numerical value of '-10' the greater the tendency for dissatisfaction with a particular item. Based on these principles, the following table 6.1 shows the degree of the satisfaction or dissatisfaction with the prototype in relation to the overall reaction:

		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
<b>Q1. Overall Reactions to the System:</b>	terrible / wonderful	-	-	-	3	2	7
	frustrating / satisfying	-	-	-	1	4	9
	dull / stimulating	-	-	-	2	3	8
	difficult / easy	-	-	-	3	2	7
	rigid / flexible	-	-	-	-	5	10
	<b>Overall Score</b>						<b>41</b>

table 6.1: One-to-one Expert Formative Evaluation Exercise in relation to the Overall Reaction to the Prototype (halfway marks= $\pm 5$ , overall halfway mark= $\pm 25$ )



In general these findings indicate that participants were very satisfied in relation to the overall reactions to the prototype. This is because, both the overall total of 41 out of a possible 50 and individual total scores are very high and therefore, the prototype was found to be generally flexible, satisfying, stimulating, easy and wonderful. The next question was concerned with the screen layout:

		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
<b>Q2. Screen Layout:</b>							
- Characters on screen	hard / easy to read	1	-	-	3	1	3
- Graphics on screen	unhelpful / helpful	-	-	2	3	-	3
- Arrangement of information	illogical / logical	-	-	-	2	3	8
- Amount of information	inadequate / adequate	-	-	-	1	4	9
- Screen layout	unhelpful / helpful	-	-	-	4	1	6
- Colour scheme	frustrating / satisfying	-	1	-	2	2	5
- Screen navigation	confusing / clear	-	-	-	2	3	8
<b>Overall Score</b>							<b>42</b>

table 6.2: One-to-one Expert Formative Evaluation Exercise in relation to the Screen Layout of the Prototype (halfway marks= $\pm 5$ , overall halfway mark= $\pm 35$ )

In general the overall score of 42 out of a possible 70 (halfway mark=35) indicates that participants were generally very satisfied with the overall screen layout of the prototype. In relation to the individual total scores, participants felt in particular the amount of information was adequate, the arrangement of information was logical and the screen navigation was easy. They also found that the screen layout was helpful and the colour scheme satisfying. Finally in relation to the characters and the graphics used on the screens, subjects were found to be more satisfied than dissatisfied and therefore, felt the layout was quite easy to read and helpful. The next question was concerned with the terminology used throughout the prototype:

		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
<b>Q3. Terminology:</b>							
- Use of terms throughout the system	inconsistent / consistent	-	-	-	2	3	8
- Relevance of terminology to the requirement of contributing data	unrelated / related	-	-	-	-	5	10
- Relevance of terminology to the requirement of searching data	unrelated / related	-	-	-	-	5	10
- Meaning of messages which appeared on screen	confusing / clear	-	-	-	1	4	9
<b>Overall Score</b>							<b>37</b>

table 6.3: One-to-one Expert Formative Evaluation Exercise in relation to the Terminology Used on the Prototype (halfway marks= $\pm 5$ , overall halfway mark= $\pm 20$ )



In general the overall score of 37 out of a possible 40 (halfway mark=20) indicates that participants were very satisfied in relation to the terminology used on the prototype. In relation to the individual total scores, participants felt of the terminology used for the requirements of contributing and searching information were particularly relevant. They also found the meaning of messages appeared on screen clear and the terminology used throughout the system consistent. The next question was concerned with the functionality of the prototype:

		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
<b>Q4. Functionality of System:</b>							
- Operating the system	difficult / easy	-	-	1	1	3	7
- Filling in the contribution form	difficult / easy	-	-	-	2	3	8
- Filling in the search form	difficult / easy	-	-	-	-	5	10
- Filling in the subscription form	difficult / easy	-	-	-	-	5	10
- Communicating with others	difficult / easy	-	-	-	-	5	10
<b>Overall Score</b>							<b>45</b>

table 6.4: One-to-one Expert Formative Evaluation Exercise in relation to the Functionality of the Prototype (halfway marks= $\pm 5$ , overall halfway mark= $\pm 25$ )

In general the overall score of 45 out of a possible 50 (halfway mark=25) indicates that participants were very satisfied with the functionality of the prototype. In relation to the individual total scores, participants felt filling the search, subscription and communicating with each other forms very easy. They also found filling in the contribution form to be easy as with operating the system in general. The final question was concerned with the speed of the processes in relation to the functions operated within the environment of the prototype:

<b>Q5. Speed of System:</b>	too slow / fast enough	-	-	-	-	5	10
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table 6.5: One-to-one Expert Formative Evaluation Exercise in relation to the Speed of the Prototype's Functions (halfway mark= $\pm 5$ )

The score of 10 out of 10 indicates that participants were very satisfied in relation to the speed concerned with the processes of the prototype's functions.

Based on the findings shown on tables 6.1, 6.2, 6.3, 6.4 and 6.5, participants were satisfied with the use of the first nereid prototype in terms of its efficient working order. This is because all overall scores were higher than the halfway mark between neutral



and very satisfied. In addition to this, the average score of 7.95 (sum=175 out of 220=22 question items) further indicates the subjects' satisfaction in relation to the prototype's working order.

However, the findings shown in table 6.2 indicate a relative weakness in relation to the characters and graphics used on the screens. Although these were still found satisfactory, they were further discussed with these subjects. One participant's comment was that size of the characters used on the body text was relatively small which reduced the text legibility in conjunction with the black background. This participant was also concerned that black may not be an appropriate colour due to possible reflections that may result from external resources in a workspace environment. The same participant made the suggestion to either increase the size of the text, change the text colour, change the background colour or a combination. However, three other subjects argued that the black colour was appropriate to the nature of this system as its main scope is to find communication linkages in an unknown environment. Finally, another two participants suggested that the graphical buttons should be changed for aesthetic purposes. In addition to this, during the testing, some problems were experienced with the search screen and in particular two search forms did not always respond properly. Such a response caused the database to lose its assigned values. Based on all these results, the following modifications were applied in order to augment the prototype's efficient working order:

- where the black background was kept the text was increased from 12 points to 18 and bold
- in some places text placed on an light orange background
- in some places text colour was changed to black
- all graphical buttons were changed and harmonised with the oval shape of the nereid logo
- an additional screen for searching for others in order to allow users to communicate with each other was designed

Based on these modifications, a refined version of the nereid prototype in terms of its efficient working order developed. The screens of this refined version of the nereid prototype can be seen in Appendix V. The following section describes the user group based evaluation of this refined prototype.

#### ***6.4.2 User Group based Formative Evaluation Method (Secondary Exercise 2)***

A user group based formative evaluation exercise was employed to ensure that the refined version of the nereid prototype supported all aspects described in the theoretical



model in an efficient way and did not adversely affect users' productivity in relation to its functions and thus the primary evaluation. This type of exercise was similar to the one-one expert evaluation exercise described in 6.4.1, however more questions were added together with specific tasks relating to all of the system functions which the subjects were asked to attempt. However, as the aspect of assessing submitted material was not implemented in this prototype, all evaluation exercises again used MA / MSc and PhD research work that had already been refereed by an examination board. The questions and the tasks undertaken on this exercise are described next.

### **Participants**

The 15 participants for this evaluation exercise were all active design researchers and included MA / MSc and PhD research students and staff at De Montfort University and included:

- Francois Bellet-Odent, MA/MSc Product and Industrial Design, De Montfort University
- Kimberly Beng Kcun Yeap, MA/MSc Interior Design, De Montfort University
- Coco (Cynthia) Chu, MA/MSc Graphic and Multimedia Design, De Montfort University
- Sara Ekenger, MA/MSc Design Management, De Montfort University
- Noel Healy, MA/MSc Graphic and Multimedia Design, De Montfort University
- Andy Gregory, MA/MSc Graphic and Multimedia Design, De Montfort University
- Dav Tara, MA/MSc Graphic and Multimedia Design, De Montfort University
- C. Volkan Demirel, MA/MSc Interior Design, De Montfort University
- Peter Chen, PhD Graphic and Multimedia Design, De Montfort University
- Carolyn Hardaker, PhD Fashion and Textiles Design, De Montfort University
- Jinho Jeong, PhD Product and Industrial Design, De Montfort University
- Hsueh-shu Liao, PhD Product and Industrial Design, De Montfort University
- Olga Miggou, PhD Interior Design, De Montfort University
- Claire Orwin, PhD Fashion and Textiles Design, De Montfort University
- Puindita Tantiwong, PhD Fashion and Textiles Design, De Montfort University

### **Conditions**

In order to ensure that all the participants received the same treatment in relation to the tasks that they were asked to accomplish, and therefore to avoid adverse interference, all participants:

- had no prior knowledge of the nereid prototype
- had no initial demonstration from the administrator of these tests. (This was because it may have biased the results as the exercises did not all take place on the same day)



- were given the same structured instructions and questions
- were given the same explanations in relation to the system's abilities
- were not given any assistance
- had the same hardware / software equipment, in particular, subjects used iMacs running at 233 Mhz with MacOS 8.1 operating system, 64 MB of RAM, and Netscape Navigator 4.7

The following conditions are considered as dependent as they can not be controlled and therefore, they may affect results in relation to the tasks. These are as follows:

- individual participants' IQ
- individual participants' computer literacy
- participants' age and sex
- individual participants' involvement in relation to the research activity
- individual participants' frequency of searching for previous and / or current relevant information for their research work
- individual participants' frequency of use of the WWW for searching for relevant information to aid their research work

In addition to this, the following conditions also existed:

- all participants were asked prior to the test to have on a disk an abstract or a summary, a whole document and a piece of audio-visual material (image, animation, video, audio, virtual reality) describing their research work to test the contribution task
- all participants were encouraged to work at their own pace without being given any time limit

Finally, participants were asked to affirm before participating that they:

- held a valid e-mail address
- freely volunteered to participate in these tests
- were postgraduate students, or a research active member of staff in design
- were aware that they were not the ones being tested, but rather it was the prototype that was under test
- were aware that they had the right to withdraw consent and to discontinue participating at any time without further question
- would be given, prior to these tests, a brief description of the project, as well as, the procedures that would need to be followed
- would be given the opportunity to ask questions and have their questions answered fully

In relation to the validity of results from an evaluation exercise, Van Dalen (1979, p.



235) confined that the administrator of the exercises should ask as to what participant populations, settings, conditions and criteria could these findings be generalised. Based on this principle the validity of the findings from this exercise should be restricted to the treatment described above and in particular, to the population represented by this participant sample, as well as, to the specific tasks that the participants were asked to accomplish and these are described next.

### **Instrument and Procedure**

The following paragraphs describe the tasks set and their purpose, as well as, the related questions and their numerical assigned values (where applicable):

#### **Section 1, Personal Details:**

These questions were asked in order to ensure the sample was valid for the purpose of this test:

Q1.1 Please indicate your age

Q1.2 Please indicate your gender

Q1.3 Please indicate your nationality

Q1.4 When you conduct research in design, how often do you search for previous and / or current research relevant to your area of enquiry

Q1.5 Do you currently use the WWW for searching information relevant to your area of enquiry

Q1.6 Please indicate if you are actively involved in research and if so to what extent

Q1.7 Please indicate your computer literacy

Next, all subjects were asked to undertake and accomplish the following tasks:

#### **Section 2, Searching**

Participants were asked to accomplish the following steps in order to ensure that all possible combinations provided in the search form were functional, worked properly and did not adversely affect user's productivity in relation to the task:

A. Load the URL: <http://146.227.33.75:591/neroid/welcome.htm> (www address of prototype)

B. Follow the appropriate hyperlinks to reach the Search page

C. Please search for:	subject of research	Graphics / Multimedia
	keyword	Medical
	visual	Image
	match logic	And

D. When you have finished, please click on the Start Search button



- E. When you have retrieved the results, check that you have relevant matches
- F. To do this, click on the Record's ID link to get details of the research work
- G. Select the full content link by either the detail or brief matches screens to get the whole document of the research work
- H. Select the image link by either the detail or brief matches screens to get relevant audio-visual material

I. Repeat steps B - E by replacing the search values using the following:

project status	Completed
deliverable	MA Dissertation
subject of research	Management
deliverable status	Unpublished
match logic	Or

J. Repeat steps B - E by replacing the search values using the following:

projects status	Current
subject of research	Fashion / Textiles
match logic	And

K. Circle / fill in questions in relation to this task which are as follows:

#### Q2. Reactions in relation to Searching:

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

#### Q3. Screen Layout in relation to Searching:

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

#### Q4. Terminology in relation to Searching:

- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear



**Q5. Functionality of System in relation to Searching:**

- |  |           |    |    |   |   |   |         |
|--|-----------|----|----|---|---|---|---------|
| - Filling the search form                                | difficult | -2 | -1 | 0 | 1 | 2 | easy    |
| - Relevance of your search criteria with those retrieved | unrelated | -2 | -1 | 0 | 1 | 2 | related |

**Q6. Speed of System in relation to Searching:**

- |          |    |    |   |   |   |             |
|----------|----|----|---|---|---|-------------|
| too slow | -2 | -1 | 0 | 1 | 2 | fast enough |
|----------|----|----|---|---|---|-------------|

**Q7. Error Messages in relation to Searching:**

- |                                     |           |    |    |   |   |   |         |
|-------------------------------------|-----------|----|----|---|---|---|---------|
| - Did you experience error messages | always    | -2 | -1 | 0 | 1 | 2 | never   |
| - Were error messages               | unhelpful | -2 | -1 | 0 | 1 | 2 | helpful |

**Q8. Please feel free to give any comments relating to the tasks****Section 3, Subscription to Updates (Part I)**

Participants were then asked to accomplish the following steps which along with steps undertaken in section 4 would ensure that this form was functional, worked properly and did not adversely affect a user's productivity in relation to the task:

- A. Load the URL: <http://146.227.33.75:591/neroid/welcome.htm>
- B. Follow the appropriate hyperlinks to reach the Search page
- C. Please search for:
 

projects status	Current
subject of research	Graphics / Multimedia
keyword	Soft Systems Methodology
match logic	And
- D. When you have finished, please click on the Start Search button
- E. When you have retrieved the results, check whether they are relevant matches
- F. Follow the appropriate hyperlinks to reach the Subscription to Updates page
- G. Please subscribe with the criteria entered in step C (excluding the 'And' logic)
- D. When you have finished, type your e-mail address and click on the Subscribe button  
(questions relating to this task are presented in section 5)

**Section 4, Contributing**

Participants were then asked to accomplish the following steps in order to ensure that the contribution form was functional, worked properly and did not adversely affect a user's productivity in relation to this task. This task involved contribution of brief textual information, audio-visual material and the whole research document using the FTP technique:



- A. Load the URL: <http://146.227.33.75:591/neroid/welcome.htm>
- B. Follow the appropriate hyperlinks to reach the Contributions page
- C. Please provide details about yourself and your research work
  - to submit text from a disk, open from file menu, select all, copy and paste
- D. When you have entered your contribution please click on the Submit button and then if the contribution is accepted follow the instructions provided and in particular to submit the whole document and the audio-visual material from a disk, locate them on the desktop and then, just drag and drop into the system's appropriate folder
- E. Wait for the system response and then go to the Search Form
- F. Search for your Name or any other combination to retrieve your contribution
- G. Check the relevance of the retrieved match with your submission
- H. Circle / fill in questions in relation to this task which are as follows:
- I. At this point, the administrator contributes relevant research work to the subscription criteria entered in step C - section 3

**Q2. Reactions in relation to Contributing:**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Screen Layout in relation to Contributing:**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q4. Terminology in relation to Contributing:**

- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q5. Functionality of System in relation to Contributing:**

- Filling the contribution form	difficult	-2	-1	0	1	2	easy
- Relevance of your contribution with the one you submitted							



unrelated	-2	-1	0	1	2	related
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**Q6. Speed of System in relation to Contributing:**

too slow	-2	-1	0	1	2	fast enough
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**Q7. Error Messages in relation to Contributing:**

- Did you experience error messages	always	-2	-1	0	1	2	never
- Were error messages	unhelpful	-2	-1	0	1	2	helpful

**Q8. Please feel free to print some comments according to the task accomplished****Section 5, Subscription to Updates (Part II)**

Participants were then asked to accomplish the following steps which along with steps undertaken in section 3 would ensure that this form was functional, worked properly and did not adversely affect a user's productivity in relation to the task:

- A. Please check your e-mail and follow the instructions
- B. Load the Search page and search for the ID provided in the e-mail
- C. Check whether the retrieval is relevant to the subscribed search and different to the one matched in section 3 (you may check the different Record ID numbers)
- D. Then click on the Record's ID link to get details of this research work
- E. Please do not close (log off) this page
- F. Circle the questions relating to this task which are as follows:

**Q2. Reactions in relation to Subscribing of Updates:**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Screen Layout in relation to Subscribing of Updates:**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear







G. Wait for a short time and then check your e-mail

H. Circle the questions relating to this task which are as follows:

**Q2. Reactions in relation to Communicating with each other:**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Functionality of System in relation to Communicating with each other:**

- Communicating with others      difficult      -2 -1 0 1 2      easy

**Q4. Speed of System in relation to Communicating with each other:**

too slow      -2 -1 0 1 2      fast enough

**Q5. Error Messages in relation to Communicating with each other:**

- Did you experience error messages      always      -2 -1 0 1 2      never

- Were error messages      unhelpful      -2 -1 0 1 2      helpful

**Q6. Please feel free to print some comments according to the task accomplished**

**Task 7, Navigating**

Finally, participants were asked to accomplish the following steps in order to ensure that the overall navigation throughout the system was functional, worked properly and did not adversely affect a user's productivity in relation to their particular task:

A. Load the URL: <http://146.227.33.75:591/nereid/welcome.htm>

B. Then follow all hyperlinks to browse the system

C. Circle the questions relating to this task which are as follows:

**Q2. Reactions in relation to Navigating the system:**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Screen Layout in relation to Navigating the system:**

- Characters on screen      hard to read      -2 -1 0 1 2      easy to read



- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q4. Terminology in relation to Navigating the system:**

- Relevance of terminology to the requirement of navigating the system	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q5. Functionality of System in relation to Navigating the system:**

- Relevance of links in relation to the navigation of the system	unrelated	-2	-1	0	1	2	related
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**Q6. Speed of System in relation to Navigating the system:**

too slow	-2	-1	0	1	2	fast enough
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**Q7. Error Messages in relation to Navigating the system:**

- Did you experience error messages	always	-2	-1	0	1	2	never
- Were error messages	unhelpful	-2	-1	0	1	2	helpful

**Q8. Please feel free to comment on the task accomplished**

**Q9. Please feel free to comment overall**

The following section will present the results gained from this evaluation exercise.

**6.4.2.1 Results of User Group based Formative Evaluation Exercise**

The following sections will present the participants responses including their personal details to the tasks of searching, contributing, subscribing, communicating with each other and finally, navigating throughout the environment of the prototype.

**6.4.2.1.1 Participants' Personal Details - Section 1**

In relation to the participants personal details the following results were found:



**Starting with the participants' age (question 1.1):**

- 11 out of 15 were below the age of 34
- 4 out of 15 were above the age of 35

**In terms of the participants' gender (question 1.2):**

- 8 out of 15 were male
- 7 out of 15 were female

**In terms of the participants' nationality (question 1.3):**

- 6 out of 15 were Non-European
- 5 out of 15 were English
- 4 out of 15 were Other European

**In response to question 1.4 which was concerned with how often participants, when they conducted research in design, searched for previous and / or current research relevant to their enquiry:**

- 10 out of 15 said they did it always
- 5 out of 15 said they did it frequently

**In response to question 1.5 which was concerned with whether participants used the WWW for searching information relevant to their research:**

- 14 out of 15 said yes
- 1 out of 15 said no

**In response to question 1.6 which was concerned with whether participants were actively involved in research and if so to what extent:**

- all 15 participants were actively involved in research
- 12 out of 15 participants were actively involved in research on a full time basis
- 3 out of 15 participants were actively involved in research on a part time basis
- 10 out of 15 participants were actively involved in research as students
- 5 out of 15 participants were actively involved in research as staff
- 7 out of 15 participants were actively involved in research on an MA/MSc programme
- 6 out of 15 subjects were actively involved in research on an PhD programme
- 2 out of 15 participants were actively involved in research on an other research programme



Finally, in terms of the participants' computer literacy (question 1.7):

- 7 out of 15 indicated average computer literacy
- 4 out of 15 indicated higher than average computer literacy
- 4 out of 15 indicated very high computer literacy

The results presented above, indicate that the participants of the evaluation exercise were all actively involved in research activities either on an MA/MSc, PHD or other research programme and nearly always conducted a search for available information related to their investigation as part of their research. In addition to this, most of the participants used the WWW for searching for information relevant to their research and they were average or above in terms of their computer literacy. Finally, findings in relation to the participants' gender, age and nationality indicate a normal distribution flow. To this extent, the participants chosen were considered valid for the purpose of this evaluation exercise.

#### 6.4.2.1.2 Participants' Response in relation to the Tasks

The main results from these exercises are shown in the following tables and are based on the 15 participants responses. Based on the numerical assigned values, the score for all the responses can be as high as '30' or as low as '-30'. The closer to the highest numerical value of '30' the greater the tendency for satisfaction with the particular item, a value close to '0' indicates a balance and the closer to the lowest numerical value of '-30' the greater the tendency for dissatisfaction with the particular item.

Based on these principles, the following tables (6.6 - 6.39) show the degree of satisfaction or dissatisfaction with the prototype in terms of its functionality, usability and efficient operational order.

#### 6.4.2.1.3 Participants' Response in relation to the Search Task - Section 2

Tables 6.6 to 6.12 show the results relating to the task of searching for completed / current design research work and these are based on questions 2 - 7 of section 2.

Table 6.6 shows the degree of the satisfaction or dissatisfaction with the prototype in relation to the searching task. These results are from question 2:



Q2. Reactions in relation to Searching:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
terrible / wonderful	-	-	1	10	4	18
frustrating / satisfying	-	-	-	7	8	23
dull / stimulating	-	-	4	7	4	15
difficult / easy	-	-	-	4	11	26
rigid / flexible	-	1	1	6	7	19
<b>Overall Score</b>						<b>101</b>

table 6.6: User Group based Formative Evaluation Exercise in relation to the Searching (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 75$ )

The score of 101 out of a possible 150 indicates that overall participants were more than 'satisfied' with the search task. In relation to the individual criteria, participants reactions indicated that they felt searching was generally easy, satisfying, flexible, wonderful and stimulating. The next question concerned the prototype's screen layout in relation to the search task and table 6.7 shows the degree of the satisfaction or dissatisfaction with this item. These results are from question 3:

Q3. Screen Layout in relation to Searching:	Numerical Assigned Values					Total Score	
	-2	-1	0	1	2		
Characters on screen	hard to read / easy to read	-	1	2	5	7	18
Graphics on screen	unhelpful / helpful	-	1	4	4	6	15
Arrangement of information	illogical / logical	-	-	1	9	5	19
Amount of information	inadequate / adequate	-	-	2	9	4	17
Screen Layout	unhelpful / helpful	-	1	1	6	7	19
Colour scheme	frustrating / satisfying	-	1	2	7	5	16
Screen navigation	confusing / clear	-	1	5	1	8	16
<b>Overall Score</b>							<b>120</b>

table 6.7: User Group based Formative Evaluation Exercise in relation the Searching System Screen Layout (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 105$ )

The score of 120 out of a possible 210 indicates that participants were more than 'satisfied' with the screen layout of the search task. The individual total scores, participants indicate that the arrangement of information was logical, the layout helpful, the characters easy to read, the amount of information adequate, the colour scheme satisfying, the screen navigation clear and the graphics on screen helpful. The next question concerned the prototype's terminology as used for the search task and table 6.8 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 4:



Q4. Terminology in relation to Searching:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Search requirement	unrelated / related	-	-	2	9	4	17
Meaning of messages	confusing / clear	-	-	3	6	6	18
<b>Overall Score</b>							<b>35</b>

table 6.8: User Group based Formative Evaluation Exercise in relation to the Terminology Used in Searching (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The score of 35 out of a possible 60 indicates that participants were more than 'satisfied' with the terminology used to search for completed / current design research work. In particular, participants felt that the meaning of messages was clear and the terminology was related to their search requirements. The next question concerned the prototype's functionality in relation to searching and table 6.9 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 5:

Q5. Functionality in relation to Searching:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Filling the Search Form	difficult / easy	-	-	1	7	7	21
Relevance of Search Criteria with those Retrieved	unrelated / related	-	-	1	6	8	22
<b>Overall Score</b>							<b>43</b>

table 6.9: User Group based Formative Evaluation Exercise in relation to the Search Functionality (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The score of 43 out of a possible 60 indicates that participants were more than 'satisfied' with the functionality provided by the search facility. In particular, participants felt that the search system was suitable for their purposes and that filling the search form was easy. The next question was concerned with the prototype's speed in searching and table 6.10 shows the degree of the satisfaction or dissatisfaction with this item. These results are from question 6:

Q6. Speed in relation to Searching:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
	Too Slow / Fast Enough	-	-	-	4	11	26

table 6.10: User Group based Formative Evaluation Exercise in relation to Searching Speed (halfway marks= $\pm 15$ )

The score of 26 out of a possible 30 indicates that participants were 'very satisfied' with the search speed. In terms of error messages related to the searching task, table 6.11



shows the degree of satisfaction or dissatisfaction with this item. These results are from question 7:

Q7. Error Messages in relation to Searching:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Experience of Error Messages always / never	-	-	1	1	13	27
If Error Messages, were unhelpful / helpful	-	-	-	2	-	2

table 6.11: User Group based Formative Evaluation Exercise in relation to Search Errors (halfway marks= $\pm 15$ )

This result indicates that 13 out of 15 participants never experienced errors using the search facility of the prototype. The 2 participants that experienced problems with the search task found the subsequent error messages helpful.

In conclusion looking at the search task overall (section2), the score of 352 (sum of the scores as seen on tables 6.6 - 6.11, excluding the last item of the table 6.11) out of 540 (the highest that can be achieved from the 18 individual items, excluding the last item of the table 6.11) indicates that participants were more than 'satisfied' overall with the search task in terms of the functionality, usability and operational order of the prototype since the 352 score is above the halfway mark (270). This is shown in table 6.12:

Section 2, The Search Task Overall:	Score	as seen on table
Q2 Reactions	101	6.6
Q3 Screen Layout	120	6.7
Q4 Terminology	35	6.8
Q5 Functionality	43	6.9
Q6 Speed	26	6.10
Q7 Error Messages	27	6.11
<b>Overall Score</b>	<b>352</b>	

table 6.12: User Group based Formative Evaluation Exercise in relation to the Search Task Overall (halfway marks= $\pm 270$ )

#### 6.4.2.1.4 Participants' Response in relation to the Contribution Task - Section 4

The next task concerned the prototype's functionality, usability and operational order when contributing completed / current design research work. Tables 6.13 to 6.19 show these results from questions 2 - 7 of section 4. Table 6.13 shows the degree of satisfaction or dissatisfaction with the prototype for the contribution task. These results are from question 2:



Q2. Reactions in relation to Contributing:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
terrible / wonderful	-	-	1	11	3	17
frustrating / satisfying	-	-	1	8	6	20
dull / stimulating	-	-	4	8	3	14
difficult / easy	-	1	3	2	9	19
rigid / flexible	-	1	3	3	8	18
<b>Overall Score</b>						<b>88</b>

table 6.13: User Group based Formative Evaluation Exercise in relation to the Contributing Reactions (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 75$ )

The score of 88 out of a possible 150 indicates that the participants were more than 'satisfied' with the contribution facility. In relation to the individual total scores, participants reactions indicated the contribution task was more than satisfying, easy, flexible and wonderful. They also indicated the contribution task was stimulating. The next question concerned the prototype's screen layout for the contribution task and table 6.14 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 3:

Q3. Screen Layout in relation to Contributing:	Numerical Assigned Values					Total Score	
	-2	-1	0	1	2		
Characters on screen	hard to read / easy to read	-	-	1	7	7	21
Graphics on screen	unhelpful / helpful	-	-	4	6	5	16
Arrangement of information	illogical / logical	1	-	1	8	5	16
Amount of information	inadequate / adequate	-	-	1	8	6	20
Screen Layout	unhelpful / helpful	-	1	2	5	7	18
Colour scheme	frustrating / satisfying	-	-	4	4	7	18
Screen navigation	confusing / clear	-	2	2	2	9	18
<b>Overall Score</b>							<b>127</b>

table 6.14: User Group based Formative Evaluation Exercise in relation to the Contribution Screen Layout (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 105$ )

The score of 127 out of a possible 210 maximum score indicates that participants were more than 'satisfied' overall with the screen layout of the contribution facility. The individual total scores should that participants mostly felt the characters were easy to read, the amount of information was adequate, the layout was helpful, the colour scheme was satisfying, the screen navigation was clear, the graphics on screen were helpful and finally, the arrangement of information was logical. The next question concerned the prototype's terminology used for contribution and table 6.15 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 4:



Q4. Terminology in relation to Contributing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Contribution requirement	unrelated / related	-	1	3	3	8	18
Meaning of messages	confusing / clear	-	-	4	5	6	17
<b>Overall Score</b>							<b>35</b>

table 6.15: User Group based Formative Evaluation Exercise in relation to the Terminology Used in Contribution (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The score of 35 out of a possible 60 maximum score indicates that participants were more than 'satisfied' with the terminology used for contribution. In particular, participants felt that the terminology related to their contribution requirements and that the meaning of messages was clear. The next question concerned the prototype's functionality in relation to the contribution task and table 6.16 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 5:

Q5. Functionality in relation to Contributing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Filling the Contribution Form	difficult / easy	-	-	2	4	9	22
Relevance of Contribution	unrelated / related	-	-	1	3	11	25
<b>Overall Score</b>							<b>47</b>

table 6.16: User Group based Formative Evaluation Exercise in relation to the Contribution Functionality (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The score of 47 out of a possible 60 maximum score indicates that participants were 'very satisfied' overall with the contribution tasks's functionality. In particular, participants felt that contribution was related to their purposes and that form filling was easy. The next question concerned the prototype's speed when contributing. Table 6.17 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 6:

Q6. Speed in relation to Contributing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Too Slow / Fast Enough		-	-	1	3	11	25

table 6.17: User Group based Formative Evaluation Exercise in relation to the Contribution Speed (halfway marks= $\pm 15$ )

The score of 25 out of a possible maximum 30 indicates that participants were 'very satisfied' with the search speed. The next question concerned error messages related to the contribution task. Table 6.18 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 7:



Q7. Error Messages in relation to Contributing:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Experience of Error Messages always / never	-	-	1	2	12	26
If Error Messages, were unhelpful / helpful	-	2	-	1	-	-1

table 6.18: User Group based Formative Evaluation Exercise in relation to the Contribution Errors (halfway marks= $\pm 15$ )

These results indicate that 12 out of 15 participants never experienced errors with the contribution task and that 2 out of the 3 participants who experienced problems with the contribution task did not find the provided messages helpful enough.

In conclusion looking at the contribution task overall (section 4), the score of 348 (sum as seen on tables tables 6.13 - 6.18, excluding the last item of table 6.18) out of 540 (the highest that can be achieved from the 18 individual items, excluding the last item of the table 6.18) indicate that participants were more than 'satisfied' overall with the contribution task in terms of the functionality, usability and operational order of the prototype since the 348 score is above the halfway mark (270). This is shown in table 6.19:

Section 4, The Contribution Task Overall:	Score	as seen on table
Q2 Reactions	88	6.13
Q3 Screen Layout	127	6.14
Q4 Terminology	35	6.15
Q5 Functionality	47	6.16
Q6 Speed	25	6.17
Q7 Error Messages	26	6.18
<b>Overall Score</b>	<b>348</b>	

table 6.19: User Group based Formative Evaluation Exercise in relation to the Contribution Task Overall (halfway marks= $\pm 270$ )

#### 6.4.2.1.5 Participants' Response in relation to the Subscription Task - Section 5

The next task concerned the prototype's functionality, usability and operational order in relation to subscribing to subsequent research in a particular field of interest. Tables 6.20 to 6.26 show the results from questions 2 - 7 of section 5.

The table 6.20 shows the degree of satisfaction or dissatisfaction with the prototype in relation to the subscription to updates task. These results are from question 2:



Q2. Reactions in relation to Subscribing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
	terrible / wonderful	-	-	-	9	6	21
	frustrating / satisfying	-	-	-	6	9	24
	dull / stimulating	-	-	3	7	5	17
	difficult / easy	-	-	-	5	10	25
	rigid / flexible	-	-	2	6	7	20
<b>Overall Score</b>							<b>107</b>

table 6.20: User Group based Formative Evaluation Exercise in relation to the Subscription of Updates Reactions (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 75$ )

The score of 107 out of a possible 150 indicates that participants were more than 'satisfied' overall with the subscription task. The individual scores show that participants felt that the subscription task was satisfying, easy, wonderful, flexible and stimulating. The next question concerned the prototype's screen layout for the subscription to updates facility and table 6.21 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 3:

Q3. Screen Layout in relation to Subscribing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Characters on screen	hard to read / easy to read	-	-	1	8	6	20
Graphics on screen	unhelpful / helpful	-	-	4	5	6	17
Arrangement of information	illogical / logical	-	-	2	4	9	23
Amount of information	inadequate / adequate	-	-	2	6	7	20
Screen Layout	unhelpful / helpful	-	-	3	7	5	17
Colour scheme	frustrating / satisfying	-	-	3	7	5	17
Screen navigation	confusing / clear	-	1	1	7	6	18
<b>Overall Score</b>							<b>132</b>

table 6.21: User Group based Formative Evaluation Exercise in relation to the Subscription Screen Layout (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 105$ )

The score of 132 out of a possible 210 indicates that participants were more than 'satisfied' overall with the screen layout of the subscription to updates task. The individual scores indicate participants felt the arrangement of information was logical, the characters were easy to read, the amount of information was adequate, the screen navigation was clear, the layout was helpful, the colour scheme was satisfying and the graphics were helpful. The next question concerned the prototype's use of terminology for the subscription to updates task. Table 6.22 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 4:



Q4. Terminology in relation to Subscribing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Subscription requirement	unrelated / related	-	-	-	6	9	24
Meaning of Messages	confusing / clear	-	-	1	5	9	23
<b>Overall Score</b>							<b>47</b>

table 6.22: User Group based Formative Evaluation Exercise in relation to the Terminology Used in Subscription (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The total of 47 out of a possible 60 maximum score indicates that participants were 'very satisfied' overall in relation to the terminology used for the subscription to updates task. In particular, participants felt the terminology in relation to subscribing to updates related to their requirements and the meaning of messages which appeared on the screen was clear. The next question concerned the prototype's functionality in relation to the subscription to updates task and table 6.23 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 5:

Q5. Functionality in relation to Subscribing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Filling the Subscription Form							
	difficult / easy	-	-	-	3	12	27
Relevance of Subscribed Criteria with those Retrieved							
	unrelated / related	-	-	1	3	11	25
<b>Overall Score</b>							<b>52</b>

table 6.23: User Group based Formative Evaluation Exercise in relation to the Subscription Functionality (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The score of 52 out of a possible 60 maximum score indicates that participants were 'very satisfied' overall in relation to the functionality of the subscription to updates task. In particular, participants felt it was related to their purposes and that filling in the form was easy. The next question concerned the prototype's speed in relation to the subscription to updates task and table 6.24 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 6:

Q6. Speed in relation to Subscribing:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
	Too Slow / Fast Enough	-	-	1	3	11	25

table 6.24: User Group based Formative Evaluation Exercise in relation to the Subscription of Updates Speed (halfway marks= $\pm 15$ )



The score of 25 out of a possible 30 maximum score indicates that participants were 'very satisfied' with the speed of the subscription to updates task. The next question concerned the prototype's error messages in relation to the subscription to updates task. Table 6.25 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 7:

Q7. Error Messages in relation to Contributing:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Experience of Error Messages always / never	-	-	1	-	14	28
If Error Messages, were unhelpful / helpful	-	-	1	-	-	0

table 6.25: User Group based Formative Evaluation Exercise in relation to the Subscription Errors (halfway marks= $\pm 15$ )

This result indicate that 14 out of 15 participants did not experience any errors with the subscription task. The 1 participant that did experience a problem with the subscription task did not find the subsequent message either helpful or unhelpful.

In conclusion regarding the subscription to updates task overall (section5), the score of 419 (sum of the scores as seen on tables tables 6.20 - 6.25, excluding the last item of the table 6.25) out of a maximum 540 (the highest that can be achieved from the 18 individual items, excluding the last item of the table 6.25) indicates that overall participants were more than 'satisfied' with the subscription to updates tasks's functionality, usability and operational order of this prototype since the 419 score is above the halfway mark (270). This is shown in table 6.26:

Section 5, The Subscription Task Overall:	Score	as seen on table
Q2 Reactions	107	6.20
Q3 Screen Layout	132	6.21
Q4 Terminology	47	6.22
Q5 Functionality	52	6.23
Q6 Speed	25	6.24
Q7 Error Messages	28	6.25
<b>Overall Score</b>	<b>419</b>	

table 6.26: User Group based Formative Evaluation Exercise in relation to the Subscription Task Overall (halfway marks= $\pm 270$ )

#### 6.4.2.1.6 Participants' Response in relation to the Communicating with each other Task - Section 6

The next task concerned the prototype's functionality, usability and operational order in relation to the two-way communication task. Tables 6.27 to 6.31 show results from



questions 2 - 5 of section 6. Table 6.27 shows the degree of satisfaction or dissatisfaction with the prototype in relation to communication. These results are from question 2:

Q2. Reactions in relation to Communicating:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
terrible / wonderful	-	-	1	7	7	21
frustrating / satisfying	-	-	2	4	9	22
dull / stimulating	-	-	1	6	8	22
difficult / easy	-	-	1	4	10	24
rigid / flexible	-	-	3	2	10	22
<b>Overall Score</b>						<b>111</b>

table 6.27: User Group based Formative Evaluation Exercise in relation to the Two-Way Communication Reactions (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 75$ )

The score of 111 out of a possible 150 maximum score indicates that participants were more than 'satisfied' overall to the two-way communication task. In relation to the individual scores, participants found that communication was easy, satisfying, flexible, stimulating and wonderful. The next question concerned the prototype's functionality in relation to the communication task. Table 6.28 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 3:

Q3. Functionality in relation to Communicating:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Communicating with others difficult / easy	-	-	-	2	13	28

table 6.28: User Group based Formative Evaluation Exercise in relation to the Two-Way Communication Functionality (halfway marks= $\pm 15$ )

The score of 28 out of a possible 30 indicates that participants were 'very satisfied' overall with the functionality of the two-way communication task and felt that communicating with each other was easy. The next question was concerned with the prototype's speed in relation to the two-way communication task. Table 6.29 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 4:

Q4. Speed in relation to Communicating:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Too Slow / Fast Enough	-	-	1	3	11	25

table 6.29: User Group based Formative Evaluation Exercise in relation to the Two-Way Communication Speed (individual halfway marks= $\pm 15$ )



The score of 25 out of a possible maximum of 30 indicates that participants were 'very satisfied' with the speed of communicating with each other. The next question concerned the prototype's error messages in relation to two-way communication. Table 6.30 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 5:

Q5. Error Messages in relation to Contributing:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Experience of Error Messages always / never	-	-	-	1	14	29
If Error Messages, were unhelpful / helpful	-	-	1	-	-	1

table 6.30: User Group based Formative Evaluation Exercise in relation to the Two-Way Communication Errors (halfway marks= $\pm 15$ )

The results indicate that 14 out of 15 participants never experienced errors in relation to the two-way communication task. The one participant who experienced problems with the communication task did not find the subsequent message either helpful or unhelpful.

In conclusion, to the task of communicating with each other the overall (section 6) score of 193 (sum of the scores as seen on tables tables 6.27 - 6.30, excluding the last item of the table 6.30) out of 240 (the highest that can be achieved from the 8 individual items, excluding the last item of the table 6.30) indicates that overall participants were more than 'satisfied' in terms of the functionality, usability and operational order of this prototype. This is shown in the table 6.31:

Section 6, The Two-Way Communication Task Overall:	Score	as seen on table
Q2 Reactions	111	6.27
Q3 Functionality	28	6.28
Q4 Speed	25	6.29
Q5 Error Messages	29	6.30
<b>Overall Score</b>	<b>193</b>	

table 6.31: User Group based Formative Evaluation Exercise in relation to the two-way Communication Task Overall (halfway marks= $\pm 120$ )

#### 6.4.2.1.7 Participants' Response in relation to the Navigation throughout the System Task - Section 7

The next exercise concerned the prototype's functionality, usability and operational order when navigating through the system. Tables 6.32 to 6.38 show the results from questions 2 - 7 of section 7. Table 6.32 shows the degree of the satisfaction or dissatisfaction with the prototype's navigation task. These results are from question 2:



Q2. Reactions in relation to Navigating the System:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
terrible / wonderful	-	-	4	9	2	13
frustrating / satisfying	-	1	2	6	6	17
dull / stimulating	-	1	2	9	3	14
difficult / easy	-	1	2	3	9	20
rigid / flexible	-	-	4	4	7	18
<b>Overall Score</b>						<b>82</b>

table 6.32: User Group based Formative Evaluation Exercise in relation to the System's Navigation Reactions (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 75$ )

In general the score of 82 out of a possible maximum of 150 indicates that overall participants were more than 'satisfied' with the navigation throughout the system. In relation to the individual scores, participants found navigation easy, flexible and satisfying. To a lesser extent some participants felt that navigation was stimulating and wonderful. The next question concerned the prototype's screen layout for navigating the system. Table 6.33 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 3:

Q3. Screen Layout of Navigation:	Numerical Assigned Values					Total Score	
	-2	-1	0	1	2		
Characters on screen	hard to read / easy to read	-	-	1	7	7	21
Graphics on screen	unhelpful / helpful	-	1	2	6	6	17
Arrangement of information	illogical / logical	-	-	1	4	10	24
Amount of information	inadequate / adequate	-	-	-	9	6	21
Screen Layout	unhelpful / helpful	-	1	3	6	5	15
Colour scheme	frustrating / satisfying	-	1	3	6	5	15
Screen navigation	confusing / clear	-	3	2	2	8	15
<b>Overall Score</b>							<b>128</b>

table 6.33: User Group based Formative Evaluation Exercise in relation to the System's Screen Layout (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 105$ )

The score of 128 out of a possible 210 maximum score indicates that participants were more than 'satisfied' overall with the screen layout of the navigation task. For the individual scores, participants felt in particular the arrangement of information was logical, the characters were easy to read, the amount of information was adequate, the graphics were helpful, the screen navigation was clear, the layout was helpful and the colour scheme was satisfying. The next question concerned the prototype's terminology used in navigating the system. Table 6.34 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 4:



Q4. Terminology in relation Navigation:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Navigation requirement	unrelated / related	-	-	1	10	4	18
Meaning of messages	confusing / clear	-	-	1	9	5	19
<b>Overall Score</b>							<b>37</b>

table 6.34: User Group based Formative Evaluation Exercise in relation to the Terminology Used throughout the System (individual halfway marks= $\pm 15$ , overall halfway mark= $\pm 30$ )

The score of 37 out of a possible 60 maximum score indicates that participants were more than 'satisfied' overall with the terminology used for navigating through the system. In particular, participants felt the messages were clear and the terminology for the navigation requirements was related. The next question concerned the prototype's functionality when navigating the system. Table 6.35 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 5:

Q5. Functionality in relation to Navigation:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Relevance of links	unrelated / related	-	-	1	5	9	23

table 6.35: User Group based Formative Evaluation Exercise in relation to the System's Functionality (halfway marks= $\pm 15$ )

The score of 23 out of a possible 30 maximum score indicates that participants were more than 'satisfied' with the functionality of the navigation task and in particular participants felt that links were related to their navigation purpose. In terms of the prototype's speed when navigating the system table 6.36 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 6:

Q6. Speed in relation to Navigation:		Numerical Assigned Values					Total Score
		-2	-1	0	1	2	
Too Slow / Fast Enough		-	-	-	4	11	26

table 6.36: User Group based Formative Evaluation Exercise in relation to the System's Speed (halfway marks= $\pm 15$ )

The score of 26 out of a possible maximum 30 indicates that participants were 'very satisfied' with the navigation speed. The next question concerned the prototype's error messages relating to navigating the system. Table 6.37 shows the degree of satisfaction or dissatisfaction with this item. These results are from question 7:



Q7. Error Messages in relation to Navigation:	Numerical Assigned Values					Total Score
	-2	-1	0	1	2	
Experience of Error Messages always / never	-	-	2	2	11	24
If Error Messages, were unhelpful / helpful	-	-	1	3	-	3

**table 6.37: User Group based Formative Evaluation Exercise in relation to the Navigation Errors (halfway marks= $\pm 15$ )**

This result indicate that 11 out of 15 participants never experienced errors in relation to navigating the system. The 4 participants who experienced problems with navigating the system did find the subsequent message helpful.

In conclusion to the navigating the system task (section 7), the score of 310 (sum of the scores as seen on tables tables 6.32 - 6.37, excluding the last item of the table 6.37) out of 510 (the highest that can be achieved from the 17 individual items, excluding the last item of the table 6.37) indicate that participants were generally more than 'satisfied' with the functionality, usability and operational order of navigation for this prototype since the 310 score is above the halfway mark (255). This is shown in table 6.38:

Section 7, Navigating the System Overall:	Score	as seen on table
Q2 Reactions	82	6.32
Q3 Screen Layout	128	6.33
Q4 Terminology	27	6.34
Q5 Functionality	23	6.35
Q6 Speed	26	6.36
Q7 Error Messages	24	6.37
<b>Overall Score</b>	<b>310</b>	

**table 6.38: User Group based Formative Evaluation Exercise in relation to the Navigation Task Overall (halfway marks= $\pm 255$ )**

Based on the analyses presented on the sections 6.4.2.1.1 - 6.4.2.1.7, the following section will demonstrate the overall satisfaction with the functionality, usability and operational order of the prototype in relation to the tasks of the theoretical model.

#### 6.4.2.1.8 Prototype's Overall Functionality, Usability and Operational Order

The cumulative results from the tables 6.12, 6.19, 6.26, 6.31, and 6.38 concerned with the overall score of each task are shown in table 6.39:



**Overall Prototype's Functionality, Usability and Operational Order:**

	<b>Score</b>	<b>as seen on</b>	<b>Halfway</b>	<b>Highest</b>
		<b>table</b>	<b>Mark</b>	
Search Task	352	6.12	270	540
Contribution Task	348	6.19	270	540
Subscription of Updates Task	419	6.26	270	540
Communicating with Each Other Task	193	6.31	120	240
Navigation Throughout the System	310	6.38	255	510
<b>Overall Score</b>	<b>1622</b>		<b>1185</b>	<b>2370</b>

**table 6.39: User Group based Formative Evaluation Exercise in relation to the Tasks Overall (halfway marks=+/-1185)**

In conclusion, the overall score of 1622 out of a possible 2370 maximum score (the highest value that can be achieved by summing up all scores) indicates that participants were more than 'satisfied' overall with the functionality, usability and operational order of the prototype and therefore, this prototype does not adversely affects a user's productivity in relation to the tasks employed in this evaluation exercise. The next section will present all the comments and suggestions made by the participants during the user group formative evaluation exercise.

#### **6.4.2.1.9 Participants' Comments and Suggestions**

In relation to the search task, the following comments and suggestions made:

The 'find all records' button is confusing (one participant).

The position of the 'Record ID' field made the participant feel he must enter a value.

He suggested moving this field to the bottom of the search screen (one participant).

In the search screen 'name' could be replaced with 'author' as the participant argued that this is the current terminology (one participant).

The same participant found the 'title' field did not work.

The 'and/or' boolean logic buttons are not clear enough and should be more prominent to alter users' system to work with them (two participants).

Finally, one participant found the task fast and easy way of searching information needed.

In relation to the contribution task, the following comments and suggestions made:

Layout of contribution form could have been more flowing (one participant).

Multiselection in the field of 'subject of research' could be included (one participant).

Compulsory fields in the contribution form should be marked (one participant).

Finally, the last participant found the flexibility of contribution was very good.



In relation to the subscription of updates task, the following comments made:

The 'and/or' buttons could be included in the subscription form (one participant).

Finally, one participant found this task convenient, easy and fast way of doing research.

In relation to the communicating with each other task, the following comments made:

More methods of contacting people could be included such as icq (one participant).

In the communicating with others search form, the option of retrieving others' details such as publications could be helpful in choosing the right people (one participant).

One participant found the ability to communicate with the author of published work very good.

Finally, another participant found search for others was very flexible and easy to complete.

In relation to the navigating throughout the prototype, the following comments made:

The navigation and interactivity could be improved (one participant).

A back button could be included on all screens (one participant).

Functions could be separated by a different colour to attract and help user to recognise them quickly (one participant).

One of the participants found the choice of words slightly strange in the evaluation questionnaire.

In the contribution and search screens the ability to identify names of referees could validate work (one participant).

Finally, the same participant found the prototype for the purpose of this test adequate.

Overall, the following comments made:

- The prototype is ok for the functionality aspect. Improve style.
- Superb functionality and new ideas but a lack of usability concerns for users.
- For a first time user it would be a bit difficult to navigate, but after getting used to it, it is quite ok to work with it.
- Overall the system's strength lies on the aspect of contribution and most of all the information push. This aspect is a unique feature of nereid and is an attribute which makes nereid different from all the existing systems ie. ASLIB, CRIB, OPAC, ARIAD.
- Good system. Very flexible compared to commercial systems used in my current work.
- I enjoyed using the system. I found it easy to use and a fast way to obtain information needed.
- Could be a very useful and time saving device in particular with reference to the current interlibrary loan system and possible frustration when surfing the net.
- The system of retrieving and submitting information works well, and overall would appear to be a worthwhile and usable interactive method of communicating past and present research electronically.
- Concept is sound and feasible.



- Excellent prototype model. Works without any flaws. Author has a thorough grasp of his work and methodology used.
- Overall the system has a lot of potential to store valuable research with the ability to locate and access it very quickly - looks good!

Based on these comments and suggestions the following modifications were made:

- The 'Record ID' field in the search screen was separated from the rest of the form
- The 'Find all records' field in the search screen was removed
- In the search screen 'name' was replaced with 'author'
- In the search screen the 'title' field was checked for its function
- In the search screen the size of the 'and/or' boolean logic buttons were increased

Other suggestions that were made by the participants were not implemented since they were not considered to adversely affect the primary evaluation exercise of this research. It is argued for instance that separating functions of the prototype with different colours does not seriously affect the usability of the various tasks which are a manifestation of the theoretical model. In addition to this, provision of back buttons on all screens was not considered feasible since it was not possible to add links to the FTP transactions.

#### 6.4.2.1.10 Final Conclusion in relation to the User Group Formative Evaluation Exercise

These results (as described on the sections 6.4.2.1.1 - 6.4.2.1.9) indicate that in general participants found the prototype to have no major functional or usability problems and it is therefore a suitable vehicle for the primary evaluation exercise of the theoretical model. The following sections will now describe the check lists exercises which will provide additional justification whether or not this final prototype supports all the aspects indicated by the theoretical model. It will therefore justify whether it is an accurate manifestation of the theoretical model suitable for the primary evaluation exercise to assess its validity.

#### ***6.4.3 Check List Features and Comparison with other Similar Systems Formative Evaluation (Secondary Exercise 3)***

This examination concerns two objectives in relation to the prototype:

- whether or not the prototype can serve as the manifestation of the theoretical model
- how the prototype' functions compare to other similar systems



### 6.4.1.1 Justification of Prototype as a Manifestation of the Theoretical Model

This section will attempt to justify and ensure that this final prototype based on the specification framework formulated in Chapter 5 and the secondary exercises described earlier can serve as the manifestation of the theoretical model formulated in Chapter 4.

In order to do that, there is a need to ensure that all aspects supported in the theoretical model are available using this prototype. A list consisting of these aspects, as well as, the functions, activities, features and abilities supported in the theoretical model can be placed in a table and used to check whether or not this prototype performs all of them. Based on these principles, the following figure 6.7 illustrates this feature check list for the final nereid prototype:

-----On-line-----							
Communication based on Completed / Current Design Research	Contribution	Assessment	Search	Retrieval of Text	Image	Subscription of Updates	2-way Communication (criticism & feedback)
✓	✓	✓•	✓	✓	✓	✓	✓

fig. 6.7: Feature Check List of Final nereid Prototype in relation to the Theoretical Model

The '✓•' symbol indicates that although this aspect is addressed in the theoretical model, it was not implemented in the prototype. This is because this aspect of assessing the submitted completed / current design research results was found not to be a priority for implementation after the results of the one-to-one structured interviews with the five experts in the field (section 5.3.5.2). In addition to this, in order to assess the validity of this aspect of the theoretical model it would require referees to be available, to affirm their willingness to be available for assessment of submitted completed / current design research results and actually to perform assessment during the primary evaluation. As this was not considered feasible the author decided that in order to perform the primary evaluation the final prototype would have to simulate this aspect of the theoretical model and this will be discussed in the primary evaluation section (6.5). The check list features table above, clearly shows that all the other aspects supported in the theoretical model are fully implemented in this working version of the prototype and therefore, it is argued that this prototype can serve as the manifestation of the theoretical model.



### 6.4.1.2 Comparison of the Prototype compared with other Similar Systems

Although there is no evidence yet that this prototype and therefore the theoretical model will provide a more effective and efficient means of communication between design researchers, the aim of this exercise is to demonstrate that there is no other current single system that has all the aspects supported by the theoretical model. In particular, although this has already been demonstrated partially in the examination of whether activities of the conceptual model (sections 4.3.3.1 and 4.3.3.2) exist in the real world, this exercise will further demonstrate that the functions of the prototype which are based on the aspects of the theoretical model do not exist in any other current system.

In order to do this, a number of systems currently used by design researchers can be placed in a check list table derived from the aspects of the theoretical model and their functions compared with those provided in the prototype. These systems are based on the primary research findings discussed in Chapter 4 and in particular on the section 4.3.3 that is concerns a comparison of the conceptual model with perceived reality. These systems are as follows:

- OPACs
- CD ROMs
- Mailbase
- FTP
- Telnet
- E-Mail
- Newsgroups
- WWW

In addition to this, both the CD ROM and WWW versions of the Allison Research Index of Art and Design (ARIAD) that represents the only U.K. national database related to design research were added to that list. This is because, ARIAD has been found to be the closest system in relation to the aim of this research (4.3.3.1). Based on these principles, the following figure 6.8 illustrates this feature check list comparison of the final prototype of nereid with the systems mentioned:

	OPAC	Telnet	CD ROM	E-mail	Mailbase	Newsgroups	FTP	WWW	ARIAD CD	ARIAD WWW	nereid
Communication of Completed Design Research	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Current Design Research	✗	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓
On-line Contribution	✗	✗	✗	✓	✓	✓	✓	✓	✗	✓.	✓
On-line Assessment	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓.



	OPAC	Telnet	CD ROM	E-mail	Mailbase	Newsgroups	FTP	WWW	ARIAD CD	ARIAD WWW	nercid
On-line Search	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓
On-line retrieval of:											
text	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓
image	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓
On-line Subscription of Updates	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✓
2-way Communication (criticism & feedback)	✗	✗	✗	✓	✓	✓	✓	✓	✗	✗	✓

fig. 6.8: Feature Check List Compared with other Similar Systems Currently used

Although there is the capability of communicating completed and current design research using the above systems, to the best of the author's knowledge there are no findings to support the idea that there are systems utilising this ability (excluding the proposed nereid). The '✓' symbol in relation to the ARIAD WWW version indicates that on-line contribution was scheduled for June 2000, however as of August 2000 this function still does not work (for more information see section 7.2 - Chapter 7 concerning the current situation within the design research discipline). The same symbol in relation to the nereid prototype indicates that this function was not implemented for reasons explained earlier and in particular in sections 5.3.5.2 and 6.4.1.1. In relation to the check list feature table illustrated above, the results indicate that no other single system currently used by design researchers for the communication of completed / current design research results incorporates all functions supported and performed in the nereid prototype based on the theoretical model.

As already mentioned the group tests show the final prototype has no usability problems while the check lists table demonstrate that this prototype is an accurate manifestation of the theoretical model and thus a suitable vehicle for testing the model's validity. The next section describes the exercises that will be used to assess the validity of the underlying theoretical model using this prototype.

### 6.5 One-to-One Expert Summative Evaluation Review as a Primary Exercise (involved key numbers: 1, 17 and 18)

The aim of this exercise was to assess whether the proposed theoretical model meets the



aim of this research and therefore, to validate whether this model provides a more effective and efficient means for communicating design research results between design researchers. In order to achieve such validation, the following method of acquiring feedback from experts in the field was employed:

- one-to-one authoritative evaluation review with five experts in design research issues employed to assess the validity of the theoretical model in terms of its effectiveness and efficiency

The following paragraph presents the theoretical model as a reminder to the reader:

- An on-line WWW based communication and information system owned, managed and operated by design researchers in which, they should be able to act, react and / or interact, and communicate with each other their completed / current design research results with speed. In particular, a system in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The system should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search system (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the system should further allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results (*as seen on page 128 of this thesis*)

Based on this theoretical model, the following figure 6.9 summarises the criteria already determined in section 4.3.3.7 which will be used to validate the theoretical model:

<b>EFFECTIVENESS</b>				
<b>Availability of</b>	<b>Accuracy of</b>	<b>Relevance of</b>	<b>Quality of</b>	<b>Convenience of</b>
<ul style="list-style-type: none"> <li>• what research has been done</li> <li>• what research is currently going on</li> <li>• what work is done subsequently</li> <li>• communication with each other</li> </ul>				
<b>EFFICIENCY</b>				
<b>Speed of</b>				
<ul style="list-style-type: none"> <li>• communicating what research has been done</li> <li>• communicating what research is currently ongoing</li> <li>• communicating what work has been done subsequently</li> <li>• communicating with each other</li> </ul>				

fig. 6.9: The Criteria with which the Theoretical Model will be Validated



As the aspect of assessing submitted material was not considered feasible (section 6.4.1.1) the author decided that in order to perform the primary evaluation it was necessary to simulate this aspect of the theoretical model. The process by which this aspect of the theoretical model would take place in the real world was explained to the participants. However, in order to not adversely affect the primary evaluation testing, completed MA / MSc / MPhils / PhDs work was used as they are considered to be already refereed design research work.

To conclude, this exercise will validate the aspects of the proposed theoretical model based on the assumption that design researchers will wish to share their works by evaluating the following criteria:

- the degree of satisfaction with the way completed and current design research is communicated
- the quality with which completed and current design research work is communicated
- the speed with which all the aspects of the proposed theoretical model can be achieved
- the degree to which the completed and current design research work is available and accessible
- the degree to which communication of completed and current design research work is relevant and accurate
- the degree to which design researchers are able to communicate with each other

Therefore, this exercise was designed in order to validate:

- whether the key aspects of the proposed theoretical model improve the efficiency and effectiveness as well as the speed and the degree in which communication of design research is able to take place

To achieve this validation the following were examined:

- whether the aspects of contributing, assessing, searching and subscribing to updates on-line are a more efficient as well as a quicker means of communicating completed / current design research work world-wide
- whether the aspect of assessing design research work can provide a higher quality of communication of completed / current design research work by providing improved reliability, validity and confidence in the source
- whether the aspect of communicating both the description and the completed and



current design research work itself world-wide provides a greater degree of detail, completeness and understanding of what is currently available

- whether the aspect of communicating both textual and audio-visual material relevant to completed / current design research work world-wide can provide a greater degree of detail, completeness and understanding of what is currently available
- whether the aspect of subscribing to updates world-wide can provide a greater degree of accuracy in terms of being aware what is currently available in completed / current design research work
- whether the aspect of communicating world-wide with each other can provide improved communication in terms of design research work
- whether the incorporation of all these aspects can provide more effective and efficient world-wide two-way communication overall for completed / current design research work and design researchers

Based on these criteria, the following paragraphs present the participants, the conditions as well as the instrument employed for the exercise of validating the proposed theoretical model.

### **Participants**

A Van Dalen (1979, p. 4) pointed out, "an effort must be made to find out whether the experts are recognised by other authorities in the field and whether they are in a position to know the facts about the particular problem under consideration". To achieve such credibility, the following five participants for this evaluation exercise were all either active design researchers, supervisors or examiners and experts in design research issues. They included:

Prof. N. Cross, The Open University

Dr G. Bunce, Nottingham Trent University

Dr K. Wells, De Montfort University

Mr J. Wood, Goldsmiths College (University of London)

Mr A. Robertson, De Montfort University

### **Conditions**

In order to ensure that all the participants had exactly the same treatment in relation to the exercise and to avoid adverse interference, all subjects:

- had never had experience with using and seeing the nereid prototype prior to this exercise
- were given the same structured explanations in relation all the aspects of the theoretical



model prior to the exercise

- were given the same demonstration of the prototype's abilities
- were given a demonstration using a similar specification of technical equipment (hardware and software). In particular, participants used the prototype on iMacs running at 266 Mhz with MacOS 8.x operating system and Netscape Navigator version 4.7
- experienced and evaluated the system at their own workplace
- were given the same structured questions

As also argued in the section 6.4.2, the validity of the findings from this exercise are based on the conditions described above as well as the specific tasks that participants undertook and the expertise and authority which each of these participant represented.

### **Technical Problems Encountered**

During the course of the evaluation process a technical problem was discovered that led to some restriction to the number of participants. The precise problem was a network configuration problem. In order for the prototype server to function properly it was necessary to enable both the 80 port (the default port for simple web pages) and the 591 port (a port for on-line databases). The 591 port is some times disabled in educational institutions for security reasons, but this restriction was lifted for this evaluation on the De Montfort University system. However some universities were not willing to enable this port at that time, though others maintain it in an enabled state as a matter of course. This restriction inhibited the operation of the prototype and therefore the evaluation was restricted to those participants who were able to access their 591 port. In addition to this the exact identification of the problem was problematic and it took considerable time to establish the root cause. This led to an extension of the time over which the evaluation exercise took place, and made some cancellations unavoidable.

### **Instrument and Procedure**

The following paragraphs describe these tasks and their purpose, as well as, the related questions and their numerical assigned values (where applicable):

#### **Personal Details:**

These questions were asked in order to ensure the relevance of the participants in relation to the purpose of the study and to determine the limits and the restrictions of the subsequent findings and validation:

Q1.1 When you conduct research in design, how often do you search for previous and / or



current research relevant to your area of enquiry?

Q1.2 What are the main sources used for research relevant to your enquiry?

Q1.3 Please indicate if you are actively involved in research and if so to what extent:

Q1.4 Please indicate your level of computer literacy

Following this, participants were given a demonstration of the following tasks and they were then asked to answer the corresponding questions:

### Section 1, Searching

Participants were shown the following process in order to demonstrate the speed, availability, accuracy, relevance, quality and convenience of searching and retrieving completed / current design research results using the nereid prototype (as a manifestation of the proposed theoretical model). In particular, this task examined whether the aspect of retrieving on-line design research work provided a satisfactory, effective and efficient means of communication. It also examined whether communicating part or the whole of design research work in both textual and audio-visual forms could provide a greater degree of understanding, completeness and detail of what has been done, what is going on currently and is available in the particular field of interest. This task included the following steps:

- A. Load the URL: <http://westworld.dmu.ac.uk:591/nereid/welcome.htm> (www address of prototype)
- B. Navigate through the system to the Search page
- C. Search with the following criteria: Graphics / Multimedia  
Medical  
Image, And (match logic)
- D. Check the relevance of matches
- E. Get details of the research work
- F. Get the audio-visual representation
- G. Get the whole design research work
- H. Repeat steps C - E replacing the search values with the following:  
Completed  
Management, Or (match logic)
- I. Repeat steps C - E by replacing the search values with the following:  
Completed  
Management, And (match logic)
- J. Circle / fill in the questions relating to this task, which are as follows:



**Q2. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerning the search and retrieval of on-line completed / current design research work world-wide as demonstrated by this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Finding what research has been done	-2	-1	0	1	2
Finding what research is currently going on	-2	-1	0	1	2
Speed	-2	-1	0	1	2
Clarity	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
Availability	-2	-1	0	1	2
Accuracy	-2	-1	0	1	2
Relevance	-2	-1	0	1	2
Quality	-2	-1	0	1	2
Convenience	-2	-1	0	1	2
Overall efficiency (see figure 6.9)	-2	-1	0	1	2
Overall effectiveness (see figure 6.9)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

## **Section 2, Subscription to Updates**

This task along with the steps that were undertaken in section 4 (complementary task) was intended to demonstrate to the participants the speed, availability, accuracy, relevance, quality and convenience of communicating what subsequent research is available world-wide using the nereid prototype (as a manifestation of the proposed theoretical model). In particular, this task examines whether the aspect of subscription to the update facility can provide a satisfactory, effective and efficient means of communication. This task involved the following steps:

- A. Load the URL: <http://westworld.dmu.ac.uk:591/nereid/welcome.htm>
- B. Navigate through the system to the Search page
- C. Search with the following criteria:

Current

Graphics / Multimedia

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And (match logic)

- D. Check whether there are any relevant matches
- E. Navigate through the system to the Subscription to Updates page
- F. Subscribe with the criteria entered in step C

(questions relating to this task are presented in section 4)

### Section 3, Contributing

Participants were given the following steps in order to demonstrate the speed, availability, accuracy, relevance and convenience of contributing on-line design research results world-wide using the nereid prototype (as the manifestation of the proposed theoretical model). This task examined whether this aspect of the theoretical model was a quick, easy and therefore, a satisfactory and efficient means for contributing world-wide completed / current design research work. It also examines whether it could provide a satisfactory and effective means for communication of what research has been done and what research is currently ongoing. This task involved the following steps:

- A. Load the URL: <http://westworld.dmu.ac.uk:591/nereid/welcome.htm>
- B. Navigate throughout the system and reach the Contributions page
- C. Provision of design research work details
- D. When you have finished, please click on the Submit button and then follow the instructions to submit the audiovisual and the whole of research
- E. Navigate through the system to the Search Form
- F. Search to retrieve the contribution just submitted
- G. Check throughout the submission
- H. Circle / fill in questions in relation to this task which are as follows:

**Q3. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with the contribution of on-line completed / current design research work world-wide as demonstrated by this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Speed of:					
Contributing	-2	-1	0	1	2
Making work available	-2	-1	0	1	2
Communicating work	-2	-1	0	1	2



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
<b>Ease of:</b>					
Contributing	-2	-1	0	1	2
Making work available	-2	-1	0	1	2
Communicating work	-2	-1	0	1	2
<b>Availability of options to represent:</b>					
Scope of contributors	-2	-1	0	1	2
Range of media	-2	-1	0	1	2
Amount of work	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
<b>Accuracy of options to represent:</b>					
Scope of contributors	-2	-1	0	1	2
Range of media	-2	-1	0	1	2
Amount of work	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
<b>Relevance of options to represent:</b>					
Scope of contributors	-2	-1	0	1	2
Range of media	-2	-1	0	1	2
Amount of work	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
<b>Convenience of:</b>					
Contributing	-2	-1	0	1	2
Making work available	-2	-1	0	1	2
Communicating work	-2	-1	0	1	2
Overall efficiency (see figure 6.9)	-2	-1	0	1	2
Overall effectiveness (see figure 6.9)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

#### **Section 4, Subscription to Updates**

Participants were then shown the following steps which along with the steps undertaken in section 2 would demonstrate the speed, availability, accuracy, relevance, quality and

convenience of world-wide communication of what subsequent research is available using the nereid prototype (as the manifestation of the proposed theoretical model). In particular, this task examined whether the subscription to updates aspect could provide a satisfactory, effective and efficient means of communication. This task involved the following steps:

- A. Check the e-mail box and follow the given instructions
- B. Navigate throughout the system and reach the Search page and search for the ID provided in the e-mail
- D. Check the accuracy and relevance of this search with the criteria entered in step C of section 2
- E. Circle / fill in questions in relation to this task which are as follows:

**Q4. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with on-line subscription to updates of completed / current design research results world-wide as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Awareness of subsequent research	-2	-1	0	1	2
Availability of subsequent research	-2	-1	0	1	2
Speed of information on about subsequent research	-2	-1	0	1	2
Accuracy of subsequent research	-2	-1	0	1	2
Relevance of subsequent research	-2	-1	0	1	2
Quality of subsequent research	-2	-1	0	1	2
Convenience of informing about subsequent research	-2	-1	0	1	2
Provision of latest updates in the field of interest	-2	-1	0	1	2
Prevention of duplication of research	-2	-1	0	1	2
Saving repeated efforts in relation to a search	-2	-1	0	1	2
Overall efficiency (see figure 6.9)	-2	-1	0	1	2
Overall effectiveness (see figure 6.9)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

### **Section 5, Communicating with each other**

Participants were then shown the following steps in order to demonstrate the speed, availability, accuracy, relevance, quality and convenience of the two-way world-wide



communication ability for either action / interaction and / or reaction between design researchers regarding design research work using the nereid prototype (as the manifestation of the proposed theoretical model). In particular, this task examined whether the aspect of communicating with each other could provide a satisfactory, effective and efficient means of communication. This task involved the following steps:

**Method I:**

- A. Click on the e-mail of the retrieved match from task 4 and send an enquiry in relation to this author's design research work
- B. Wait for up a short period of time and re-check your e-mail and then answer

**Method II:**

- A. Navigate throughout the system and reach the Search Users page
- B. Search using the following criteria:   Current  
  PhD  
  And   (match logic)
- C. Check accuracy and relevance of matches
- D. Repeat steps A and B from method I
- C. Circle / fill in questions in relation to this section which are as follows:

**Q5. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with researchers communicating on-line with each other world-wide based on completed / current design research results as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Speed of communication	-2	-1	0	1	2
Ease of communication	-2	-1	0	1	2
Availability of communication	-2	-1	0	1	2
Accuracy of communication	-2	-1	0	1	2
Relevance of communication	-2	-1	0	1	2
Quality of communication	-2	-1	0	1	2
Convenience of communication	-2	-1	0	1	2
<b>Encouragement of:</b>					
dialogue between design researchers	-2	-1	0	1	2
criticism of design research work	-2	-1	0	1	2

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Overall efficiency (see figure 6.9)	-2	-1	0	1	2
Overall effectiveness (see figure 6.9)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

### **Section 6, Assessing (on simulation basis)**

Participants were then informed of how the refereeing process would take place in the real world. In particular, it was explained that the refereeing method would be the same as that currently used in assessing articles and papers in refereed journals and at conferences. It was also explained that although assessing work may be at the same speed when compared to existing methods that also use electronic mediums, where would be no fixed publication dates as with both journals and conferences (including conference proceedings) which extend the time required before refereed work is available for communication. It should be also emphasised that the assessment procedure would be continuous and on-going. In addition to this, it was also explained that the refereeing action would assess only research that has been submitted in whole and not as descriptions. It also explained that refereeing will not take place when submitted research work has been already assessed by an examination / referee board as with completed MA / MSc / MPhils / PhDs or refereed published articles and papers. Finally, it was explained how a researcher could apply to become a referee, to qualify and assess relevant design research work according to their experience and expertise by using a similar form to subscription to updates form.

Participants were then asked whether this aspect of the theoretical model would provide a more effective way of communicating refereed design research results and whether this would be a quicker means of assessing and thereafter communicating refereed design research work. They were asked whether this aspect would provide a more reliable and valid source for research in relation to what research is currently available in terms of what has been done and what is currently going on. In particular, participants were asked:

**Q6. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with the assessment of on-line completed / current design research results world-wide as demonstrated literally and with this diagram (fig. 5.5) in terms of the following criteria:**



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
<b>Speed:</b>					
Of assessing design research work	-2	-1	0	1	2
With which refereed work is available	-2	-1	0	1	2
With which refereed work is communicated	-2	-1	0	1	2
Accuracy of what is subsequently communicated	-2	-1	0	1	2
Relevance of what is subsequently communicated	-2	-1	0	1	2
Quality of what is subsequently communicated	-2	-1	0	1	2
Convenience of what is subsequently communicated	-2	-1	0	1	2
Clarity of what is subsequently communicated	-2	-1	0	1	2
Validity of what is subsequently communicated	-2	-1	0	1	2
Reliability of what is subsequently communicated	-2	-1	0	1	2
Confidence in what is subsequently communicated	-2	-1	0	1	2
Overall efficiency (see figure 6.9)	-2	-1	0	1	2
Overall effectiveness (see figure 6.9)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

### **Section 7, Overall Effectiveness and Efficiency of the Proposed Theoretical Model**

Finally, based on the demonstration of all the tasks described above participants were asked to answer the following questions in relation to the communication of design research between design researchers based on the proposed theoretical model as a whole:

**Q7. To what extent does the proposed theoretical model taken as a whole as demonstrated in this prototype represent an improvement in communicating design research work in terms of:**

	much worse	worse	neither	better	much better
<b>• Availability of:</b>					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
<b>• Accuracy of:</b>					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2

	much worse	worse	neither	better	much better
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
• Relevance of:					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
• Quality (in terms of clarity, validity, reliability and confidence in the source) of:					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
• Convenience of:					
Communicating what research has been done	-2	-1	0	1	2
Communicating what research is currently going on	-2	-1	0	1	2
Communicating what research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
• Speed of:					
Communicating what research has been done	-2	-1	0	1	2
Communicating what research is currently going on	-2	-1	0	1	2
Communicating what research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
Overall efficiency (see figure 6.9)	-2	-1	0	1	2
Overall effectiveness (see figure 6.9)	-2	-1	0	1	2

### 7. Please feel free to express overall comments

The following section will present the results gained from this evaluation exercise.

#### ***6.5.1 Results of One-to-One Expert based Evaluation Exercise (Primary / Summative Evaluation Exercise)***

The following sections will present the participants' responses, including their personal details, to the tasks of searching, contributing, assessing, subscribing, communicating with each other and finally, their assessment of the overall efficiency and effectiveness of the theoretical communication and information model regarding communication of



design research work between design researchers.

#### ***6.5.1.1 Participants' Personal Details***

In relation to the participants' personal details the following were found:

In response to question 1.1 which was concerned with how often participants, when they conduct research in design, search for previous and / or current research relevant to their enquiry:

- 3 out of 5 said they did it frequently
- 1 out of 5 said they did it always
- 1 out of 5 said they did it seldom

In response to question 1.2 which was concerned with the main sources used for research relevant to their enquiry:

- 5 out of 5 said they use Printed Materials
- 4 out of 5 said they use WWW
- 4 out of 5 said they use OPACs
- 4 out of 5 said they use E-Mail
- 4 out of 5 said they use Mailbase
- 2 out of 5 said they use Newsgroups
- 2 out of 5 said they use CD ROMs

In response to question 1.3 which was concerned with whether participants are actively involved in research and if so to what extent:

- all 5 participants were actively involved in research
- 3 out of 5 participants were actively involved in research on a part time basis
- 1 out of 5 participants was actively involved in research on a both full and part time basis
- 1 out of 5 participants was actively involved in research on a full time basis
- 5 out of 5 participants were actively involved in research as Researchers
- 4 out of 5 participants were actively involved in research as Supervisors
- 3 out of 5 participants were actively involved in research as Examiners

Finally, in terms of the participants' computer literacy (question 1.4):

- 3 out of 5 indicated average computer literacy
- 2 out of 5 indicated high computer literacy

The results presented above, indicate that the participants of the primary evaluation exercise were actively involved in research activities either as researchers, supervisors or examiners. As they frequently searched for previous and / or current research relevant to their enquiry, they also used most of the available communication and information systems for their research purposes. Finally, the findings indicate that the participants were average or above in terms of their computer literacy. To this extent, the participants chosen were considered valid for the purpose of this primary evaluation exercise.

#### *6.5.1.2 Participants' Response in Relation to the Tasks*

The main results from these evaluation exercises are shown in the following tables and are based on the 5 participants responses. Based on the numerical assigned values, the score for all 5 responses can be as high as '10' or as low as '-10'. The closer to the highest numerical value of '10' the greater the tendency for satisfaction with the particular item, a value close to '0' indicates a balance and the closer to the lowest numerical value of '-10' the greater the tendency for dissatisfaction with the particular item.

Based on these principles, the following tables (6.40 - 6.44) show the degree of satisfaction or dissatisfaction with the theoretical model in terms of its efficiency and effectiveness.

Table 6.45 indicates similarly the degree of overall improvement in communicating design research work in terms of efficiency and effectiveness of the theoretical model.

##### *6.5.1.2.1 Participants' Response in Relation to the Search Task*

Table 6.40 shows the results relating to the aspect of the proposed theoretical communication and information model concerned with searching and retrieving on-line completed / current design research work as demonstrated in the prototype. In particular, it demonstrates the degree of satisfaction or dissatisfaction as well as the overall efficiency and effectiveness relating to the searching aspect. These results are from question 2:



Q2. The Searching Aspect:	Numerical Assigned Values					Score
	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory	
	-2	-1	0	1	2	
Finding what research has been done	-	-	1	1	3	7
Finding what research is going on	-	-	1	2	2	6
Speed	-	-	-	2	3	8
Clarity	-	-	-	4	1	6
Completeness	-	-	-	3	2	7
Detail	-	-	1	3	1	5
Availability	-	-	1	1	3	7
Accuracy	-	-	-	1	4	9
Relevance	-	-	-	4	1	6
Quality	-	-	-	2	3	8
Convenience	-	-	-	2	3	8
Overall Efficiency (see figure 6.9)	-	-	-	2	3	8
Overall Effectiveness (see figure 6.9)	-	-	-	4	1	6
<b>Total Score</b>						<b>91</b>

table 6.40: Expert based Summative Evaluation in relation to the Searching (individual halfway marks= $\pm 5$ , overall halfway mark= $\pm 65$ )

The total score of 91 out of a possible 130 maximum score indicates that overall participants were more than satisfied with this proposed aspect of the theoretical model concerned with searching and retrieving on-line completed / current design research work as demonstrated in the prototype. In relation to the overall efficiency and effectiveness, the scores of 8 and 6 respectively out of a possible 10 maximum score also indicate that participants were more than satisfied with the efficiency and the effectiveness of the searching and retrieving aspect. This is also demonstrated by the individual scores where participants responses indicated their satisfaction in relation to the availability, relevance, quality, convenience, clarity, completeness and detail. In conclusion, these results indicate that overall participants found the searching aspect of the proposed theoretical model as demonstrated in this prototype a satisfactory, efficient and effective means of communication.

#### 6.5.1.2.2 Participants' Response in Relation to the Contribution Task

Table 6.41 shows the results relating to the aspect of the proposed theoretical communication and information model concerning the on-line contribution of completed / current design research work as demonstrated by the prototype. In particular, it demonstrates the degree of satisfaction or dissatisfaction as well as the

overall efficiency and effectiveness relating to the contribution aspect. These results are from question 3:

<b>Q3. The Contribution Aspect:</b>	<b>Numerical Assigned Values</b>					<b>Score</b>
	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory	
	-2	-1	0	1	2	
Speed of contributing	-	-	-	-	5	10
Speed of making work available	-	-	-	-	5	10
Speed of communicating work	-	-	-	1	4	9
Ease of contributing	-	-	-	-	5	10
Ease of making work available	-	-	-	1	4	9
Ease of communicating work	-	-	-	1	4	9
<b>Availability of options to represent:</b>						
Scope of contributors	-	-	-	2	3	8
Range of media	-	-	-	2	3	8
Amount of work	-	-	1	1	3	7
Completeness	-	-	-	2	3	8
Detail	-	-	-	2	3	8
<b>Accuracy of options to represent:</b>						
Scope of contributors	-	-	-	2	3	8
Range of media	-	-	-	2	3	8
Amount of work	-	-	-	3	2	7
Completeness	-	-	-	2	3	8
Detail	-	-	-	2	3	8
<b>Relevance of options to represent:</b>						
Scope of contributors	-	-	-	3	2	7
Range of media	-	-	1	2	2	6
Amount of work	-	-	1	2	2	6
Completeness	-	-	-	3	2	7
Detail	-	-	-	3	2	7
Convenience of contributing	-	-	-	-	5	10
Convenience of making work available	-	-	-	-	5	10
Convenience of communicating work	-	-	-	1	4	10
Overall Efficiency (see figure 6.9)	-	-	-	2	3	9
Overall Effectiveness (see figure 6.9)	-	-	-	4	1	7
<b>Total Score</b>						<b>214</b>

table 6.41: Expert based Summative Evaluation in relation to the Contributing  
(individual halfway marks= $\pm 5$ , overall halfway mark= $\pm 130$ )

The total score of 214 out of a possible 260 maximum score indicates that overall participants were more than satisfied with this proposed aspect of the theoretical model concerned with contributing on-line completed / current design research work as



demonstrated by the prototype. In relation to the overall efficiency and effectiveness, the scores of 9 and 7 respectively out of a possible 10 maximum score also indicate that participants were more than satisfied with the efficiency and the effectiveness of the contribution task. This is further demonstrated by the individual scores where participants responses indicated their satisfaction with the speed, ease and convenience of contributing, making work available and communicating work, as well as, their satisfaction in relation to the availability, relevance, and accuracy of options to represent the scope of contributors, range of media, amount of work, completeness and detail. In conclusion, these results indicate that overall participants found the contribution aspect of the proposed theoretical model as demonstrated in this prototype a satisfactory, efficient and effective means of communication.

#### 6.5.1.2.3 Participants' Response in Relation to the Subscription to Updates

Table 6.42 shows the results relating to the aspect of the proposed theoretical communication and information model concerning the communication of what subsequent research is available. In particular, it demonstrates the degree of satisfaction or dissatisfaction as well as the overall efficiency and effectiveness relating to this aspect. These results are from question 4:

Q4. The Subscription to Updates Aspect:	Numerical Assigned Values					Score
	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory	
	-2	-1	0	1	2	
Awareness about subsequent research	-	-	-	1	4	9
Availability subsequent research	-	-	-	1	4	9
Speed of informing about subsequent research	-	-	-	-	5	10
Accuracy of informing about subsequent research	-	-	-	2	3	8
Relevance of informing about subsequent research	-	-	-	4	1	6
Quality of informing about subsequent research	-	-	-	3	2	7
Convenience of informing about subsequent research	-	-	-	-	5	10
Provision of latest updates in the field of interest	-	-	-	-	5	10
Prevention of duplication of research	-	-	-	3	2	7
Saving repeated efforts in relation to a search	-	-	-	2	3	8
Overall Efficiency (see figure 6.9)	-	-	-	1	4	9
Overall Effectiveness (see figure 6.9)	-	-	-	2	3	8
<b>Total Score</b>						<b>101</b>

table 6.42: Expert based Summative Evaluation in relation to the Subscribing to Updates (individual halfway marks= $\pm 5$ , overall halfway mark= $\pm 60$ )

The total score of 101 out of a possible 120 maximum score indicates that overall participants were more than satisfied with this proposed aspect of the theoretical model concerned with subscribing on-line to updates of completed / current design research work as demonstrated in the prototype. In relation to the overall efficiency and effectiveness, the scores of 9 and 8 respectively out of a possible 10 maximum score indicate that participants were more than satisfied with the efficiency and effectiveness of the task of communicating what research has been done subsequently (see figure 6.9). This is also demonstrated by the individual scores where participants responses indicated their satisfaction in relation to the availability and level of awareness of subsequent research. In addition to this, they indicated their satisfaction with the speed, accuracy, relevance, quality and convenience of communicating subsequent research. Participants also indicated their satisfaction in relation to the effects of this aspect in preventing research duplication and saving repeated search efforts. In conclusion, these results indicate that overall participants found the subscription to updates aspect of the proposed theoretical model as demonstrated in this prototype satisfactory, efficient and effective means of communication.

#### 6.5.1.2.4 Participants' Response in Relation to the Communication with Each Other

Table 6.43 shows the results relating to the aspect of the proposed theoretical communication and information model concerned with the two-way world-wide communication ability allowing action, interaction and / or reaction between design researchers regarding design research work. In particular, it demonstrates the degree of satisfaction or dissatisfaction as well as the overall efficiency and effectiveness relating to this aspect. These results are from question 5:

Q5. The Communicating with Each Other Aspect:	Numerical Assigned Values					Score
	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory	
	-2	-1	0	1	2	
Speed of Communication	-	-	-	1	4	9
Ease of Communication	-	-	-	2	3	8
Availability of communication	-	-	-	2	3	8
Accuracy of communication	-	-	-	2	3	8
Relevance of communication	-	-	-	3	2	7
Quality of communication	-	-	-	4	1	6
Convenience of communication	-	-	-	2	3	8
Encouragement of:						
Dialogue between design researchers	-	-	-	-	5	10
Criticism of design research work	-	-	-	1	4	9



Overall Efficiency (see figure 6.9)	-	-	-	1	4	9
Overall Effectiveness (see figure 6.9)	-	-	-	2	3	8
<b>Total Score</b>						<b>90</b>

table 6.43: Expert based Summative Evaluation in relation to the Communicating with Each Other (individual halfway marks= $\pm 5$ , overall halfway mark= $\pm 55$ )

The total score of 90 out of a possible 110 maximum score indicates that overall participants were more than satisfied with this proposed aspect of the theoretical model concerning world-wide on-line communication with each other based on completed / current design research work as demonstrated in the prototype. In relation to the overall efficiency and effectiveness, the scores of 9 and 8 respectively out of a possible 10 maximum score also indicate that participants were very satisfied with the efficiency and the effectiveness of this aspect allowing communication with each other (see figure 6.9). This is also demonstrated by the individual scores where participants' responses indicated their satisfaction in relation to the speed, ease, accuracy, relevance, quality and convenience of communicating with one other in this way. In conclusion, these results indicate that overall, the participants found that this communication aspect of the proposed theoretical model as demonstrated by this prototype to be a satisfactory, efficient and effective means of communication.

#### 6.5.1.2.5 Participants' Response in Relation to the Assessment of Design Research Work

Table 6.44 shows the results relating to the aspect of the proposed theoretical communication and information model concerning the assessment of completed design research work. In particular, it demonstrates the degree of satisfaction or dissatisfaction as well as the overall efficiency and effectiveness related to this aspect. These results are from question 6:

Q6. The Assessing Aspect:	Numerical Assigned Values					Score
	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory	
	-2	-1	0	1	2	
Speed of assessing design research work	-	-	-	3	2	7
Speed in which refereed work is available	-	-	-	2	3	8
Speed in which refereed work is communicated	-	-	-	2	3	8
Accuracy of what is subsequently communicated	-	-	2	2	1	4
Relevance of what is subsequently communicated	-	-	2	2	1	4
Quality of what is subsequently communicated	-	-	3	1	1	3
Convenience of what is subsequently communicated	-	-	2	1	2	5
Clarity of what is subsequently communicated	-	-	1	2	2	6

Validity of what is subsequently communicated	-	-	2	2	1	4
Reliability of what is subsequently communicated	-	-	1	3	1	5
Confidence in what is subsequently communicated	-	-	1	3	1	5
Overall Efficiency (see figure 6.9)	-	-	-	2	3	8
Overall Effectiveness (see figure 6.9)	-	-	-	3	2	7
<b>Total Score</b>						<b>74</b>

table 6.44: Expert based Summative Evaluation in relation to the Assessing (individual halfway marks= $\pm 5$ , overall halfway mark= $\pm 65$ )

The total score of 74 out of a possible 130 maximum score indicated that the participants were more than satisfied with this proposed aspect of the theoretical model concerning on-line assessment of completed / current design research work as demonstrated in the prototype. In relation to the overall efficiency and effectiveness, the scores of 8 and 7 respectively out of a possible 10 maximum score also indicated that participants were more than satisfied (see figure 6.9). This is also demonstrated by the individual scores where the participants responses indicated their satisfaction with the speed of assessment and the time in which refereed work could be made available and communicated. In addition to this, participants were more than satisfied with the convenience, clarity, confidence and reliability of what is subsequently communicated. Participants were slightly less satisfied with the accuracy, relevance, quality and validity of what is subsequently communicated. In conclusion however, these results indicate that overall participants found the assessment aspect of the proposed theoretical model as demonstrated in this prototype a satisfactory, efficient and effective means of communication.

#### 6.5.1.2.6 Participants' Response in Relation to the Overall Efficiency and Effectiveness of the Proposed Theoretical Model

Table 6.45 shows the results concerned with the proposed theoretical model, taken as a whole, as demonstrated by this prototype and whether it represents an improvement in communicating design research work. It also demonstrates improvements in efficiency and effectiveness in terms of the availability, accuracy, relevance, quality, convenience and speed of communicating completed research, what research is ongoing, communicating subsequent results and in communication regarding design research work that is available. These results are from question 7:



**Q7. The Overall Efficiency and Effectiveness  
of the Proposed Theoretical Model  
taken as a Whole:**

	<b>Numerical Assigned Values</b>					<b>Score</b>
	<b>much worse</b>	<b>worse</b>	<b>neither</b>	<b>better</b>	<b>much better</b>	
	<b>-2</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>2</b>	
<b>Availability of:</b>						
what research has been done	-	-	1	-	4	8
what research is currently going on	-	-	1	-	4	8
what research is done subsequently	-	-	-	-	5	10
communication with each other	-	-	-	1	4	9
<b>Accuracy of:</b>						
what research has been done	-	-	-	4	1	6
what research is currently going on	-	-	-	2	3	8
what research is done subsequently	-	-	-	1	4	9
communication with each other	-	-	-	2	3	8
<b>Relevance of:</b>						
what research has been done	-	-	1	3	1	5
what research is currently going on	-	-	1	3	1	5
what research is done subsequently	-	-	-	3	2	7
communication with each other	-	-	-	2	3	8
<b>Quality (in terms of clarity, validity, reliability and confidence in the source) of:</b>						
what research has been done	-	-	2	1	2	5
what research is currently going on	-	-	1	2	2	6
what research is done subsequently	-	-	1	1	3	7
communication with each other	-	-	1	-	4	8
<b>Convenience of:</b>						
communicating what research has been done	-	-	-	-	5	10
communicating what research is currently going on	-	-	-	1	4	9
communicating what research is done subsequently	-	-	-	-	5	10
communication with each other	-	-	-	1	4	9
<b>Speed of:</b>						
communicating what research has been done	-	-	-	2	3	8
communicating what research is currently going on	-	-	-	2	3	8
communicating what research is done subsequently	-	-	-	1	4	9
communication with each other	-	-	1	-	4	8
Overall Efficiency (see figure 6.9)	-	-	-	2	3	8
Overall Effectiveness (see figure 6.9)	-	-	-	2	3	8
<b>Total Score</b>						<b>204</b>

**table 6.45: Expert based Summative Evaluation in relation to the Overall Efficiency and Effectiveness of the Proposed Theoretical Model Taken as a Whole (individual halfway marks=+/-5, overall halfway mark=+/-130)**

The total score of 204 out of a possible 260 maximum score indicates that overall

participants found the proposed theoretical model taken as a whole, and demonstrated by the prototype, an improvement in communicating design research work. For the overall efficiency and effectiveness, the scores of 8 and 8 respectively out of a possible 10 maximum score indicate that participants found an improvement in efficiency (speed) and in the effectiveness (availability, accuracy, relevance, quality and convenience) in communicating with one other as well as the communication of completed research, what research is currently ongoing and the communication of subsequent research (see figure 6.9). This is also demonstrated by the individual scores as seen on table 6.45, where participants responses indicated that all the criteria as seen in figure 6.9 were improved.

In conclusion, these results indicate that overall participants found that the proposed theoretical model taken as a whole as demonstrated by this prototype satisfactory, efficient and effective as well as an improved means of communicating design research work. The next section will present all the comments made by participants during the primary evaluation exercise.

#### 6.5.1.2.7 Participants' Comments

In relation to the searching aspect of the proposed theoretical model, the following comments were made:

- 3 out of 5 participants said that this is a prototype with a limited number of records and therefore, the criterion of finding what has been done and what is currently going on is hypothetical or not answerable as this is dependant on the number of contributions. In addition, one of the participants said that accuracy, relevance and overall effectiveness is dependant on how design researchers represent design research work in keywords.

In relation to the contribution aspect of the proposed theoretical model, the following comments were made:

- one participant said that this is very promising, with rugged thinking and well deployed within a prototype. This aspect could make a valuable contribution to design research as it is known.

In relation to the subscription to updates aspect of the proposed theoretical model, the following comments were made:

- one participant said that this is a good tool that will be helpful to many design



researchers. Another participant said that availability and awareness about subsequent research is also dependant contribution. The same participant said that accuracy of informing about subsequent research is dependant on keywords.

In relation to the communication with each other aspect of the proposed theoretical model, the following comments were made:

- one participant said that this is a good tool for the purpose and the culture of design research.

In relation to the assessing aspect of the proposed theoretical model, the following comments were made:

- one participant said that this is a helpful tool.

Finally, in relation to the proposed theoretical model taken as a whole as demonstrated in the prototype, the following comments were made:

- one participant said that the aspects concerning communication are served well. However, the aspects of relevance, accuracy and quality are served less well, since volume of data is lacking to make judgments.
- one participant said that the proposed model includes a great concept if it is taken as a way to facilitate a learning and authoring culture. The same participant added that richer material, suited to the user base may permit additional (perhaps semantic) tools that would add value to this fine proof of the concept.
- one participant said that in the field of design it has been very difficult to find out about past or current research as traditional searches do not work. This proposed model would greatly improve the situation of communication between design researcher world wide.
- one participant said that the overall efficiency, effectiveness, availability, accuracy of what research has been done, currently going on, is done subsequently and communication with each other is dependant on contribution. In addition to this, the same participant added that the relevance of what research has been done, what research is currently going on, what research is done subsequently and communication with each other is also dependant on keywords. Finally, this participant said that this theoretical model as a whole represents an extremely valuable contribution to the dissemination of design research, provided that enough contributors participate.

#### 6.5.1.2.8 Final Conclusions in Relation to the Validity of the Proposed Theoretical Model

The major conclusions that can be drawn in relation to the primary evaluation exercise

are summarised as follows:

- results as seen in tables 6.40 to 6.44 indicated that participants found that all the individual aspects of the proposed theoretical model as demonstrated in the prototype represented a satisfactory, efficient and effective means of communicating design research work.
- results as seen in table 6.45 indicated that participants found that the proposed theoretical model taken as a whole as demonstrated by the prototype represents an improved, efficient and effective means of communicating design research work.
- finally, comments made by the participants indicated the proposed theoretical model represents an improvement in the communication of design research work. In relation to the comments concerned the dependency of participating contributions, it is argued that this was explained and described in sections 4.2.2 to 4.2.7 (where the SSM's analyses two, three and the formulation of the conceptual model was described, pp. 87 - 95 of this thesis). In relation to the limited number of records in the prototype, it is suggested that additional testing with more records could take place and this will be described in the sections on criticism, further research and recommendations in the next chapter (7.4 and 7.5). In relation to the keywords dependency, another research study will be suggested in the section on further research and recommendations (7.5) as this issue addresses the formulation of a common based terminology for the representation of design research work.

In conclusion, the results (as described throughout in the 6.5 section) concerning the primary evaluation exercise indicate that in general expert participants found the individual aspects of and the proposed theoretical model taken as a whole as demonstrated by the prototype represent an improvement in terms of efficiency and effectiveness relating to the communication of design research work. Therefore the proposed theoretical communication and information model as seen on page 128 of this thesis is validated through the criteria as seen in figures 4.6 and 6.9.

## **6.6 Summary**

This Chapter described stage 5 of the five step methodology by employing evaluation exercises in relation to the validation of the proposed theoretical model. It provided:



- a description of the process in which an experimental real world working prototype as a manifestation of the theoretical model was implemented
- the methods of formative and summative evaluation which were used to test this prototype and evaluate the validity of the theoretical model through the prototype

The formative approach as a secondary evaluation exercise of the prototype concerning the refinement of the prototype tested its efficacy, as well as, its functionality and usability in terms of its efficient operational order and included:

- one-to-one evaluation review with five experts in content, design and technical matters
- user group based evaluation with fifteen participants as end - users to assess the efficient working order of the prototype
- check list features to ensure that the prototype is a manifestation of the theoretical model and unique compared to other similar systems currently used by design researchers

Finally, the summative approach as a primary evaluation exercise involved:

- one-to-one authoritative evaluation review with five participants, experts in design research issues employed to assess the validity of the theoretical model in terms of its effectiveness and efficiency

The secondary evaluation exercises indicated that the prototype was a manifestation of the proposed theoretical model, unique among the communication and information systems currently used by design researchers and that the prototype had no major usability or functionality problems. The secondary evaluation exercises proved the efficacy (efficient operational order) of the prototype and as a result, this prototype was considered as an appropriate vehicle for validating the proposed theoretical model in terms of its efficiency and effectiveness. Finally, the primary evaluation exercises validated the proposed theoretical model representing an improvement in the communication of design research work.

The next Chapter presents the conclusion to this thesis by summarising the main achievements of the undertaken research. It also provides a critical evaluation of the research undertaken, as well as, recommending areas for further research and development.

## **Chapter 7: Conclusion**

### **7.1 Introduction**

Chapter 7 examines the current situation in relation to the aim of this research. It also presents the conclusion of this thesis by summarising the main achievements of the undertaken research. Finally, it provides a critical evaluation of the research employed, as well as, recommending ways to extend the findings by further research and development.

### **7.2 Current Situation in the Field in Relation to Communicating Design Research**

Current findings indicate there no have been major changes in the field in relation to communicating design research results between design researchers. Although there is an encouraging and continued debate on improvements to the ARIAD database system, there is no intention to provide communication linkages similar to those proposed in the theoretical communication and information model of this research.

In particular, the on-line WWW ARIAD system is still based on its 1996 CD-ROM version. Although the editor of the ARIAD announced (Brian Allison, 1st of June, 2000, Design Research Mailbase system) improvements to the WWW version by enabling design researchers to contribute on-line descriptions of design research work and relevant images, and examiners to contribute their details on-line these do still not exist at the present time.

Even if these proposed on-lines facilities were implemented for the ARIAD system it would still not represent a complete manifestation of the proposed model of this PhD research. This is because firstly, ARIAD clearly does not provide the facilities for design researchers to qualify on-line as examiners, to assess on-line submitted design research work (including descriptions of the design research itself, as well as audio-visual materials supporting design research work such as images, movies, sounds, virtual reality sets and videos). Secondly, ARIAD clearly does not provide the facility to search for audio-visual material, completed or current, published or unpublished research works or the facility to subscribe to updates in relation to subsequent research work that has been done or is currently being undertaken. Therefore though the proposed changes would represent an improvement to ARIAD it would still not



represent the degree of overall improvement to the communication of design research indicated by nereid and its underlying theoretical model developed through SSM.

### **7.3 Achievements**

The main achievement of this research concerned the proposal and validation of a soft systems based theoretical communication and information model which provides a more effective and efficient means for design researchers to communicate their design research work. This therefore has met the original aim of this research that was to improve communication between design researchers based on a soft systems theoretical model that would enable more efficient and effective communication of design research results between design researchers. The following section will provide a more detailed explanation of this achievement.

#### ***7.3.1 Proposing an Improved Theoretical Model for the Communication of Design Research***

The literature review presented in Chapter 2 highlighted a number of relevant issues, which identified the need for the research to be undertaken. In particular, Allison (1991) and Cooper (1995, p. 17) for different reasons argued that design research lacked evidence in terms of communicating design research results. Further, the increased funding that has come into the Art and Design sector for research, in many cases for the first time, and the wider range of the design research key areas involved in the most recent RAE compared to the previous RAE have all led to a growth in the number of researchers as well as to the volume of design research output. This in turn has added to the complexity and need to communicate design research work more efficiently and effectively. The need for the availability and accessibility of design research results has also been emphasised by Parnas and Clements (1986), Korvenmaa and James (1993, p. 23), Agnew (1993), Press (1995, p. 38), Bessis and Robertson (1995), Newbury (1996) and RAE (1999). Friedman (1997) based on Vakkari (1996) stated the need for the development of a rich theoretical framework as a basis for communication within the design research community. The literature review also identified a number of tangible disadvantages concerning current systems used for communicating design research results. Finally, the failure of information systems development methodologies to deliver what is required (Lucas, 1975, Galliers, 1987 and Mingers, 1995, p. 19), the novelty of the current communication and information technologies (Committee of Scottish Universities Principals, 1992) and the incremental changes in the way people seek, acquire and use information caused by electronic information systems

(Marchionini, 1995, p. 4) demonstrated the need for further research on information and communication models and systems that facilitate the communication of design research information. Based on these principles, research objectives were identified and presented in Chapter 2:

- to review what already exists in terms of communication and information systems used for communicating design research
- to determine the information needs and requirements of potential users
- to develop a theoretical communication and information model concerning how design research results can be more effectively and efficiently communicated between design researchers
- to review Human Computer Interaction considerations in order to help produce a real world specification framework and a prototype in relation to the theoretical model
- to evaluate the validity of the theoretical communication and information model through this prototype in terms of its effectiveness and efficiency

Within these research objectives, the following paragraphs describe the five step methodology employed in order to formulate the proposed theoretical model:

- |         |  |
|---------|--|
| stage 1 | To review the background area of Information Systems Development Methodologies (ISDMs), including Soft Systems Methodology (SSM) in order to identify methodological approaches potentially applicable to support the achievement of the aim of this research study  |
| stage 2 | To explore and understand the nature of the problem by using SSM, i.e.. to draw a rich picture, examine the interventions, the cultural and political aspects of the problem situation, identify relevant conceptual systems and describe a root definition in relation to communicating design research results, as well as, the identification and formulation of a conceptual model.<br>The need for a questionnaire as the primary research tool suitable for further understanding within the area of the investigation is identified   |
| stage 3 | To acquire respondents input through the questionnaire which will be used to establish how design research knowledge is currently communicated, as well as to identify what methods, systems and networks for communication are currently employed or needed. These results along with literature review will be used to make a comparison of the conceptual model identified in stage 2 against the perceived real world and to suggest feasible changes in the form of a new rich picture and a refined version of a root definition. These findings along with the literature review and the conceptual model are used to propose |



a new theoretical communication and information model concerned with how design research results can be more effectively efficiently communicated between its peers

- stage 4 To further analyse the questionnaire along with stages 2 and 3 findings and Human Computer Interaction (HCI) literature based considerations in order to produce a specification framework. Structured interviews will be performed to evaluate the initial specification framework prior to the formulation of the prototype which will stand as the manifestation of the proposed theoretical communication and information model which will be tested in stage 5 to determine the model's validity
- stage 5 To perform evaluation studies employing Formative and Summative exercises in order to test the working prototype, and thereby, the validity of the proposed theoretical communication and information model in terms of its effectiveness and efficiency

This five step methodology employed is illustrated in the fig. 7.1 on the next page. Based on this research framework, Soft Systems Methodology (SSM) was employed in order to formulate and validate (based on the criteria as seen in fig. 6.9) the proposed theoretical model. There was no question as to whether SSM was the best approach to tackle the problem as only the employment of both soft and hard thinking at the same time could provide the answer, it can be argued and that ultimately, the SSM approach produced a theoretical model that proposed improvements to communication between design researchers regarding their works. The proposed theoretical model which was formulated and subsequently validated is as follows:

- An on-line WWW based communication and information system owned, managed and operated by design researchers in which, they should be able to act, react and / or interact, and communicate with each other their completed / current design research results with speed. In particular, a system in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The system should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search system (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the system should further allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results



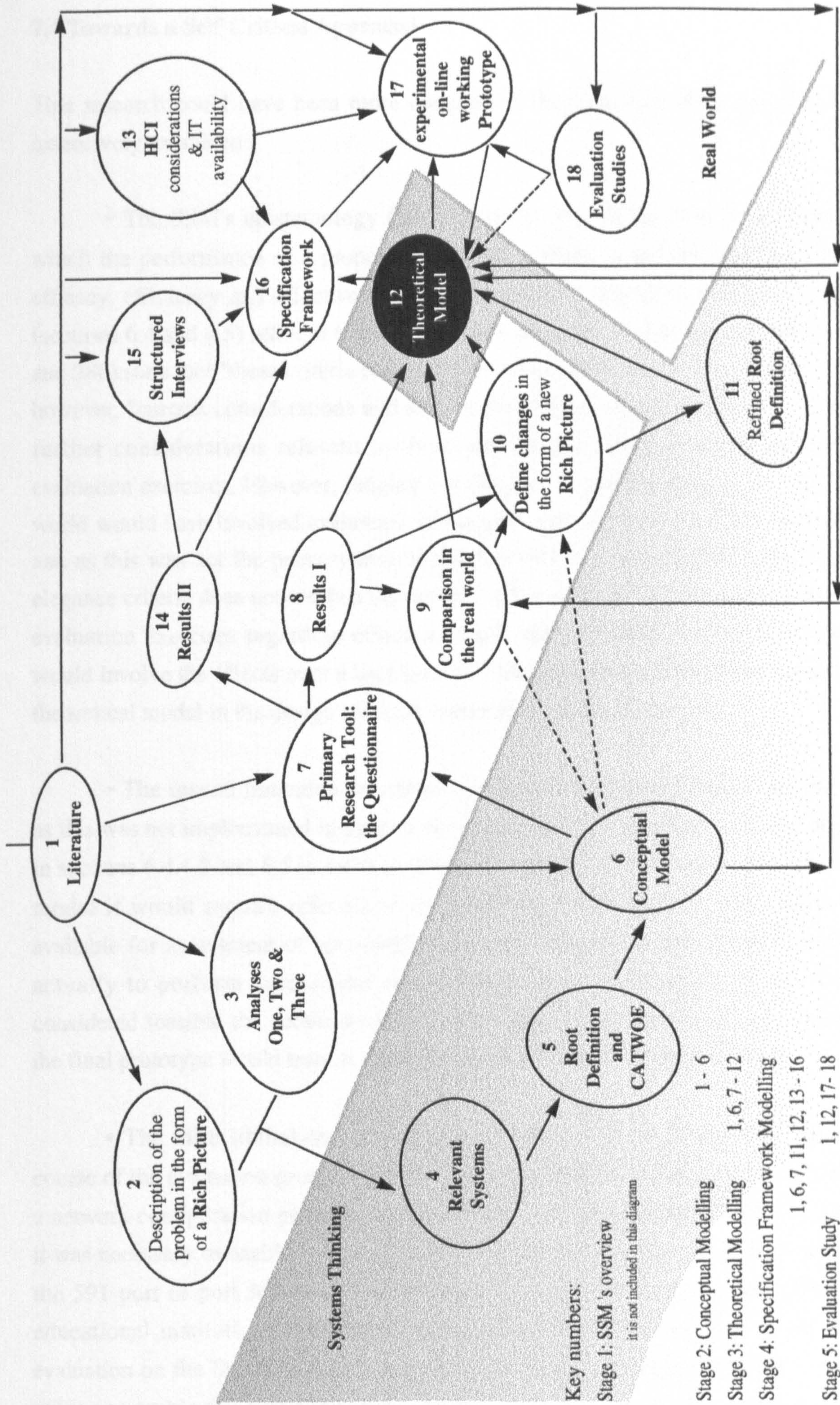


Figure 7.1: The Research Framework



## 7.4 Towards a Self Critical Appraisal

This research could have been more complete if the following three issues had more extensively examined:

- The SSM's epistemology (pp 70 and 72), highlights three major criteria by which the performance of a proposed model as a whole is judged, and these include: efficacy, efficiency and effectiveness and this research employed evaluation exercises (sections 6.4 and 6.5) relevant to these criteria. Checkland and Scholes (2000, pp 39, 42 and 288) state that "these criteria cover the basic idea of the model's transformation (T)" however, "current considerations add the criteria of Ethicacy and Elegance". Therefore, further considerations relevant to these additional criteria could supplement the evaluation exercises. However, judging the elegance of the proposed system in the real world would have involved evaluation of the prototype itself in relation to its aesthetics and as this was not the primary aim of this research, it is argued that exclusion of the elegance criteria does not weaken the validity of the proposed model. In addition to this, evaluation exercises regarding ethicacy would not be feasible in this study, as they would involve the effects over a long period of time of a real world system based on the theoretical model in the design research community and its members.

- The second limitation concerned the aspect of assessing design research work as this was not implemented in the real world experimental prototype. As was explained in sections 6.4.1.2 and 6.5 in order to assess the validity of this aspect of the theoretical model it would require referees to be available, to affirm their willingness to be available for assessment of submitted completed / current design research results and actually to perform assessment during the primary evaluation. As this was not considered feasible the author decided that in order to perform the primary evaluation the final prototype would have to simulate this aspect of the theoretical model.

- The third limitation concerned a technical problem discovered during the course of the evaluation process that led to some restrictions. The precise problem was a network configuration problem. In order for the prototype server to function properly it was necessary to enable both the 80 port (the default port for simple web pages) and the 591 port (a port for on-line databases). The 591 port is some times disabled in educational institutions for security reasons, but this restriction was lifted for this evaluation on the De Montfort University system. However some universities were not willing to enable this port at that time, though others maintain it in an enabled state as a

matter of course. This restriction inhibited the operation of the prototype and therefore the evaluation was restricted to those participants who were able to access their 591 port. In addition to this the exact identification of the problem was problematic and it took considerable time to establish the root cause. This led to an extension of the time over which the evaluation exercise took place, and made some cancellations unavoidable.

## **7.5 Further Research and Recommendations**

Regarding extensions to this research, it is argued that complementary research first regarding the individual aspects of the theoretical model could take place, and second the refined aspects of the model taken as a whole could improve understanding of the situation. Therefore a refined SSM approach based on the proposed theoretical communication and information model could further improve the efficiency and the effectiveness of the communication between design researchers based on their design research work.

Further research could take place in relation to the aspect of the theoretical model concerned with assessing design research work. In particular, it is suggested that an evaluation study based on a real word working prototype concerned the assessment of design research work could advance understanding and make the proposed model more complete.

In addition to this, research could also take place regarding the formulation of a theoretical framework concerned with the representation of design research work based on a common terminology. This would develop on understanding of how design research work can be better classified for more efficient and effective communication of design research based on the proposed theoretical model.

Another evaluation exercise concerning usability and functionality issues could also be employed for a longer period of time within the real world and therefore with a larger number of participants as the end-users of the real word system. Such evaluation exercises could contribute considerably to further refinements and improvements to the effectiveness and efficiency that the underlying proposed theoretical model could provide to the real world situation. In addition to this, such an approach could also contribute to the identification of the effects (intervention) caused by the proposed theoretical model.



Finally, the author hopes that the development of this theoretical model and initial prototype will form the basis for a new real-world communication and information system for design researchers. The next section will provide some details of how such a system, as a manifestation of the validated theoretical model could be embedded in the real world. Initial discussion of this has already taken place outside the scope of this thesis, with potentially interested collaborators both within De Montfort University and relevant external agencies such as the DRS, ARIAD, NSEAD and VADS.

## **7.6 Embedding the Proposed System in the Real World**

Firstly it is important that the design research community is made aware of the existence of any new real world system based on this theoretical model. Such a system would need to be continuously adapted to meet the changing needs of the community. There are various ways in which the system could be promoted, as well as respond to those needs.

One way of promoting the system would be to encourage its introduction and/or demonstration in the teaching of design research methodology to show its usefulness and the benefits of a professional attitude to the sharing of work in general. This may nurture, introduce and demonstrate both the system and these values. This development could be aided by enlisting the support of bodies such as the RAE, CSD, CHEAD, DRS, and EAD and other relevant bodies. Additionally, support could be enlisted at relevant conferences, meetings and seminars. It should be made clear that the system is potentially international, and therefore these actions need not be limited to the UK but also include the rest of the world.

As well as the system's in-built reporting and feedback mechanisms the environment in which it will be used should also help provide continuous feedback for creating, sustaining, maintaining, refining and adapting the system to the ever-changing needs of the user community. This will ensure that the system will continue to be relevant and useful. To further future-proof the system, it is argued that more studies need to take place as was stated in the section on further recommendations (see section 7.5). These should include consideration of the theoretical model itself as well as the real world system, particularly in terms of possible technological advances that will further enhance the efficiency and effectiveness of design research communication. It should also include changes to what may constitute design research in the future. Channels for additional technological advances could therefore be provided that match the way

design research could be represented, expressed and conducted in the future. Such advances could include real time and/or media streaming instead of video, videoconferencing instead of e-mail, new three-dimensional interactive and/or virtual environments and communication through wireless and satellites systems such as compatible WAP mobile phones and/or any other device that has not yet been conceived or developed.

In order to ensure that the system always reflects the ongoing future design research needs and their changing context, it is argued that the system should be owned by the design researchers themselves and all those involved in using it. However the need for an administrator and an editorial board in the real world seems to be necessary. Therefore it is proposed that the system could be administered through a liaison of national and international universities, design and educational organisations. This may ensure the smooth running of the system and its future proofing in a changing environment. This management body could also undertake responsibility for investigating the changing context of what constitutes design research and take responsibility for adapting the system according to need.

Some of the immediate needs identified are stated in the section on further research. Additional needs include the implementation of a help facility in the form of a dictionary or thesaurus of synonymous terms (see section 7.5). For example end users could represent or formulate their work or inquiry using their own keywords according to their own understanding. However, as there is as yet no common understanding of terminology, an artificial intelligent agent in the form of a tailored script in the system could suggest other relevant keywords, which end users could assign and include in the formulation of their work or inquiry. This may improve the match facility as well as prepare the groundwork for a common terminology within design research disciplines.

It is also apparent that research communicated through the system's channels could include confidential work, such as research sponsored by government, industry and commercial sectors. In those cases where it is considered appropriate by the parties involved, end users could be given access to research abstracts. Furthermore, full information about confidential research could be made available subject to the charging of fees with the agreement of the owners of the information.

There are various ways in which the system could be funded within the design research environment. For instance, interested parties (universities and colleges, research bodies



and other organisations or institutions) around the world could subscribe to the system on an annual basis as is often done with journals. Subscribers would be given a personal password related to their identity (staff or student identity) in order to access the system and its services. It is proposed that the income gained could be used for the system's maintenance, administration and promotion.

Finally, the transferability of the proposed theoretical should be emphasised. Although this model has been formulated for improving the effectiveness and efficiency of communication within the design research community the model is a generic theoretical communication model which could equally be applied or adapted to other disciplines such as, science, medicine, computing, politics, business, humanities, engineering and architecture.

On this basis, application of this generic theoretical model to other disciplines could result in related communication systems for a variety of subjects linked together. This in turn could result in a new universal interrelated, interdisciplinary, multidisciplinary and interlinked research network.

## **7.7 Summary**

The findings from this research indicate the proposed theoretical model represents an improvement in the effectiveness and efficiency in the way design research results can be communicated between design researchers, and therefore, the proposed theoretical communication and information model could be used as a basis to improve the communication of design research results and to improve communication between design researchers. Although the current research work has certain limitations as mentioned earlier, Shneiderman (1992, p. 54) point out that a theory or a model by its definition "is an abstraction of reality, and therefore must be incomplete" in which, what constitutes a good theory is "its understandability, as well as, its ability to produce similar conclusions for all who use it, and help to solve specific practical problems". Based on these principles, the current research hopes to be understandable and be the cause for further research in the area, thus, its value lies with others to either accept, modify or contradict it, and therefore, in its own right this thesis hopes to have contributed to knowledge growth.

## **Appendices and References**

<b>Appendix I:</b>	<b>Primary Research Instrument and Data</b>	<b>275</b>
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<b>Appendix IV:</b>	<b>Primary Evaluation Exercise Instrument and Data</b>	<b>385</b>
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<b>Appendix VII:</b>	<b>Meanings to the Abbreviations</b>	<b>428</b>
<b>Appendix VIII:</b>	<b>Analysis of RAE Outcomes Relevant to Art and Design</b>	<b>430</b>
<b>References</b>		<b>455</b>



## **Primary Research Tool**

This Appendix consists of the instruments used in the questionnaire, the accompanying letters and the list of participated bodies and organisations. It also documents the questionnaire's responses and the basic statistical description of the data. The following people and organisations provided the addresses of possible subjects:

**Dr Robert Jerrard (in relation to Design Research Society)**

University of Central England in Birmingham, Corporation street, Birmingham, B4 7DX

**Mr Brian Lymbery (in relation to Chartered Society of Designers)**

Chartered Society of Designers, 32 - 38 Saffron Hill, London, EC1N 8FH

**Prof Brian Allison (in relation to ARIAD), De Montfort University, Leicester**

The following present the letters and the questionnaire itself sent on the subjects:

*Dear Sir / Madam,*

*Research communication within the design discipline.*

In recent years it has become increasingly evident that there are problems in the ways information is communicated within the design discipline. These problems have been exacerbated by the development of the new technologies. A survey is being conducted to help identify the nature of the problem and to look forward to their resolution.

The main questions being addressed to designers are:

**What does research in design mean to you?**

**What do you want from information resources about design?**

**What communication system(s) keep you informed of current design trends and improvements?**

I sincerely hope that you will participate in this survey by addressing these questions from your own professional experience. This survey is part of a PhD research project entitled:

**"The development of a methodology and system for representing academic design research with particular reference to Information Technology based representation and communication".**

The project is being supervised by Nick Higgett, Brian Allison and Ray Holland. The survey is being assisted by the Chartered Society of Designers (CSD), to whom the outcomes will be reported.

The following questionnaire is quite long but I hope you will be able to make time to complete it. I appreciate the pressures on your time but would be grateful if you could return the questionnaire to me as soon as possible. If you want more information about this project or wish to be kept informed of the results do not hesitate to contact me. I look forward to hearing from you. Thank you for your help.

*Yours sincerely,*

*Nikolaos Bessis, PhD Design Research*

*Tel.: 0116 2551551 ext: 8575,*

*e-mail: nbessis@dmu.ac.uk*



**DE MONTFORT  
UNIVERSITY  
LEICESTER**

- What does research in design mean to you?**
- What communication system(s) keep you informed of current design trends and improvements?**
- What do you want from information resources about design?**

## **How to complete the questionnaire**

1. Please write in capital letters.
2. Tick boxes like this
3. If you make a mistake, simply cross it out and continue.
4. Please return the questionnaire to:

N. Bessis  
School of Design and  
Manufacture  
De Montfort University  
The Gateway  
Leicester  
LE1 9BH



**1. Personal and Professional Details**

**Title:** Prof 01  Dr 02  Mr 03  Mrs 04  Ms 05  Miss 06

**Sex:** M 01  F 02

**Surname:**..... **First Name:**.....

**1.1 Please indicate your age category from one of the following groups:**

- Below the age of 28 01
- 29 - 34 02
- 35 - 44 03
- 45 - 58 04
- 59 + 05

**1.2 Please indicate your educational qualification(s): (Please tick all that apply)**

- |                  |                             |              |                             |
|------------------|-----------------------------|--------------|-----------------------------|
| HND / BTEC       | 01 <input type="checkbox"/> | Post-Doct    | 05 <input type="checkbox"/> |
| BA / BSc / BEng  | 02 <input type="checkbox"/> | Professional | 06 <input type="checkbox"/> |
| MA / MSc / MPhil | 03 <input type="checkbox"/> | Practitioner | 07 <input type="checkbox"/> |
| PhD              | 04 <input type="checkbox"/> | Other.....   | 08 <input type="checkbox"/> |

**1.3 Please indicate your main discipline:**

- Design Management 01
- Fashion / Textiles 02
- Interior / Furniture Design 03
- Industrial / Product Design 04
- Graphics/ Multimedia Design 05
- Other design discipline ..... 06
- Non design discipline ..... 07

**1.4 Which post best describes your main occupational status?**

- |                      |                             |              |                             |
|----------------------|-----------------------------|--------------|-----------------------------|
| Research student     | 01 <input type="checkbox"/> | Assistant    | 10 <input type="checkbox"/> |
| Senior researcher    | 02 <input type="checkbox"/> | Technician   | 11 <input type="checkbox"/> |
| Principal researcher | 03 <input type="checkbox"/> | Practitioner | 12 <input type="checkbox"/> |
| Research fellow      | 04 <input type="checkbox"/> | Designer     | 13 <input type="checkbox"/> |
| Lecturer             | 05 <input type="checkbox"/> | Consultant   | 14 <input type="checkbox"/> |
| Senior lecturer      | 06 <input type="checkbox"/> | Professional | 15 <input type="checkbox"/> |
| Principal lecturer   | 07 <input type="checkbox"/> | Manager      | 16 <input type="checkbox"/> |
| Supervisor           | 08 <input type="checkbox"/> | Other.....   | 17 <input type="checkbox"/> |
| Programme leader     | 09 <input type="checkbox"/> |              |                             |

**1.5 Please give your Institution's / Body's name:**

.....

**1.6 Which best describes your Institution's / Body's occupational status: (Please tick all that apply)**

- Education / Training 01
- Research & Development 02
- Consultancy 03
- Design Bureau 04
- Production 05
- Other..... 06

**1.7 Please indicate your membership of the following professional organisations: (Please tick all that apply)**

- |            |                             |                             |                             |                             |
|------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| None       | 01 <input type="checkbox"/> |                             |                             |                             |
|            |                             | Member                      | Council                     | Officer                     |
| CSD        | 02 <input type="checkbox"/> | 15 <input type="checkbox"/> | 28 <input type="checkbox"/> | 41 <input type="checkbox"/> |
| D&DA       | 03 <input type="checkbox"/> | 16 <input type="checkbox"/> | 29 <input type="checkbox"/> | 42 <input type="checkbox"/> |
| DBA        | 04 <input type="checkbox"/> | 17 <input type="checkbox"/> | 30 <input type="checkbox"/> | 43 <input type="checkbox"/> |
| DIA        | 05 <input type="checkbox"/> | 18 <input type="checkbox"/> | 31 <input type="checkbox"/> | 44 <input type="checkbox"/> |
| DMI        | 06 <input type="checkbox"/> | 19 <input type="checkbox"/> | 32 <input type="checkbox"/> | 45 <input type="checkbox"/> |
| DRS        | 07 <input type="checkbox"/> | 20 <input type="checkbox"/> | 33 <input type="checkbox"/> | 46 <input type="checkbox"/> |
| IDDA       | 08 <input type="checkbox"/> | 21 <input type="checkbox"/> | 34 <input type="checkbox"/> | 47 <input type="checkbox"/> |
| FIRA       | 09 <input type="checkbox"/> | 22 <input type="checkbox"/> | 35 <input type="checkbox"/> | 48 <input type="checkbox"/> |
| NSEAD      | 10 <input type="checkbox"/> | 23 <input type="checkbox"/> | 36 <input type="checkbox"/> | 49 <input type="checkbox"/> |
| RSA        | 11 <input type="checkbox"/> | 24 <input type="checkbox"/> | 37 <input type="checkbox"/> | 50 <input type="checkbox"/> |
| STD        | 12 <input type="checkbox"/> | 25 <input type="checkbox"/> | 38 <input type="checkbox"/> | 51 <input type="checkbox"/> |
| TI         | 13 <input type="checkbox"/> | 26 <input type="checkbox"/> | 39 <input type="checkbox"/> | 52 <input type="checkbox"/> |
| Other..... | 14 <input type="checkbox"/> | 27 <input type="checkbox"/> | 40 <input type="checkbox"/> | 53 <input type="checkbox"/> |

**2. Research Activity**

2.1 Please indicate if you are actively involved in research and if yes to what extent? (If No go to Question 3.1)

Yes 01  Full Time 03  Part Time 04   
 No 02

2.2 How many years have you been research active?

One to two years 01   
 Three to five years 02   
 Five to ten years 03   
 More than ten years 04   
 Other / NA..... 05

2.3 Please list any research papers you have presented in the last year:

Title:	Venue / Publication:
.....	.....
.....	.....
.....	.....
.....	.....

**3. Computer Technology**

3.1 Does your institution use computer technology?

Yes 01  No 02

3.2 Do you directly use computer technology? (If No go to Question 4.1)

Yes 01  No 02

3.3 Which of the following computer systems do you work on? (Please tick all that apply)

Windows 3.X / 95 / IBM compatible 01   
 Windows NT 02   
 Apple Mac / Mac OS compatible 03   
 UNIX 04   
 Other..... 05

3.4 Does your computer have a CD Rom facility?

Yes 01  No 02

3.5 How often do you use computer technology?

Less than five hours per week 01   
 Five to ten hours per week 02   
 Ten to twenty hours per week 03   
 More than twenty hours per week 04

3.6 For what purpose(s) do you use computer technology in your work? (Please tick all that apply)

Teaching 01   
 Research and Development 02   
 Design Practice 03   
 Administration 04   
 Other..... 05

3.7 Please rate the following type of applications in terms of your experience: (Please tick all that apply)

	Very Experienced	Experienced	Not very Experienced	Not Experienced
Word Processing	01 <input type="checkbox"/>	14 <input type="checkbox"/>	27 <input type="checkbox"/>	40 <input type="checkbox"/>
Page Layout	02 <input type="checkbox"/>	15 <input type="checkbox"/>	28 <input type="checkbox"/>	41 <input type="checkbox"/>
Spreadsheets	03 <input type="checkbox"/>	16 <input type="checkbox"/>	29 <input type="checkbox"/>	42 <input type="checkbox"/>
Image manipulation	04 <input type="checkbox"/>	17 <input type="checkbox"/>	30 <input type="checkbox"/>	43 <input type="checkbox"/>
Multimedia	05 <input type="checkbox"/>	18 <input type="checkbox"/>	31 <input type="checkbox"/>	44 <input type="checkbox"/>
Databases	06 <input type="checkbox"/>	19 <input type="checkbox"/>	32 <input type="checkbox"/>	45 <input type="checkbox"/>
CAD / CAM	07 <input type="checkbox"/>	20 <input type="checkbox"/>	33 <input type="checkbox"/>	46 <input type="checkbox"/>
WWW authoring	08 <input type="checkbox"/>	21 <input type="checkbox"/>	34 <input type="checkbox"/>	47 <input type="checkbox"/>
WWW browsing	09 <input type="checkbox"/>	22 <input type="checkbox"/>	35 <input type="checkbox"/>	48 <input type="checkbox"/>
FTP / Gopher	10 <input type="checkbox"/>	23 <input type="checkbox"/>	36 <input type="checkbox"/>	49 <input type="checkbox"/>
Newsgroups	11 <input type="checkbox"/>	24 <input type="checkbox"/>	37 <input type="checkbox"/>	50 <input type="checkbox"/>
E-mail	12 <input type="checkbox"/>	25 <input type="checkbox"/>	38 <input type="checkbox"/>	51 <input type="checkbox"/>
Mail-base	13 <input type="checkbox"/>	26 <input type="checkbox"/>	39 <input type="checkbox"/>	52 <input type="checkbox"/>



- 3.8 Do you have access to the Internet? (If No go to Question 4.1)  
 Yes 01  No 02
- 3.9 How often do you use the Internet?  
 Less than five hours per week 01   
 Five to ten hours per week 02   
 Ten to twenty hours per week 03   
 More than twenty hours per week 04   
 Not at all 05
- 3.10 What type of information do you usually search for on the Internet? (Please tick all that apply)  
 Governmental 01   
 Commercial 02   
 Scientific 03   
 Academic / Higher education 04   
 Technological 05   
 Social 06   
 Other..... 07
- 3.11 Which of the following Internet tools do you use frequently? (Please tick all that apply)  
 FTP/Gopher 01   
 WWW 02   
 E-mail 03   
 Newsgroups 04   
 Other..... 05
- 3.12 Which of the following WWW search engines do you use most? (Please tick all that apply)  
 Yahoo 01   
 Lycos 02   
 Altavista 03   
 Other..... 04

**4. Research Practice**

- 4.1 When you conduct research in design, how often do you search for previous and/or current research relevant to your enquiry?  
 Always 01   
 Frequently 02   
 Seldom 03   
 Never 04
- 4.2 Which of the following information and communication systems do you use to search for previous and/or current research? (Please tick all that apply)  
 Printed materials 01   
 Audio-visual materials 02   
 Events 03   
 Computer based materials 04   
 Other..... 05

**5. Non Computer based Information and Communication Systems**

- 5.1 Please rate the following in terms of importance as contributors to your research activity:
- |                          | Very important              | Important                   | Not very important          | Unimportant                 |
|--------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Literature / Periodicals | 01 <input type="checkbox"/> | 09 <input type="checkbox"/> | 17 <input type="checkbox"/> | 25 <input type="checkbox"/> |
| Conferences              | 02 <input type="checkbox"/> | 10 <input type="checkbox"/> | 18 <input type="checkbox"/> | 26 <input type="checkbox"/> |
| Seminars                 | 03 <input type="checkbox"/> | 11 <input type="checkbox"/> | 19 <input type="checkbox"/> | 27 <input type="checkbox"/> |
| Workshops                | 04 <input type="checkbox"/> | 12 <input type="checkbox"/> | 20 <input type="checkbox"/> | 28 <input type="checkbox"/> |
| Exhibitions              | 05 <input type="checkbox"/> | 13 <input type="checkbox"/> | 21 <input type="checkbox"/> | 29 <input type="checkbox"/> |
| Meetings                 | 06 <input type="checkbox"/> | 14 <input type="checkbox"/> | 22 <input type="checkbox"/> | 30 <input type="checkbox"/> |
| Correspondence contacts  | 07 <input type="checkbox"/> | 15 <input type="checkbox"/> | 23 <input type="checkbox"/> | 31 <input type="checkbox"/> |
| Other.....               | 08 <input type="checkbox"/> | 16 <input type="checkbox"/> | 24 <input type="checkbox"/> | 32 <input type="checkbox"/> |

5.2 Please rate the following in terms of importance as contributors to your research activity:

	Very Important	Important	Not very Important	Unimportant
Abstracts / Indexes / Catalogues	01 <input type="checkbox"/>	16 <input type="checkbox"/>	31 <input type="checkbox"/>	46 <input type="checkbox"/>
Books	02 <input type="checkbox"/>	17 <input type="checkbox"/>	32 <input type="checkbox"/>	47 <input type="checkbox"/>
Research theses	03 <input type="checkbox"/>	18 <input type="checkbox"/>	33 <input type="checkbox"/>	48 <input type="checkbox"/>
Reports	04 <input type="checkbox"/>	19 <input type="checkbox"/>	34 <input type="checkbox"/>	49 <input type="checkbox"/>
Papers / Proceedings	05 <input type="checkbox"/>	20 <input type="checkbox"/>	35 <input type="checkbox"/>	50 <input type="checkbox"/>
Articles / Reviews	06 <input type="checkbox"/>	21 <input type="checkbox"/>	36 <input type="checkbox"/>	51 <input type="checkbox"/>
Newsletters	07 <input type="checkbox"/>	22 <input type="checkbox"/>	37 <input type="checkbox"/>	52 <input type="checkbox"/>
Tapes	08 <input type="checkbox"/>	23 <input type="checkbox"/>	38 <input type="checkbox"/>	53 <input type="checkbox"/>
Slides	09 <input type="checkbox"/>	24 <input type="checkbox"/>	39 <input type="checkbox"/>	54 <input type="checkbox"/>
Microform	10 <input type="checkbox"/>	25 <input type="checkbox"/>	40 <input type="checkbox"/>	55 <input type="checkbox"/>
Questionnaires	11 <input type="checkbox"/>	26 <input type="checkbox"/>	41 <input type="checkbox"/>	56 <input type="checkbox"/>
Direct contacts / Interviews	12 <input type="checkbox"/>	27 <input type="checkbox"/>	42 <input type="checkbox"/>	57 <input type="checkbox"/>
Mail	13 <input type="checkbox"/>	28 <input type="checkbox"/>	43 <input type="checkbox"/>	58 <input type="checkbox"/>
Telephone / Fax	14 <input type="checkbox"/>	29 <input type="checkbox"/>	44 <input type="checkbox"/>	59 <input type="checkbox"/>
Other.....	15 <input type="checkbox"/>	30 <input type="checkbox"/>	45 <input type="checkbox"/>	60 <input type="checkbox"/>

6. Computer based Information and Communication Systems / Resources

6.1 Please rate the following in terms of importance as contributors to your research activity:

	Very Important	Important	Not very Important	Unimportant
OPAC's	01 <input type="checkbox"/>	10 <input type="checkbox"/>	19 <input type="checkbox"/>	28 <input type="checkbox"/>
Telnet	02 <input type="checkbox"/>	11 <input type="checkbox"/>	20 <input type="checkbox"/>	29 <input type="checkbox"/>
CD Rom databases	03 <input type="checkbox"/>	12 <input type="checkbox"/>	21 <input type="checkbox"/>	30 <input type="checkbox"/>
WWW	04 <input type="checkbox"/>	13 <input type="checkbox"/>	22 <input type="checkbox"/>	31 <input type="checkbox"/>
FTP / Gopher	05 <input type="checkbox"/>	14 <input type="checkbox"/>	23 <input type="checkbox"/>	32 <input type="checkbox"/>
Newsgroups	06 <input type="checkbox"/>	15 <input type="checkbox"/>	24 <input type="checkbox"/>	33 <input type="checkbox"/>
E-mail	07 <input type="checkbox"/>	16 <input type="checkbox"/>	25 <input type="checkbox"/>	34 <input type="checkbox"/>
Mail-base	08 <input type="checkbox"/>	17 <input type="checkbox"/>	26 <input type="checkbox"/>	35 <input type="checkbox"/>
Other.....	09 <input type="checkbox"/>	18 <input type="checkbox"/>	27 <input type="checkbox"/>	36 <input type="checkbox"/>

6.2 Please rate the following in terms of importance as contributors to your research activity:

	Very Important	Important	Not very Important	Unimportant
Art, Design and Architecture Media Information Gateway (ADAM)	01 <input type="checkbox"/>	20 <input type="checkbox"/>	39 <input type="checkbox"/>	58 <input type="checkbox"/>
Allison Research Index of Art and Design (ARIAD)	02 <input type="checkbox"/>	21 <input type="checkbox"/>	40 <input type="checkbox"/>	59 <input type="checkbox"/>
Art Bibliographies Modern	03 <input type="checkbox"/>	22 <input type="checkbox"/>	41 <input type="checkbox"/>	60 <input type="checkbox"/>
Art Index	04 <input type="checkbox"/>	23 <input type="checkbox"/>	42 <input type="checkbox"/>	61 <input type="checkbox"/>
Bath Information and Data Services (BIDS)	05 <input type="checkbox"/>	24 <input type="checkbox"/>	43 <input type="checkbox"/>	62 <input type="checkbox"/>
Bulletin Board for Libraries (BUBL)	06 <input type="checkbox"/>	25 <input type="checkbox"/>	44 <input type="checkbox"/>	63 <input type="checkbox"/>
BLDSC Conference Proceedings	07 <input type="checkbox"/>	26 <input type="checkbox"/>	45 <input type="checkbox"/>	64 <input type="checkbox"/>
British Education Index	08 <input type="checkbox"/>	27 <input type="checkbox"/>	46 <input type="checkbox"/>	65 <input type="checkbox"/>
British Reports, Translation and Theses	09 <input type="checkbox"/>	28 <input type="checkbox"/>	47 <input type="checkbox"/>	66 <input type="checkbox"/>
The Clothing and Textile Arts Index	10 <input type="checkbox"/>	29 <input type="checkbox"/>	48 <input type="checkbox"/>	67 <input type="checkbox"/>
Current Technology Index	11 <input type="checkbox"/>	30 <input type="checkbox"/>	49 <input type="checkbox"/>	68 <input type="checkbox"/>
Current Research in Britain	12 <input type="checkbox"/>	31 <input type="checkbox"/>	50 <input type="checkbox"/>	69 <input type="checkbox"/>
Design and Applied Arts Index	13 <input type="checkbox"/>	32 <input type="checkbox"/>	51 <input type="checkbox"/>	70 <input type="checkbox"/>
Educational Research Information Centre (ERIC)	14 <input type="checkbox"/>	33 <input type="checkbox"/>	52 <input type="checkbox"/>	71 <input type="checkbox"/>
Index to Theses (ASLIB)	15 <input type="checkbox"/>	34 <input type="checkbox"/>	53 <input type="checkbox"/>	72 <input type="checkbox"/>
Multimedia Assets for Industrial Design (MAID)	16 <input type="checkbox"/>	35 <input type="checkbox"/>	54 <input type="checkbox"/>	73 <input type="checkbox"/>
Textiles Technology Digest	17 <input type="checkbox"/>	36 <input type="checkbox"/>	55 <input type="checkbox"/>	74 <input type="checkbox"/>
Online Public Access Catalogues (OPAC's)	18 <input type="checkbox"/>	37 <input type="checkbox"/>	56 <input type="checkbox"/>	75 <input type="checkbox"/>
Other.....	19 <input type="checkbox"/>	38 <input type="checkbox"/>	57 <input type="checkbox"/>	76 <input type="checkbox"/>

7. Database Search Categories

7.1 Please rate the following references in terms of their usefulness in your computer based search activity:

	Very Useful	Useful	Not very Useful	Not Useful
Author	01 <input type="checkbox"/>	14 <input type="checkbox"/>	27 <input type="checkbox"/>	40 <input type="checkbox"/>
Research Project Title	02 <input type="checkbox"/>	15 <input type="checkbox"/>	28 <input type="checkbox"/>	41 <input type="checkbox"/>
Abstract / Summary	03 <input type="checkbox"/>	16 <input type="checkbox"/>	29 <input type="checkbox"/>	42 <input type="checkbox"/>
Aims and Objectives / Brief	04 <input type="checkbox"/>	17 <input type="checkbox"/>	30 <input type="checkbox"/>	43 <input type="checkbox"/>
Subject / Discipline	05 <input type="checkbox"/>	18 <input type="checkbox"/>	31 <input type="checkbox"/>	44 <input type="checkbox"/>
Keyword	06 <input type="checkbox"/>	19 <input type="checkbox"/>	32 <input type="checkbox"/>	45 <input type="checkbox"/>
Publication type (paper, theses, seminar, ...)	07 <input type="checkbox"/>	20 <input type="checkbox"/>	33 <input type="checkbox"/>	46 <input type="checkbox"/>
Resource type & award achieved (education, commercial,...)	08 <input type="checkbox"/>	21 <input type="checkbox"/>	34 <input type="checkbox"/>	47 <input type="checkbox"/>
Chronological and demographic determination	09 <input type="checkbox"/>	22 <input type="checkbox"/>	35 <input type="checkbox"/>	48 <input type="checkbox"/>
Methodology (practical, survey, case-studies,...)	10 <input type="checkbox"/>	23 <input type="checkbox"/>	36 <input type="checkbox"/>	49 <input type="checkbox"/>
Collaboration / Sponsor Body	11 <input type="checkbox"/>	24 <input type="checkbox"/>	37 <input type="checkbox"/>	50 <input type="checkbox"/>
Visual material	12 <input type="checkbox"/>	25 <input type="checkbox"/>	38 <input type="checkbox"/>	51 <input type="checkbox"/>
Other.....	13 <input type="checkbox"/>	26 <input type="checkbox"/>	39 <input type="checkbox"/>	52 <input type="checkbox"/>



**8. REVIEW: Strengths and Weaknesses of Selected Data and Communication Systems**

**8.1 Please rate the relevant features of any of the following systems in terms of their strengths and weaknesses. Please tick S for strength and W weakness:**

<u>System:</u>	<u>OPAC's</u> 01 02	<u>Telnet</u> 03 04	<u>CD Roms</u> 05 06	<u>E-mail</u> 07 08	<u>Mailbase</u> 09 10	<u>Newsgroups</u> 11 12	<u>FTP</u> 13 14	<u>WWW</u> 15 16
<b>User Interface</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>
17 Functionality	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
18 Easy to learn	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
19 Easy to use	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
20 Help facility	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
21 Graphical User Interface	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
22 Layout	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
23 Terminology	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
24 Speed	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
25 Other.....	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

**8.2 Please rate the relevant features of any of the following systems in terms of their strengths and weaknesses. Please tick S for strength and W weakness:**

<u>System:</u>	<u>OPAC's</u> 01 02	<u>Telnet</u> 03 04	<u>CD Roms</u> 05 06	<u>E-mail</u> 07 08	<u>Mailbase</u> 09 10	<u>Newsgroups</u> 11 12	<u>FTP</u> 13 14	<u>WWW</u> 15 16
<b>Information</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>
17 Structure	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
18 Content	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
19 Classification / Taxonomy	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
20 Representation	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
21 Reliability / Validity	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
22 Search options	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
23 Other.....	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

**8.3 Please rate the relevant features of any of the following systems in terms of their strengths and weaknesses. Please tick S for strength and W weakness:**

<u>System:</u>	<u>OPAC's</u> 01 02	<u>Telnet</u> 03 04	<u>CD Roms</u> 05 06	<u>E-mail</u> 07 08	<u>Mailbase</u> 09 10	<u>Newsgroups</u> 11 12	<u>FTP</u> 13 14	<u>WWW</u> 15 16
<b>Miscellaneous</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>	<b>S W</b>
17 Communication	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
18 Interactivity	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
19 Updatedability	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
20 Extensibility	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
21 Other.....	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

**8.4 Please identify your preferred data and communication systems and give their main features:**

01 Name of System (eg: ARIAD,...): ..... Type of System: (eg: CD, WWW,...): .....

.....

**Features:**

i.....

ii.....

iii.....

02 Name of System (eg: ARIAD,...): ..... Type of System: (eg: CD, WWW,...): .....

.....

**Features:**

i.....

ii.....

iii.....

03 Name of System (eg: ARIAD,...): ..... Type of System: (eg: CD, WWW,...): .....

.....

**Features:**

i.....

ii.....

iii.....

**9. Future Data and Communication Systems Features**

**9.1 Please rate the following characteristics which you feel should feature in any new data and communication system in terms of Importance to your research activity:**

	Very Important	Important	Not very Important	Unimportant
Online	01 <input type="checkbox"/>	27 <input type="checkbox"/>	63 <input type="checkbox"/>	79 <input type="checkbox"/>
Interactive	02 <input type="checkbox"/>	28 <input type="checkbox"/>	64 <input type="checkbox"/>	80 <input type="checkbox"/>
Hyperlinks	03 <input type="checkbox"/>	29 <input type="checkbox"/>	65 <input type="checkbox"/>	81 <input type="checkbox"/>
Speed	04 <input type="checkbox"/>	30 <input type="checkbox"/>	66 <input type="checkbox"/>	82 <input type="checkbox"/>
Help facility	05 <input type="checkbox"/>	31 <input type="checkbox"/>	67 <input type="checkbox"/>	83 <input type="checkbox"/>
Graphical user interface (GUI)	06 <input type="checkbox"/>	32 <input type="checkbox"/>	68 <input type="checkbox"/>	84 <input type="checkbox"/>
Updated	07 <input type="checkbox"/>	33 <input type="checkbox"/>	69 <input type="checkbox"/>	85 <input type="checkbox"/>
Extensible	08 <input type="checkbox"/>	34 <input type="checkbox"/>	70 <input type="checkbox"/>	86 <input type="checkbox"/>
Refereed information content	09 <input type="checkbox"/>	35 <input type="checkbox"/>	71 <input type="checkbox"/>	87 <input type="checkbox"/>
Indexed classification system	10 <input type="checkbox"/>	36 <input type="checkbox"/>	72 <input type="checkbox"/>	88 <input type="checkbox"/>
2D visual representation	11 <input type="checkbox"/>	37 <input type="checkbox"/>	73 <input type="checkbox"/>	89 <input type="checkbox"/>
Sound representation	12 <input type="checkbox"/>	38 <input type="checkbox"/>	74 <input type="checkbox"/>	90 <input type="checkbox"/>
Video-based representation	13 <input type="checkbox"/>	39 <input type="checkbox"/>	75 <input type="checkbox"/>	91 <input type="checkbox"/>
Virtual reality representation	14 <input type="checkbox"/>	40 <input type="checkbox"/>	76 <input type="checkbox"/>	92 <input type="checkbox"/>
Keyword(s), image search system	15 <input type="checkbox"/>	41 <input type="checkbox"/>	77 <input type="checkbox"/>	93 <input type="checkbox"/>
Refined intelligent search system*	16 <input type="checkbox"/>	42 <input type="checkbox"/>	78 <input type="checkbox"/>	94 <input type="checkbox"/>
Ordering system	17 <input type="checkbox"/>	43 <input type="checkbox"/>	79 <input type="checkbox"/>	95 <input type="checkbox"/>
E-mail	18 <input type="checkbox"/>	44 <input type="checkbox"/>	80 <input type="checkbox"/>	96 <input type="checkbox"/>
Text conferencing	19 <input type="checkbox"/>	45 <input type="checkbox"/>	81 <input type="checkbox"/>	97 <input type="checkbox"/>
Voice conferencing	20 <input type="checkbox"/>	46 <input type="checkbox"/>	82 <input type="checkbox"/>	98 <input type="checkbox"/>
Video conferencing	21 <input type="checkbox"/>	47 <input type="checkbox"/>	83 <input type="checkbox"/>	99 <input type="checkbox"/>
File transfer	22 <input type="checkbox"/>	48 <input type="checkbox"/>	84 <input type="checkbox"/>	100 <input type="checkbox"/>
Application sharing	23 <input type="checkbox"/>	49 <input type="checkbox"/>	85 <input type="checkbox"/>	101 <input type="checkbox"/>
Publication facility	24 <input type="checkbox"/>	50 <input type="checkbox"/>	86 <input type="checkbox"/>	102 <input type="checkbox"/>
White board facility	25 <input type="checkbox"/>	51 <input type="checkbox"/>	87 <input type="checkbox"/>	103 <input type="checkbox"/>
Other.....	26 <input type="checkbox"/>	52 <input type="checkbox"/>	88 <input type="checkbox"/>	104 <input type="checkbox"/>

\* If you ask for specific information the computer will intelligently permit entries related directly to your enquiry while rejecting any non useful entries.

**9.2 Please arrange the following databases in order of importance to your research needs from 1 (most important) to 6 / 7 (least important):**

Index of standards for product testing and quality assurance	01 .....
Index of professional organisations and research relevant bodies	02 .....
Index of national and international events and other resources (exhibitions, conferences)	03 .....
Index of completed research within the academic design area	04 .....
Index of current research within the academic design area	05 .....
Index of individuals willing to collaborate in research endeavour (supervisors, practitioners,....)	06 .....
Other.....	07 .....

**9.3 Please rate the following delivery systems in terms of appropriateness for the database you identify as most important in question 9.2:**

	Very Appropriate	Appropriate	Not very Appropriate	Inappropriate
Mailbase system	01 <input type="checkbox"/>	05 <input type="checkbox"/>	09 <input type="checkbox"/>	13 <input type="checkbox"/>
CD Rom based system	02 <input type="checkbox"/>	06 <input type="checkbox"/>	10 <input type="checkbox"/>	14 <input type="checkbox"/>
Online WWW based system	03 <input type="checkbox"/>	07 <input type="checkbox"/>	11 <input type="checkbox"/>	15 <input type="checkbox"/>
Other.....	04 <input type="checkbox"/>	08 <input type="checkbox"/>	12 <input type="checkbox"/>	16 <input type="checkbox"/>

May I contact you further? Yes 01  No 02

Please give your telephone number: 0..... ext.....

E-mail Address:.....

Full Address:.....

Today's Date:.....

Please return your completed questionnaire. Thank you for your help.

(Office use) Received on:..... No.....



This survey has been researched and designed by N. Bessis for his PhD research. It is supported by his Supervisors: N. Higgett, Prof. B. Allison, R. Holland, and the De Montfort University, Leicester.



**TEXT BOUND INTO**

**THE SPINE**



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	prof	dr	mr	ms	title	sex	surname	name	v1.1	vequalif	bas	adv	vadv
1			Mr		Mr	Male	Cook	John	45-58	Advanced		Advanced	
2			Mr		Mr	Male	Martin	Paul	45-58	Basic	Basic		
3			Mr		Mr	Male	Liang	Robert	29-34	Advanced		Advanced	
4			Mr		Mr	Male	Hartwell	David	45-58	Other			
5				Ms	Ms	Female	Prendivi	Alison	29-34	Advanced		Advanced	
6	Professo				Professo	Male	VanDerLe	Paul	45-58	Very Adv			Very Adv
7				Miss	Miss	Female	Bodenham	Helen	29-34	Advanced		Advanced	
8		Mr			Mr	Male	Shaw	Benjamin	35-44	Advanced		Advanced	
9	Professo				Professo		Reid	Hew	59+	Very Adv			Very Adv
10				Ms	Ms	Female	Hart	Sue	45-58	Basic	Basic		
11		Dr			Dr	Male	Bishop	David	45-58	Very Adv			Very Adv
12		Dr			Dr	Male	Hou	Lei	35-44	Very Adv			Very Adv
13				Miss	Miss	Female	Arrowsmi	Claire	below th	Basic	Basic		
14				Ms	Ms	Female	Georgiad	Elisavet	29-34	Advanced		Advanced	
15			Mr		Mr	Male	Snow	Rob	29-34	Advanced		Advanced	
16			Mr		Mr	Male	Robertso	Alec	35-44	Advanced		Advanced	
17			Mr		Mr	Male	Holland	Rav	45-58	Advanced		Advanced	
18		Dr			Dr				35-44	Very Adv			Very Adv
19	Professo				Professo	Female	Cooper	Rachel	35-44	Very Adv			Very Adv
20			Mr		Mr	Male			29-34	Advanced		Advanced	
21		Dr			Dr	Female	Flint	Nancy	29-34	Very Adv			Very Adv
22		Dr			Dr	Male	Fozzard	Gary	29-34	Very Adv			Very Adv
23									45-58	Very Adv			Very Adv
24				Miss	Miss	Female	Hardaker	Carolyn	29-34	Advanced		Advanced	
25			Mr		Mr	Male	Fisher	Tom	35-44	Basic	Basic		
26				Ms	Ms	Female	Poole	Lucy	below th	Advanced		Advanced	
27				Ms	Ms	Female	Candy	Linda	45-58	Advanced		Advanced	
28			Mr		Mr	Male	Davis	Mike	45-58	Other			
29		Dr			Dr	Female	Heeley	Joanne	below th	Very Adv			Very Adv
30			Mr		Mr	Male	Bonner	John	35-44	Basic	Basic		
31		Dr			Dr	Male	Turner	Martin	29-34	Very Adv			Very Adv
32		Dr			Dr	Female	Bhamra	Tracy	below th	Very Adv			Very Adv
33	Professo				Professo	Male	Symes	Martin	45-58	Very Adv			Very Adv
34	Professo				Professo	Male	Archer	Bruce	59+	Very Adv			Very Adv
35		Dr			Dr	Male	Potter	Stephen	35-44	Very Adv			Very Adv
36			Mr		Mr	Male	Coward	Tim	45-58	Advanced		Advanced	
37				Ms	Ms	Female	Thomas	Angharad	45-58	Advanced		Advanced	
38		Dr			Dr	Male	Biags	Michael	35-44	Very Adv			Very Adv
39		Dr			Dr	Male	Young	Robert	35-44	Very Adv			Very Adv
40	Professo				Professo	Male	Agnew	Kenneth	59+	Advanced		Advanced	
41				Miss	Miss	Female	Karligio	Eleni	below th	Advanced		Advanced	
42			Mr		Mr	Male	Barker	John Hen	45-58	Advanced		Advanced	
43		Dr			Dr	Female	Briags	Amanda	29-34	Very Adv			Very Adv
44			Mr		Mr	Male	Smith	Brian	59+	Basic	Basic		
45			Mr		Mr	Male	Smith	Alan	45-58	Other			
46			Mr		Mr	Male	Kettell	Robert	35-44	Advanced		Advanced	
47				Ms	Ms	Female	Harding	Emma	29-34	Advanced		Advanced	
48	Professo				Professo	Male	Robertso	Peter	35-44	Very Adv			Very Adv
49				Ms	Ms	Female	Barnes	Sara	35-44	Basic	Basic		
50			Mr		Mr	Male	Lin	MingHuan	29-34	Advanced		Advanced	
51		Dr			Dr	Male	Glanvill	Ranulph	45-58	Very Adv			Very Adv
52		Dr			Dr	Female	Liddamen	Terry	45-58	Very Adv			Very Adv
53			Mr		Mr	Male	Vargo	Andrew	45-58	Advanced		Advanced	
54			Mr		Mr	Male	Higgett	Nick	35-44	Advanced		Advanced	
55			Mr		Mr	Male	Bessis	Nikolaos	29-34	Advanced		Advanced	
56		Dr			Dr				35-44	Very Adv			Very Adv
57			Mr		Mr	Male	Pandroul	Tolis	below th	Advanced		Advanced	
58				Ms	Ms	Female	Miagou	Olga	29-34	Advanced		Advanced	
59				Ms	Ms	Female	Bunnell	Katie	29-34	Advanced		Advanced	
60	Professo			Miss	Professo	Female	Gray	Carole	35-44	Very Adv			Very Adv
61		Dr		Mrs	Dr	Female	Sterry	Pat	45-58	Very Adv			Very Adv
62		Dr		Mrs	Dr	Female			29-34	Very Adv			Very Adv
63			Mr		Mr	Male			below th	Basic	Basic		
64		Dr		Mrs	Dr	Female	Bunce	Gillian	45-58	Very Adv			Very Adv
65			Mr		Mr	Male	Hull	Edmund	45-58	Basic	Basic		
66			Mr		Mr	Male	Coe	Brian	45-58	Advanced		Advanced	
67			Mr		Mr	Male	Oliver	Mark	35-44	Basic	Basic		
68				Mrs	Mrs	Female	Theodosi	SallyAnn	35-44	Basic	Basic		
69				Mrs	Mrs	Female	Foulis	Jane	45-58	Advanced		Advanced	
70			Mr		Mr	Male	Desbacat	Gus	35-44	Advanced		Advanced	
71			Mr		Mr	Male	Sayer	Jack	35-44	Basic	Basic		
72				Ms	Ms	Female	Tottle	Ann	35-44	Basic	Basic		
73			Mr		Mr	Male	Sheldon	Martin	below th	Basic	Basic		
74			Mr		Mr	Male			35-44	Basic	Basic		
75				Mrs	Mrs	Female			45-58	Basic	Basic		
76			Mr		Mr	Male	Boyer	Graham	45-58	Other			
77				Ms	Ms	Female	Gibbs	Sally	29-34	Basic	Basic		
78				Miss	Miss	Female	Liapi	Eirini	below th	Advanced		Advanced	
79			Mr		Mr	Male			45-58	Basic	Basic		
80				Ms	Ms	Female			45-58	Basic	Basic		
81			Mr		Mr	Male	Stewart	Jim	35-44	Advanced		Advanced	
82				Mrs	Mrs	Female	Patrick	Anne Jud	45-58	Basic	Basic		
83				Ms	Ms	Female	Fox	Val	45-58	Basic	Basic		
84				Miss	Miss	Female	Shearing	Chantal	below th	Basic	Basic		
85				Ms	Ms	Female			below th	Advanced		Advanced	
86				Miss	Miss	Female	Lampropo	Vasiliki	below th	Basic	Basic		
87			Mr		Mr	Male	Curran	Desmond	59+	Basic	Basic		



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v1.2a	v1.2b	v1.2c	v1.2d	v1.2e	v1.2f	v1.2g	v1.2h	v1.3a	v1.3b	v1.3c	v1.3d	v1.3e
1			MA/MSc/M			Professi	Practiti					Industri	
2		BA/BSc/B									Interior		
3			MA/MSc/M									Industri	
4						Professi		Other			Interior		
5			MA/MSc/M						Design M				
6		BA/BSc/B	MA/MSc/M	PhD	Post-Doc	Professi	Practiti	Other					Graphics
7			MA/MSc/M						Design M	Fashion/			
8		BA/BSc/B	MA/MSc/M			Professi						Industri	
9		BA/BSc/B		PhD		Professi					Interior		
10		BA/BSc/B				Professi	Practiti		Design M				
11		BA/BSc/B		PhD						Fashion/			
12				PhD						Fashion/			
13		BA/BSc/B								Fashion/			
14		BA/BSc/B	MA/MSc/M										Graphics
15		BA/BSc/B	MA/MSc/M										Graphics
16			MA/MSc/M			Professi							
17			MA/MSc/M			Professi			Design M				
18				PhD									
19				PhD		Professi			Design M				
20		BA/BSc/B	MA/MSc/M										Graphics
21		BA/BSc/B		PhD			Practiti						Graphics
22		BA/BSc/B	MA/MSc/M	PhD									
23		BA/BSc/B		PhD		Professi	Practiti			Fashion/			
24		BA/BSc/B	MA/MSc/M							Fashion/			
25		BA/BSc/B										Industri	
26		BA/BSc/B	MA/MSc/M								Interior		
27			MA/MSc/M			Professi							
28							Practiti	Other					
29		BA/BSc/B		PhD	Post-Doc					Fashion/			
30		BA/BSc/B											
31		BA/BSc/B	MA/MSc/M	PhD									
32		BA/BSc/B	MA/MSc/M	PhD									
33		BA/BSc/B	MA/MSc/M	PhD		Professi							
34	HND/BTEC		MA/MSc/M	PhD		Professi						Industri	
35				PhD									
36			MA/MSc/M			Professi						Industri	
37		BA/BSc/B	MA/MSc/M					Other		Fashion/			
38		BA/BSc/B	MA/MSc/M	PhD									
39		BA/BSc/B		PhD		Professi						Industri	
40			MA/MSc/M			Professi						Industri	
41		BA/BSc/B	MA/MSc/M										
42			MA/MSc/M			Professi	Practiti				Interior		
43		BA/BSc/B	MA/MSc/M	PhD						Fashion/			
44		BA/BSc/B								Fashion/			
45								Other	Design M	Fashion/			Graphics
46		BA/BSc/B	MA/MSc/M					Other					Graphics
47		BA/BSc/B	MA/MSc/M							Fashion/			
48		BA/BSc/B		PhD		Professi	Practiti					Industri	
49		BA/BSc/B										Industri	Graphics
50			MA/MSc/M									Industri	
51		BA/BSc/B	MA/MSc/M	PhD		Professi	Practiti						
52	HND/BTEC	BA/BSc/B	MA/MSc/M	PhD	Post-Doc								
53			MA/MSc/M			Professi	Practiti						Graphics
54		BA/BSc/B	MA/MSc/M										Graphics
55		BA/BSc/B	MA/MSc/M										Graphics
56		BA/BSc/B	MA/MSc/M	PhD		Professi			Design M			Industri	
57		BA/BSc/B	MA/MSc/M			Professi							
58		BA/BSc/B	MA/MSc/M								Interior	Industri	
59		BA/BSc/B	MA/MSc/M			Professi	Practiti						
60		BA/BSc/B	MA/MSc/M	PhD	Post-Doc		Practiti						
61		BA/BSc/B		PhD									
62		BA/BSc/B	MA/MSc/M	PhD	Post-Doc								
63		BA/BSc/B								Fashion/			
64				PhD						Fashion/			
65		BA/BSc/B					Practiti						
66			MA/MSc/M				Practiti						Graphics
67		BA/BSc/B											Graphics
68		BA/BSc/B				Professi							Graphics
69	HND/BTEC	BA/BSc/B	MA/MSc/M			Professi				Fashion/			Graphics
70		BA/BSc/B	MA/MSc/M									Industri	
71		BA/BSc/B				Professi					Interior		
72	HND/BTEC					Professi				Fashion/			
73		BA/BSc/B									Interior		
74	HND/BTEC									Fashion/			
75	HND/BTEC						Practiti			Fashion/			
76						Professi			Design M		Interior		
77		BA/BSc/B				Professi			Design M				
78			MA/MSc/M			Professi					Interior		
79	HND/BTEC	BA/BSc/B				Professi	Practiti						Graphics
80		BA/BSc/B					Practiti	Other		Fashion/			
81		BA/BSc/B	MA/MSc/M			Professi							
82		BA/BSc/B				Professi	Practiti						
83		BA/BSc/B				Professi	Practiti		Design M				
84		BA/BSc/B										Industri	
85	HND/BTEC	BA/BSc/B	MA/MSc/M			Professi	Practiti		Design M	Fashion/			
86		BA/BSc/B									Interior		
87		BA/BSc/B									Interior		



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	v1.3f	v1.3g	v1.4	ved	vindb	v1.4a	v1.4b	v1.4c	v1.4d	v1.4e	v1.4f	v1.4g	v1.4h
1			EducBase	EducBase						Programm	Practiti		
2			EducBase	EducBase				Senior L					
3			EducBase	EducBase		Research							
4			EducBase	EducBase				Senior L					
5			EducBase	EducBase			Research						
6			InduBase		InduBase								
7			EducBase	EducBase				Lecturer	Supervis				
8			EducBase	EducBase		Research							
9			EducBase	EducBase									
10	Other De		EducBase	EducBase				Senior L					
11			EducBase	EducBase			Senior R						
12			EducBase	EducBase			Research						
13			EducBase	EducBase		Research							
14			EducBase	EducBase		Research							
15			EducBase	EducBase		Research		Lecturer				Designer	Consulta
16	Other De		EducBase	EducBase									
17			EducBase	EducBase				Principa					
18		Other No	EducBase	EducBase				Senior L					
19			EducBase	EducBase									
20			EducBase	EducBase		Research							
21			EducBase	EducBase								Designer	
22		Other No	EducBase	EducBase				Senior L					
23			EducBase	EducBase			Principa						
24			EducBase	EducBase				Senior L					
25			EducBase	EducBase				Senior L					
26			EducBase	EducBase		Research						Designer	
27	Other De		EducBase	EducBase		Senior R	Senior R						
28	Other De		EducBase	EducBase						Programm	Practiti		
29			EducBase	EducBase			Research						
30	Other De		EducBase	EducBase				Senior L					
31		Other No	EducBase	EducBase			Research						
32		Other No	EducBase	EducBase			Research						
33	Other De		EducBase	EducBase						Programm			
34	Other De		EducBase	EducBase					Supervis				
35	Other De		EducBase	EducBase			Research						
36			EducBase	EducBase									
37			EducBase	EducBase				Senior L		Programm			
38	Other De		EducBase	EducBase				Principa					
39			EducBase	EducBase				Principa					
40			EducBase	EducBase					Supervis				
41		Other No	EducBase	EducBase		Research							
42			InduBase		InduBase							Designer	
43	Other De		InduBase		InduBase			Lecturer			Practiti		
44			EducBase	EducBase				Lecturer					
45			EducBase	EducBase									
46			EducBase	EducBase				Principa					
47			EducBase	EducBase		Research		Lecturer					
48	Other De		EducBase	EducBase			Principa						
49		Other No	EducBase	EducBase		Research		Lecturer		Programm			
50			EducBase	EducBase		Research		Lecturer					
51	Other De	Other No	InduBase		InduBase								
52	Other De		EducBase	EducBase			Senior R	Lecturer					
53			EducBase	EducBase						Programm		Designer	
54			EducBase	EducBase				Principa					
55			EducBase	EducBase		Research		Lecturer					
56	Other De		InduBase		InduBase								Consulta
57		Other No	InduBase		InduBase								
58			EducBase	EducBase		Research						Designer	
59	Other De		EducBase	EducBase							Practiti	Designer	
60		Other No	EducBase	EducBase					Supervis		Practiti		
61	Other De		EducBase	EducBase				Senior L					
62	Other De		EducBase	EducBase			Research	Principa	Supervis	Programm			
63			EducBase	EducBase		Research							
64			EducBase	EducBase			Research						
65	Other De		EducBase	EducBase				Senior L					
66			EducBase	EducBase				Principa		Programm			
67			InduBase		InduBase							Designer	
68			EducBase	EducBase								Designer	
69			EducBase	EducBase									
70			InduBase		InduBase								
71			InduBase		InduBase								Consulta
72	Other De		InduBase		InduBase							Designer	
73			InduBase		InduBase							Designer	
74			EducBase	EducBase							Practiti		
75			InduBase		InduBase						Practiti		
76			InduBase		InduBase							Designer	Consulta
77		Other No	InduBase		InduBase							Consulta	
78			InduBase		InduBase							Designer	
79			InduBase		InduBase							Designer	Consulta
80			InduBase		InduBase							Designer	
81			EducBase	EducBase				Senior L					
82			InduBase		InduBase						Practiti		
83			InduBase		InduBase								
84			EducBase	EducBase								Designer	
85			InduBase		InduBase						Practiti	Designer	
86			EducBase	EducBase								Designer	
87			EducBase	EducBase				Senior L					



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	v1.4i	v1.4j	v1.4k	v1.5	v1.6a	v1.6b	v1.6c	v1.6d	v1.6e	v1.6f	v1.7	v1.7a	v1.7csd
1	Professi	Manager		DMU	Educatio						Yes	CSD Fell	CSD
2				DMU	Educatio						No	NA	
3				Un Derby	Educatio						Yes		
4				DMU	Educatio						Yes	CSD Memb	CSD
5				UEastLon	Educatio	Research					Yes		
6			Other	UWEBrist	Educatio	Research	Consulta				Yes	CSD Memb	CSD
7				UCE	Educatio	Research	Consulta				Yes	CSD Memb	CSD
8				RCA	Educatio						Yes		
9			Other	BuckinUC	Educatio						Yes		
10				NewcastC	Educatio						Yes		
11				DMU	Educatio	Research	Consulta				Yes		
12				DMU	Educatio	Research					Yes		
13				DMU	Educatio	Research	Consulta				Yes		
14				DMU	Educatio	Research					No	NA	
15	Professi			DMU	Educatio						No	NA	
16				CSD						Other	Yes	CSD Memb	CSD
17				DMU	Educatio						Yes		
18				DMU	Educatio						Yes		
19			Other	UCSalfor	Educatio						Yes		
20				DMU	Educatio	Research					Yes		
21				Liverpoo		Research					No	NA	
22				DMU	Educatio						No	NA	
23					Educatio						Yes		
24				DMU	Educatio						No	NA	
25				SHallamU	Educatio						Yes		
26				UWolverh	Educatio						Yes		
27				LoughboU	Educatio	Research					Yes		
28				USunderl	Educatio	Research					Yes		
29				ManchMeU	Educatio						Yes		
30				TeesideU	Educatio						No	NA	
31				DMU	Educatio	Research					Yes		
32				CranFU	Educatio	Research					No	NA	
33				UManches	Educatio						Yes		
34			Other	RCA UD L	Educatio						Yes		
35				OpenU	Educatio						No		
36		Manager		UWIC	Educatio						Yes	CSD Fell	CSD
37				USalford	Educatio	Research					Yes		
38				UHertfor	Educatio	Research					Yes		
39				UNorthNe	Educatio	Research	Consulta	Design B			Yes		
40				UUlster	Educatio						Yes	CSD Fell	CSD
41				DMU	Educatio	Research					No	NA	
42				BuilDesP			Consulta				Yes	CSD Fell	CSD
43				NoTrentU	Educatio	Research					Yes		
44				NoTrentU	Educatio						No	NA	
45		Manager		BradF&IU	Educatio	Research	Consulta	Design B			Yes	CSD Fell	CSD
46				UDerby	Educatio						No	NA	
47				UEL	Educatio						Yes	CSD Memb	CSD
48		Manager		KentIA&D	Educatio						Yes	CSD Fell	CSD
49		Manager		BlackpoC	Educatio						Yes		
50				RCA	Educatio	Research					No	NA	
51			Other	selfempl						Other	Yes		
52				GoldsmiU	Educatio	Research					Yes	CSD Memb	CSD
53				NorwichS	Educatio						Yes	CSD Memb	CSD
54				DMU	Educatio						Yes		
55				DMU	Educatio	Research	Consulta				No	NA	
56	Professi		Other	UCE	Educatio	Research	Consulta				Yes	CSD Memb	CSD
57				UCE	Educatio	Research	Consulta				Yes		
58			Other	Gray'sSA	Educatio	Research					No	NA	
59			Other	RobertGU	Educatio	Research	Consulta	Design B	Producti		Yes		
60				USalford	Educatio	Research					Yes		
61					Educatio	Research					No	NA	
62				NoTrentU	Educatio	Research	Consulta		Producti		No	NA	
63				NoTrentU	Educatio	Research	Consulta				No	NA	
64				DMU	Educatio						Yes		
65				DMU	Educatio						No	NA	
66				MODesign			Consulta	Design B	Producti		Yes	CSD Memb	CSD
67				CroyoonC	Educatio						Yes	CSD Memb	CSD
68							Consulta				Yes	CSD Memb	CSD
69	Professi		Other	CandompD			Consulta				Yes	CSD Memb	CSD
70				JMSayerD			Consulta				Yes	CSD Memb	CSD
71				TottleTr			Consulta				Yes	CSD Memb	CSD
72				JWebster			Consulta				Yes	CSD Memb	CSD
73								Design B	Producti		Yes	CSD Memb	CSD
74	Professi								Producti		Yes	CSD Memb	CSD
75		Manager		InteriFB			Consulta	Design B	Producti		Yes	CSD Memb	CSD
76	Professi			InteriFB			Consulta	Design B	Producti		No	NA	
77	Professi			InteriFB			Consulta	Design B	Producti		No	NA	
78							Consulta	Design B			Yes	CSD Memb	CSD
79										Other	No	NA	
80				DMU	Educatio						Yes	CSD Fell	CSD
81				JPPhotog						Other	Yes	CSD Memb	CSD
82		Manager		FoxDesCo			Consulta	Design B			Yes	CSD Memb	CSD
83				Optimum			Consulta				Yes	CSD Memb	CSD
84							Consulta	Design B			No	NA	
85	Professi			DMU	Educatio						No	NA	
86				DMU	Educatio						Yes		
87				DMU	Educatio						Yes		



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	v1.7drs	v1.7b	v1.7c	v1.7d	v1.7e	v1.7f	v2.1a	v2.1b	v2.2	v2.2.01	v2.2.02	v2.2.03	v2.2.04
1			RSA Memb				Yes	Part Tim	More tha				More tha
2							Yes	Part Tim	Three to		Three to		
3	DRS	DRS Fel				DMI Memb	Yes	Full Tim	One to T	One to T			
4							Yes	Part Tim	Three to		Three to		
5	DRS	DRS Memb					Yes	Full Tim	Three to		Three to		
6			RSA Memb			NSEAD Me	Other Me	Yes	Full Tim	More tha			More tha
7				DBA Memb				Yes	Part Tim	Three to		Three to	
8	DRS	DRS Memb						Yes	Full Tim	One to T	One to T		
9				FIRA Mem				Yes	Full Tim	More tha			More tha
10				D&DA Mem		NSEAD Me		Yes	Part Tim	More tha			More tha
11							Other Me	Yes	Full Tim	More tha			More tha
12							Other Me	Yes	Full Tim	Five to		Five to	
13				TI Membe				Yes	Full Tim	Other			
14								Yes	Full Tim	Three to		Three to	
15								Yes	Part Tim	One to T	One to T		
16	DRS	DRS Offi	RSA Fel				Other Me	Yes		Five to		Five to	
17	DRS	DRS Memb				DMI Memb	Other Me	Yes	Full Tim	More tha			More tha
18				TI Membe			Other Me	Yes	Part Tim	More tha			More tha
19			RSA Fel			DMI Memb		Yes	Full Tim	More tha			More tha
20	DRS	DRS Memb						Yes	Full Tim	Three to		Three to	
21								Yes	Part Tim	Five to		Five to	
22								Yes	Part Tim	More tha			More tha
23			RSA Fel	TI Fell			Other F	Yes	Part Tim	More tha			More tha
24								Yes	Part Tim	Five to		Five to	
25	DRS	DRS Memb						Yes	Part Tim	Three to		Three to	
26	DRS	DRS Memb						Yes	Full Tim	Three to		Three to	
27	DRS	DRS Memb						Yes	Full Tim	More tha			More tha
28							Other Me	Yes	Part Tim	More tha			More tha
29				TI Membe			Other Of	Yes	Full Tim	Three to		Three to	
30								Yes	Part Tim	Three to		Three to	
31							Other Me	Yes	Full Tim	Five to		Five to	
32								Yes	Full Tim	Five to		Five to	
33							Other Me	Yes	Part Tim	More tha			More tha
34	DRS	DRS Coun					Other Me	Yes	Part Tim	More tha			More tha
35	DRS	DRS Memb						Yes	Full Tim	More tha			More tha
36	DRS	DRS Memb	RSA Fel					Yes	Part Tim	More tha			More tha
37	DRS	DRS Memb						Yes	Part Tim	Three to		Three to	
38			RSA Fel	D&DA Mem				Yes	Part Tim	Five to		Five to	
39	DRS	DRS Memb	RSA Fel					Yes	Full Tim	Three to		Three to	
40			RSA Fel					Yes	Part Tim	More tha			More tha
41								Yes	Full Tim	One to T	One to T		
42				FIRA Mem			Other Me	Yes	Part Tim	More tha			More tha
43				TI Membe				Yes	Part Tim	Three to		Three to	
44								Yes	Part Tim	Three to		Three to	
45			RSA Fel					Yes	Part Tim	More tha			More tha
46								Yes	Part Tim	More tha			More tha
47								Yes	Part Tim	One to T	One to T		
48	DRS	DRS Memb	RSA Fel					Yes	Full Tim	More tha			More tha
49							Other Me	Yes	Part Tim	Three to		Three to	
50								Yes	Full Tim	One to T	One to T		
51	DRS	DRS Memb	RSA Memb				Other Me	Yes	Part Tim	More tha			More tha
52	DRS	DRS Memb						Yes	Part Tim	More tha			More tha
53				D&DA Mem	STD Memb			Yes		More tha			More tha
54	DRS	DRS Memb						Yes	Part Tim	Three to		Three to	
55								Yes	Full Tim	Three to		Three to	
56							Other Me	Yes	Part Tim	Five to		Five to	
57							Other Me	Yes	Part Tim	One to T	One to T		
58								Yes	Part Tim	Three to		Three to	
59								Yes	Full Tim	One to T	One to T		
60	DRS	DRS Memb						Yes	Full Tim	More tha			More tha
61	DRS	DRS Memb					Other Me	Yes	Part Tim	Five to		Five to	
62								Yes	Full Tim	Five to		Five to	
63								Yes	Full Tim	Three to		Three to	
64								Yes	Part Tim	More tha			More tha
65			RSA Memb					No	NA	NA			
66								No	NA	NA			
67								No	NA	NA			
68								No	NA	NA			
69								No	NA	NA			
70				DBA Memb	DMI Memb	Other Me		No	NA	NA			
71								No	NA	NA			
72								No	NA	NA			
73								No	NA	NA			
74								No	NA	NA			
75								No	NA	NA			
76								No	NA	NA			
77								No	NA	NA			
78								No	NA	NA			
79								No	NA	NA			
80								No	NA	NA			
81								No	NA	NA			
82								No	NA	NA			
83						STD Memb		No	NA	NA			
84							Other Me	No	NA	NA			
85								No	NA	NA			
86								No	NA	NA			
87				TI Membe				No	NA	NA			



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	v2.2.05	v2.3	v3.1	v3.2	v3.3a	v3.3b	v3.3c	v3.3d	v3.4	v3.5	v3.5.01	v3.5.02	v3.5.03
1		Yes	Yes	Yes	Windows				Yes	More tha			
2		Yes	Yes	Yes	Windows				Yes	Less tha	Less tha		
3		No	Yes	Yes	Windows				Yes	More tha			
4		Yes	Yes	Yes	Windows				Yes	Five to		Five to	
5		Yes	Yes	Yes	Windows		Apple Ma		Yes	Ten to T			Ten to T
6		No	Yes	Yes	Windows	Windows	Apple Ma	UNIX	Yes	Ten to T			Ten to T
7		No	Yes	Yes	Windows	Windows	Apple Ma		Yes	More tha			
8		No	Yes	Yes			Apple Ma		Yes	More tha			
9		Yes	Yes	Yes			Apple Ma		Yes	Five to		Five to	
10		No	Yes	Yes			Apple Ma		Yes	Five to		Five to	
11		No	Yes	No	NA	NA	NA	NA	NA	NA			
12		Yes	Yes	Yes	Windows			UNIX	Yes	More tha			
13	Other	No	Yes	Yes	Windows				No	More tha			
14		Yes	Yes	Yes	Windows				Yes	More tha			
15		No	Yes	Yes	Windows		Apple Ma	UNIX	Yes	Ten to T			Ten to T
16		Yes	Yes	Yes	Windows		Apple Ma		Yes	Five to		Five to	
17		Yes	Yes	Yes	Windows				Yes	Less tha	Less tha		
18		Yes	Yes	Yes	Windows				Yes	Five to		Five to	
19		Yes	Yes	Yes	Windows		Apple Ma		Yes	Five to		Five to	
20		No	Yes	Yes			Apple Ma		Yes	Ten to T			Ten to T
21		No	Yes	Yes			Apple Ma		Yes	More tha			
22		Yes	Yes	Yes	Windows		Apple Ma	UNIX	Yes	More tha			
23		No	Yes	Yes	Windows			UNIX	Yes	More tha			
24		Yes	Yes	Yes	Windows		Apple Ma	UNIX	Yes	More tha			
25		Yes	Yes	Yes	Windows		Apple Ma		No	Ten to T			Ten to T
26		Yes	Yes	Yes	Windows				Yes	Five to		Five to	
27		No	Yes	Yes			Apple Ma	UNIX	Yes	Ten to T			Ten to T
28		No	Yes	Yes			Apple Ma		Yes	Less tha	Less tha		
29		No	Yes	Yes	Windows				No	More tha			
30		Yes	Yes	Yes			Apple Ma		Yes	Ten to T			Ten to T
31		No	Yes	Yes	Windows		Apple Ma	UNIX	Yes	More tha			
32		Yes	Yes	Yes	Windows				Yes	More tha			
33		Yes	Yes	Yes	Windows			UNIX	No	Five to		Five to	
34		No	Yes	Yes			Apple Ma		Yes	More tha			
35		Yes	Yes	Yes			Apple Ma		No	Ten to T			Ten to T
36		Yes	Yes	Yes	Windows		Apple Ma		No	Ten to T			Ten to T
37		Yes	Yes	Yes			Apple Ma		Yes	Five to		Five to	
38		Yes	Yes	Yes	Windows		Apple Ma		Yes	Ten to T			Ten to T
39		Yes	Yes	Yes	Windows		Apple Ma	UNIX	Yes	Ten to T			Ten to T
40		Yes	Yes	Yes	Windows				Yes	More tha			
41		No	Yes	Yes	Windows				Yes	Five to		Five to	
42		Yes	Yes	Yes		Windows	Apple Ma		Yes	More tha			
43		Yes	Yes	Yes			Apple Ma		Yes	Ten to T			Ten to T
44		Yes	Yes	Yes	Windows		Apple Ma		Yes	Five to		Five to	
45		No	Yes	Yes	Windows		Apple Ma		No	Five to		Five to	
46		Yes	Yes	Yes			Apple Ma		Yes	Ten to T			Ten to T
47		No	Yes	Yes	Windows		Apple Ma		Yes	More tha			
48		No	Yes	Yes	Windows		Apple Ma		Yes	Five to		Five to	
49		No	Yes	Yes	Windows		Apple Ma	UNIX	No	Five to		Five to	
50		No	Yes	Yes			Apple Ma		No	Ten to T			Ten to T
51		No		Yes			Apple Ma		Yes	Ten to T			Ten to T
52		Yes	Yes	Yes	Windows		Apple Ma		Yes	Ten to T			Ten to T
53		No	Yes	Yes			Apple Ma		Yes	Five to		Five to	
54		Yes	Yes	Yes	Windows				Yes	Ten to T			Ten to T
55		No	Yes	Yes	Windows		Apple Ma		Yes	Ten to T			Ten to T
56		No	Yes	Yes	Windows			UNIX	Yes	Five to		Five to	
57		No	Yes	Yes	Windows	Windows		UNIX	Yes	More tha			
58		No	Yes	Yes	Windows				Yes	Five to		Five to	
59		Yes	Yes	Yes			Apple Ma		Yes	More tha			
60		Yes	Yes	Yes			Apple Ma		Yes	Five to		Five to	
61		Yes	Yes	Yes			Apple Ma		No	Five to		Five to	
62		No	Yes	Yes	Windows	Windows	Apple Ma	UNIX	Yes	More tha			
63		Yes	Yes	Yes	Windows		Apple Ma		Yes	More tha			
64		No	Yes	Yes	Windows		Apple Ma		Yes	More tha			
65	NA	NA	Yes	Yes	Windows				Yes	Five to		Five to	
66	NA	NA	Yes	Yes			Apple Ma		Yes	Five to		Five to	
67	NA	NA	Yes	Yes			Apple Ma		Yes	More tha			
68	NA	NA	Yes	Yes			Apple Ma		Yes	More tha			
69	NA	NA	Yes	Yes	Windows				Yes	More tha			
70	NA	NA	Yes	Yes				UNIX	No	More tha			
71	NA	NA	Yes	Yes		Windows			Yes	Five to		Five to	
72	NA	NA	No	No	NA	NA	NA	NA	NA	NA			
73	NA	NA	Yes	No	Windows				No	Less tha	Less tha		
74	NA	NA	Yes	No	NA	NA	NA	NA	NA	NA			
75	NA	NA	Yes	No	NA	NA	NA	NA	NA	NA			
76	NA	NA	Yes	No	NA	NA	NA	NA	NA	NA			
77	NA	NA	Yes	Yes	Windows				Yes	Less tha	Less tha		
78	NA	NA	Yes	Yes	Windows				Yes	Less tha	Less tha		
79	NA	NA	Yes	Yes	Windows				Yes	Five to		Five to	
80	NA	NA	Yes	Yes			Apple Ma		Yes	Less tha	Less tha		
81	NA	NA	Yes	Yes	Windows				Yes	Less tha	Less tha		
82	NA	NA	Yes	Yes	Windows		Apple Ma		Yes	Less tha	Less tha		
83	NA	NA	Yes	Yes			Apple Ma		Yes	Five to		Five to	
84	NA	NA	Yes	Yes		Windows			Yes	Five to		Five to	
85	NA	Yes	Yes	Yes	Windows	Windows	Apple Ma		Yes	Ten to T			Ten to T
86	NA	NA	Yes	Yes	Windows		Apple Ma		Yes	Five to		Five to	
87	NA	NA	Yes	No	NA	NA	NA	NA	NA	NA			



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	v3.5.04	v3.6a	v3.6b	v3.6c	v3.6d	v3.6e	wproces	playout	spreadsh	imageman	multimed	databas	cadcam
1	More tha	Teaching	Research		Adminstr		Not Very	Not Very	Not Very	Not Expe	Not Expe	Not Expe	Not Expe
2		Teaching	Research		Adminstr		Experien	Experien	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe
3	More tha			Design P			Experien	Experien	Not Very	Experien	Not Very	Not Very	Experien
4		Teaching	Research		Adminstr		Experien	Not Very	Not Expe	Not Very	Not Expe	Not Expe	Not Expe
5			Research		Adminstr		Very Exp	Experien	Not Very	Not Very	Not Expe	Experien	Not Expe
6		Teaching	Research		Adminstr		Very Exp	Very Exp	Very Exp	Very Exp	Not Expe	Very Exp	Not Expe
7	More tha	Teaching	Research		Adminstr		Very Exp	Very Exp	Experien	Not Expe	Not Expe	Very Exp	Not Expe
8	More tha		Research				Very Exp	Not Expe	Very Exp	Not Expe	Not Expe	Not Very	Experien
9			Research		Adminstr		Very Exp	Experien	Experien	Not Very	Not Very	Very Exp	Experien
10				Design P	Adminstr		Very Exp	Experien	Very Exp	Not Very	Not Expe	Not Expe	Not Expe
11		NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
12	More tha		Research				Experien	Not Expe	Experien	Experien	Not Expe	Not Expe	Experien
13	More tha	Teaching	Research		Adminstr		Experien	Experien	Experien	Not Expe	Not Expe	Not Very	Not Expe
14	More tha		Research	Design P			Very Exp	Very Exp	Experien	Experien	Experien	Very Exp	Experien
15		Teaching	Research	Design P			Experien	Experien	Not Very	Very Exp	Very Exp	Not Very	Experien
16		Teaching	Research		Adminstr		Very Exp	Experien	Not Expe	Experien	Experien	Not Expe	Not Expe
17			Research				Not Very	Not Expe	Not Very	Not Expe	Not Very	Not Very	Not Expe
18		Teaching	Research		Adminstr		Experien	Experien	Experien	Experien	Experien	Experien	Not Very
19			Research				Experien	Experien	Experien	Not Expe	Not Expe	Not Expe	Not Expe
20			Research				Very Exp	Experien	Not Very	Experien	Experien	Experien	Not Expe
21	More tha	Teaching	Research	Design P	Adminstr		Experien	Experien	Not Expe	Very Exp	Experien	Not Expe	Not Expe
22	More tha	Teaching	Research		Adminstr		Experien	Experien	Experien	Experien	Experien	Experien	Very Exp
23	More tha	Teaching	Research		Adminstr		Experien	Experien	Not Very	Not Very	Not Very	Not Very	Not Very
24	More tha	Teaching	Research	Design P	Adminstr		Very Exp	Experien	Very Exp	Very Exp	Experien	Experien	Very Exp
25		Teaching	Research		Adminstr		Very Exp	Not Very	Experien	Not Expe	Not Expe	Experien	Not Expe
26		Teaching	Research	Design P	Adminstr		Very Exp	Experien	Not Very	Experien	Not Very	Experien	Experien
27			Research		Adminstr		Very Exp	Experien	Not Very	Experien	Experien	Not Very	Not Expe
28					Adminstr		Experien	Not Very	Not Very	Not Very	Not Expe	Not Expe	Not Expe
29	More tha		Research				Experien	Experien	Not Very	Not Very	Not Very	Not Very	Not Very
30		Teaching	Research		Adminstr		Experien	Not Expe	Experien	Not Expe	Not Expe	Not Very	Not Expe
31	More tha		Research		Adminstr		Experien	Not Very	Experien	Very Exp	Experien	Not Very	Very Exp
32	More tha		Research		Adminstr		Very Exp	Very Exp	Very Exp	Not Very	Very Exp	Very Exp	Experien
33			Research				Experien	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe
34	More tha	Teaching	Research		Adminstr		Very Exp	Experien	Experien	Not Expe	Not Expe	Very Exp	Not Expe
35		Teaching	Research		Adminstr		Experien	Not Expe	Not Very	Not Expe	Not Expe	Not Very	Not Expe
36			Research		Adminstr		Experien	Experien	Experien	Not Expe	Not Expe	Not Very	Not Expe
37		Teaching	Research	Design P	Adminstr	Other	Experien	Not Expe	Experien	Not Very	Not Very	Experien	Not Expe
38		Teaching	Research		Adminstr		Very Exp	Experien	Not Very	Experien	Experien	Very Exp	Experien
39		Teaching	Research	Design P	Adminstr		Very Exp	Experien	Very Exp	Not Very	Not Very	Experien	Experien
40	More tha	Teaching	Research		Adminstr		Very Exp	Not Expe	Experien	Not Very	Not Expe	Not Expe	Experien
41			Research				Very Exp	Not Very	Not Very	Not Expe	Not Expe	Not Expe	Not Expe
42	More tha		Research	Design P	Adminstr		Experien	Not Expe	Not Very	Not Expe	Not Very	Experien	Experien
43		Teaching	Research	Design P			Experien	Not Very	Not Very	Very Exp	Not Very	Not Very	Experien
44		Teaching	Research	Design P	Adminstr		Very Exp	Experien	Not Expe	Very Exp	Not Very	Not Expe	Very Exp
45				Design P	Adminstr		Experien	Not Very	Experien	Not Very	Not Very	Not Very	Not Expe
46			Research	Design P	Adminstr		Very Exp	Very Exp	Experien	Experien	Not Very	Not Very	Not Very
47	More tha	Teaching	Research	Design P			Experien	Experien	Not Expe	Very Exp	Experien	Not Expe	Experien
48			Research		Adminstr		Very Exp	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Very
49			Research		Adminstr		Experien	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe
50			Research				Experien	Experien	Not Expe	Not Expe	Not Expe	Not Expe	Experien
51		Teaching	Research	Design P	Adminstr		Very Exp	Experien	Not Very	Experien	Not Very	Experien	Experien
52		Teaching	Research		Adminstr		Experien	Experien	Experien	Not Very	Not Very	Experien	Experien
53		Teaching	Research	Design P			Experien	Experien	Not Expe	Experien	Not Very	Not Expe	Not Expe
54		Teaching	Research				Very Exp	Experien	Not Very	Very Exp	Very Exp	Not Very	Very Exp
55		Teaching	Research		Adminstr		Very Exp	Very Exp	Experien	Very Exp	Experien	Very Exp	Not Expe
56			Research		Adminstr		Very Exp	Experien	Experien	Not Expe	Not Expe	Not Expe	Very Exp
57	More tha		Research		Adminstr		Very Exp	Not Very	Very Exp	Not Very	Not Very	Experien	Very Exp
58			Research	Design P	Adminstr		Very Exp	Not Very	Not Very	Not Very	Not Very	Experien	Very Exp
59	More tha		Research	Design P	Adminstr		Very Exp	Very Exp	Not Very	Very Exp	Not Very	Very Exp	Very Exp
60		Teaching	Research	Design P	Adminstr		Experien	Experien	Not Very	Experien	Experien	Not Very	Not Very
61			Research		Adminstr		Very Exp	Very Exp	Experien	Not Very	Not Very	Not Very	Not Expe
62	More tha	Teaching	Research	Design P	Adminstr		Very Exp	Very Exp	Experien	Very Exp	Very Exp	Very Exp	Experien
63	More tha		Research	Design P	Adminstr		Experien	Not Expe	Not Expe	Very Exp	Experien	Not Very	Very Exp
64	More tha	Teaching	Research	Design P		Other	Experien	Not Very	Not Expe	Very Exp	Not Very	Not Very	Very Exp
65		Teaching			Adminstr		Experien	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe
66		Teaching	Research		Adminstr		Very Exp	Very Exp	Experien	Very Exp	Experien	Very Exp	Not Expe
67	More tha			Design P	Adminstr		Not Expe	Very Exp	Not Very	Very Exp	Not Very	Not Expe	Not Expe
68	More tha	Teaching		Design P	Adminstr		Experien	Very Exp	Not Very	Very Exp	Experien	Experien	Not Expe
69	More tha	Teaching		Design P	Adminstr		Very Exp	Very Exp	Not Very	Very Exp	Not Expe	Experien	Very Exp
70	More tha			Design P	Adminstr		Experien	Experien	Experien	Not Expe	Not Expe	Not Expe	Very Exp
71				Design P	Adminstr		Experien	Not Very	Not Very	Not Very	Not Expe	Not Expe	Not Expe
72		NA	NA	NA	NA	NA	Not Very	Not Very	Not Very	Not Expe	Not Expe	Not Very	Not Expe
73					Adminstr		Not Very	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Very
74		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
75		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
76		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
77					Adminstr		Very Exp	Not Very	Not Very	Not Expe	Not Expe	Not Expe	Not Expe
78				Design P		Other	Experien	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	Very Exp
79				Design P	Adminstr		Very Exp	Very Exp	Not Expe	Very Exp	Experien	Not Very	Not Expe
80				Design P		Other	Experien	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	Experien
81		Teaching	Research		Adminstr		Not Very	Not Expe	Not Very	Not Expe	Not Expe	Not Expe	Not Very
82					Adminstr		Very Exp	Very Exp	Very Exp	Not Expe	Not Expe	Very Exp	Not Expe
83				Design P	Adminstr		Experien	Experien	Not Very	Experien	Not Expe	Experien	Not Expe
84				Design P	Adminstr		Experien	Not Very	Not Very	Not Expe	Not Very	Not Very	Experien
85				Design P	Adminstr		Experien	Not Very	Experien	Not Expe	Not Expe	Not Very	Not Expe
86				Design P			Experien	Not Expe	Not Expe	Not Very	Not Expe	Not Very	Experien
87		NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	wwwouth	wwwbrows	Ftp.goph	newsgr	email	mailbase	v3.8	v3.9	v3.10a	v3.10b	v3.10c	v3.10d	v3.10e
1	Not Expe	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	No	Less tha					
2	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	Not at A	NA	NA	NA	NA	NA
3	Not Expe	Experien	Not Expe	Experien	Experien	Experien	Yes	Ten to T		Commerci			Technolo
4	Not Expe	Not Expe	Not Expe	Not Expe	Not Very	Not Expe	No	NA	NA	NA	NA	NA	NA
5	Not Expe	Very Exp	Not Very	Not Expe	Experien	Experien	Yes	Less tha	Governme				
6	Very Exp	Not Expe	Not Expe	Not Expe	Very Exp	Not Expe	Yes	Less tha	Governme	Commerci		Academic	Technolo
7	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	Not at A	NA	NA	NA	NA	NA
8	Not Expe	Not Very	Not Very	Not Very	Very Exp	Not Very	Yes	Five to				Academic	
9	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha			Scientif	Academic	Technolo
10	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha					Technolo
11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
12	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	More tha			Scientif	Academic	
13	Not Expe	Not Very	Not Very	Not Expe	Not Very	Not Expe	Yes	Five to			Scientif	Academic	Technolo
14	Very Exp	Very Exp	Very Exp	Very Exp	Very Exp	Very Exp	Yes	Ten to T	Governme	Commerci	Scientif	Academic	Technolo
15	Experien	Experien	Experien	Not Very	Experien	Not Expe	Yes	Five to		Commerci			
16	Very Exp	Very Exp	Experien	Experien	Very Exp	Experien	Yes	Five to					Technolo
17	Not Expe	Not Very	Not Expe	Not Expe	Not Very	Not Expe	Yes	Less tha	Governme			Academic	
18	Not Very	Experien	Experien	Not Very	Experien	Experien	Yes	Less tha	Governme	Commerci	Scientif	Academic	Technolo
19	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Very	Yes	Less tha		Commerci		Academic	
20	Experien	Very Exp	Not Very	Not Very	Very Exp	Experien	Yes	Five to			Scientif	Academic	
21	Not Expe	Experien	Not Very	Not Very	Experien	Not Expe	Yes	Less tha		Commerci		Academic	
22	Experien	Very Exp	Very Exp	Very Exp	Very Exp	Not Expe	Yes	More tha		Commerci	Scientif	Academic	Technolo
23	Not Very	Not Expe	Not Expe	Not Expe	Very Exp	Not Expe	Yes	Less tha			Scientif	Academic	Technolo
24	Not Very	Very Exp	Experien	Experien	Very Exp	Not Expe	Yes	Five to	Governme	Commerci	Scientif	Academic	Technolo
25	Not Expe	Very Exp	Not Expe	Not Very	Very Exp	Experien	Yes	Less tha				Academic	
26	Not Expe	Experien	Not Expe	Experien	Experien	Not Expe	Yes	Less tha		Commerci		Academic	
27	Not Very	Experien	Not Very	Not Very	Very Exp	Experien	Yes	Ten to T			Scientif	Academic	Technolo
28	Not Expe	Not Very	Not Very	Not Expe	Experien	Not Expe	Yes	Less tha					Technolo
29	Not Expe	Experien	Experien	Experien	Experien	Experien	Yes	Less tha				Academic	
30	Not Expe	Experien	Not Expe	Experien	Experien	Experien	Yes	Less tha			Scientif	Academic	
31	Experien	Very Exp	Experien	Not Very	Experien	Not Expe	Yes	Five to			Scientif	Academic	
32	Not Very	Very Exp	Very Exp	Very Exp	Very Exp	Very Exp	Yes	Five to	Governme		Scientif	Academic	Technolo
33	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha	Governme			Academic	
34	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	Not at A	NA	NA	NA	NA	NA
35	Not Expe	Not Very	Not Expe	Not Very	Very Exp	Not Very	Yes	Less tha	Governme			Academic	Technolo
36	Not Expe	Experien	Not Expe	Experien	Experien	Experien	Yes	Less tha				Academic	
37	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha		Commerci		Academic	
38	Experien	Experien	Experien	Experien	Very Exp	Experien	Yes	Less tha				Academic	
39	Not Very	Experien	Not Expe	Experien	Experien	Not Very	Yes	Less tha	Governme	Commerci		Academic	Technolo
40	Not Expe	Not Expe	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha		Commerci	Scientif	Academic	
41	Not Expe	Very Exp	Experien	Not Very	Experien	Experien	Yes	Five to			Scientif	Academic	
42	Not Expe	Not Expe	Not Expe	Not Expe	Not Very	Not Expe	Yes	Not at A	NA	NA	NA	NA	NA
43	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha				Academic	Technolo
44	Not Very	Very Exp	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha				Academic	Technolo
45	Not Expe	Not Very	Not Expe	Not Very	Experien	Not Expe	Yes	Less tha	Governme	Commerci		Academic	Technolo
46	Not Very	Experien	Not Very	Not Very	Very Exp	Not Very	Yes	Less tha		Commerci		Academic	Technolo
47	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha		Commerci		Academic	Technolo
48	Not Expe	Experien	Not Expe	Not Expe	Very Exp	Not Expe	Yes	Five to	Governme		Scientif	Academic	Technolo
49	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	Five to				Academic	
50	Not Expe	Not Expe	Not Expe	Not Expe	Experien	Not Expe	Yes	Five to				Academic	
51	Not Very	Experien	Experien	Not Very	Very Exp	Not Expe	Yes	Ten to T					
52	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha				Academic	Technolo
53	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Very	Yes	Less tha		Commerci		Academic	
54	Experien	Very Exp	Not Very	Very Exp	Very Exp	Not Very	Yes	Five to		Commerci		Academic	Technolo
55	Very Exp	Very Exp	Not Expe	Not Expe	Very Exp	Experien	Yes	Less tha				Academic	
56	Not Expe	Very Exp	Not Expe	Not Expe	Very Exp	Not Expe	Yes	Less tha	Governme	Commerci			Technolo
57	Not Very	Very Exp	Experien	Experien	Very Exp	Experien	Yes	Five to		Commerci			Technolo
58	Not Expe	Very Exp	Not Expe	Not Expe	Very Exp	Experien	Yes	Less tha		Commerci		Academic	
59	Not Expe	Very Exp	Experien	Not Very	Very Exp	Not Very	Yes	Less tha				Academic	Technolo
60	Not Expe	Not Very	Not Expe	Not Expe	Experien	Not Very	Yes	Less tha				Academic	
61	Not Expe	Not Very	Not Very	Not Very	Not Very	Not Very	Yes	Less tha				Academic	
62	Very Exp	Very Exp	Experien	Experien	Very Exp	Very Exp	Yes	Less tha			Scientif	Academic	
63	Not Expe	Experien	Not Very	Not Expe	Experien	Not Expe	Yes	Less tha	Governme	Commerci	Scientif	Academic	Technolo
64	Not Expe	Not Very	Not Expe	Not Very	Experien	Not Expe	Yes	Less tha				Academic	Technolo
65	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
66	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
67	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Yes	Less tha					
68	Not Expe	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	Yes	Less tha		Commerci	Scientif		
69	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
70	Not Expe	Not Expe	Not Expe	Not Expe	Very Exp	Not Expe	Yes	Less tha					
71	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
72	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
73	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
74	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA	NA	NA
75	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA	NA	NA
76	NA	NA	NA	NA	NA	NA	No	NA	NA	NA	NA	NA	NA
77	Not Expe	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
78	Not Expe	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
79	Not Expe	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha		Commerci			Technolo
80	Not Expe	Not Very	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
81	Not Expe	Not Very	Not Expe	Not Expe	Not Very	Not Expe	No	NA	NA	NA	NA	NA	NA
82	Not Expe	Not Expe	Not Expe	Not Expe	Very Exp	Not Expe	Yes	Less tha					
83	Not Very	Experien	Not Expe	Not Expe	Experien	Not Expe	Yes	Less tha		Commerci			
84	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	Not Expe	No	NA	NA	NA	NA	NA	NA
85	Not Expe	Experien	Not Very	Not Expe	Experien	Not Very	Yes	Five to	Governme	Commerci	Scientif	Academic	Technolo
86	Not Expe	Experien	Not Expe	Not Expe	Not Expe	Not Expe	Yes	Less tha			Scientif		Technolo
87	NA	NA	NA	NA	NA	NA	Yes	Not at A	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v3.10f	v3.10g	v3.11a	v3.11b	v3.11c	v3.11d	v3.12a	v3.12b	v3.12c	v3.12d	v4.1	v4.1.01	v4.1.02
1											Frequent		Frequent
2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frequent		Frequent
3				WWW	E-mail		Yahoo	Lycos			Always	Always	
4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frequent		Frequent
5		Other			E-mail		Yahoo	Lycos	Altavist		Always	Always	
6				WWW	E-mail					Other	Frequent		Frequent
7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frequent		Frequent
8					E-mail		Yahoo	Lycos		Other	Seldom		
9				WWW	E-mail		Yahoo				Always	Always	
10			FTP / Go	WWW	E-mail		Yahoo				Frequent		Frequent
11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Always	Always	
12			FTP / Go	WWW	E-mail						Seldom		
13			FTP / Go	WWW	E-mail		Yahoo				Always	Always	
14	Social		FTP / Go	WWW	E-mail			Lycos	Altavist	Other	Always	Always	
15	Social		FTP / Go	WWW	E-mail			Lycos		Other	Seldom		
16		Other		WWW	E-mail		Yahoo		Altavist		Frequent		Frequent
17					E-mail						Always	Always	
18		Other		WWW	E-mail				Altavist		Always	Always	
19				WWW	E-mail		Yahoo	Lycos	Altavist		Always	Always	
20	Social			WWW	E-mail	Other	Yahoo	Lycos	Altavist	Other	Always	Always	
21				WWW	E-mail		Yahoo				Frequent		Frequent
22										Other	Always	Always	
23				WWW	E-mail			Lycos			Seldom		
24	Social		FTP / Go	WWW	E-mail					Other	Always	Always	
25	Social	Other		WWW	E-mail		Yahoo				Always	Always	
26	Social			WWW	E-mail	Newsrou	Yahoo				Always	Always	
27				WWW	E-mail		Yahoo	Lycos	Altavist		Always	Always	
28			FTP / Go	WWW	E-mail			Lycos			Frequent		Frequent
29		Other			E-mail					Other	Frequent		Frequent
30				WWW	E-mail	Newsrou	Yahoo				Frequent		Frequent
31				WWW	E-mail					Other	Frequent		Frequent
32			FTP / Go	WWW	E-mail		Yahoo				Always	Always	
33				WWW	E-mail					Other	Frequent		Frequent
34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Always	Always	
35				WWW							Frequent		Frequent
36	Social	Other	FTP / Go	WWW	E-mail	Newsrou	Yahoo	Lycos			Always	Always	
37	Social			WWW	E-mail		Yahoo	Lycos	Altavist	Other	Always	Always	
38				WWW	E-mail		Yahoo	Lycos			Always	Always	
39				WWW	E-mail	Newsrou	Yahoo			Other	Always	Always	
40				WWW	E-mail						Always	Always	
41	Social			WWW	E-mail		Yahoo				Always	Always	
42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Always	Always	
43				WWW	E-mail		Yahoo				Frequent		Frequent
44				WWW	E-mail		Yahoo	Lycos	Altavist	Other	Frequent		Frequent
45				WWW	E-mail		Yahoo				Frequent		Frequent
46			FTP / Go	WWW	E-mail		Yahoo	Lycos			Frequent		Frequent
47				WWW	E-mail		Yahoo		Altavist		Seldom		
48				WWW	E-mail		Yahoo	Lycos			Always	Always	
49	Social			WWW	E-mail		Yahoo			Other	Always	Always	
50				WWW	E-mail		Yahoo				Always	Always	
51		Other			E-mail				Altavist		Seldom		
52				WWW	E-mail		Yahoo				Always	Always	
53				WWW	E-mail			Lycos			Frequent		Frequent
54				WWW	E-mail	Newsrou	Yahoo				Always	Always	
55				WWW	E-mail		Yahoo	Lycos		Other	Always	Always	
56				WWW	E-mail					Other	Seldom		
57	Social		FTP / Go	WWW	E-mail		Yahoo	Lycos		Other	Frequent		Frequent
58				WWW	E-mail		Yahoo		Altavist	Other	Frequent		Frequent
59				WWW	E-mail		Yahoo				Always	Always	
60		Other		WWW	E-mail		Yahoo				Frequent		Frequent
61				WWW	E-mail		Yahoo	Lycos	Altavist		Always	Always	
62				WWW	E-mail		Yahoo	Lycos	Altavist		Always	Always	
63	Social	Other		WWW	E-mail		Yahoo	Lycos	Altavist	Other	Always	Always	
64		Other		WWW	E-mail						Always	Always	
65	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frequent		Frequent
67		Other								Other	Never		
68											Always	Always	
69	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Never		
70	Social				E-mail				Altavist				
71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Seldom		
72	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Seldom		
73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frequent		Frequent
74	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Never		
75	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Seldom		
76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Seldom		
78	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Frequent		Frequent
79	Social			WWW	E-mail		Yahoo	Lycos			Seldom		
80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Seldom		
81	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Always	Always	
82		Other			E-mail		Yahoo				Always	Always	
83	Social	Other		WWW	E-mail		Yahoo		Altavist		Seldom		
84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Always	Always	
85	Social			WWW	E-mail					Other	Frequent		Frequent
86	Social			WWW			Yahoo				Seldom		
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Never		



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v4.1.03	v4.1.04	v4.2a	v4.2b	v4.2c	v4.2d	v4.2e	v5.1lit	v5.1conf	v5.1sem	v5.1work	v5.1exh	v5.1meet
1			Printed					Importan	Very Imp	Importan	Importan	Importan	Importan
2			Printed	Audio-Vi	Events			Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
3			Printed					Very Imp	Importan	Importan	Importan	Very Imp	Very Imp
4			Printed		Events			Very Imp	Very Imp	Importan	Importan	Importan	Very Imp
5			Printed	Audio-Vi	Events			Very Imp	Importan	Importan	Importan	Not Very	Importan
6			Printed	Audio-Vi	Events		Other						
7			Printed		Events			Very Imp	Importan		Importan		Very Imp
8	Seldom		Printed		Events			Very Imp	Importan	Not Very	Not Very	Not Very	Not Very
9			Printed		Events			Very Imp	Very Imp	Very Imp			Very Imp
10			Printed	Audio-Vi				Very Imp	Not Very	Unimport	Importan	Importan	Very Imp
11			Printed		Events	Computer		Very Imp	Importan	Importan	Not Very	Unimport	Importan
12	Seldom					Computer		Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan
13			Printed		Events	Computer		Very Imp	Importan	Importan	Importan	Not Very	Importan
14			Printed	Audio-Vi	Events	Computer		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
15	Seldom		Printed	Audio-Vi		Computer		Very Imp	Unimport	Unimport	Unimport	Unimport	Unimport
16			Printed	Audio-Vi	Events	Computer		Very Imp	Very Imp	Very Imp	Importan	Importan	Importan
17			Printed			Computer		Very Imp	Very Imp	Importan	Importan	Importan	Not Very
18			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Not Very	Importan
19			Printed			Computer		Very Imp	Importan		Very Imp		Very Imp
20			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Importan	Not Very
21			Printed		Events	Computer		Very Imp	Importan	Importan	Not Very	Not Very	Not Very
22			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Importan	Importan
23	Seldom		Printed			Computer		Very Imp	Very Imp	Very Imp	Not Very	Importan	Very Imp
24			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Importan	Importan
25			Printed			Computer		Very Imp	Importan	Not Very	Not Very	Not Very	Importan
26			Printed	Audio-Vi	Events	Computer		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
27			Printed		Events	Computer		Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan
28			Printed			Computer		Very Imp	Not Very	Not Very	Not Very	Importan	Importan
29			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Not Very	Importan
30			Printed			Computer		Very Imp	Importan	Not Very	Not Very	Not Very	Importan
31			Printed		Events	Computer		Very Imp	Importan	Importan	Importan	Not Very	Not Very
32			Printed		Events	Computer		Very Imp	Very Imp	Very Imp	Importan	Not Very	Very Imp
33			Printed		Events	Computer		Importan	Importan	Importan	Importan	Not Very	Very Imp
34			Printed			Computer		Very Imp	Importan	Very Imp	Not Very	Unimport	
35			Printed	Audio-Vi		Computer		Very Imp	Very Imp	Importan	Importan	Unimport	Importan
36			Printed			Computer		Very Imp	Very Imp	Importan	Importan	Not Very	Importan
37			Printed	Audio-Vi	Events	Computer		Importan	Very Imp			Very Imp	Importan
38			Printed			Computer		Very Imp	Importan	Not Very	Not Very	Importan	Not Very
39			Printed	Audio-Vi	Events	Computer	Other	Very Imp	Importan	Importan	Importan	Importan	Very Imp
40			Printed	Audio-Vi	Events	Computer	Other	Importan					Very Imp
41			Printed			Computer		Very Imp	Not Very	Importan	Very Imp	Importan	Very Imp
42			Printed			Computer	Other	Very Imp	Not Very	Not Very	Not Very	Importan	Importan
43			Printed	Audio-Vi	Events	Computer		Very Imp	Importan	Importan	Not Very	Importan	Not Very
44			Printed	Audio-Vi		Computer		Very Imp	Very Imp	Very Imp	Not Very	Importan	Not Very
45			Printed	Audio-Vi	Events	Computer		Very Imp	Importan	Importan	Importan	Very Imp	Very Imp
46			Printed	Audio-Vi	Events	Computer	Other	Very Imp	Not Very	Not Very	Not Very	Very Imp	Not Very
47	Seldom		Printed			Computer		Importan	Not Very	Unimport	Unimport	Unimport	Importan
48			Printed			Computer		Very Imp	Importan	Not Very	Not Very	Unimport	Unimport
49			Printed		Events	Computer		Very Imp	Very Imp	Very Imp	Importan	Very Imp	Importan
50			Printed			Computer		Very Imp			Very Imp		
51	Seldom		Printed		Events	Computer		Not Very	Importan	Not Very	Not Very		
52			Printed	Audio-Vi		Computer		Very Imp	Very Imp	Very Imp	Importan	Importan	Importan
53			Printed			Computer	Other	Very Imp	Not Very	Importan	Importan	Very Imp	Importan
54			Printed	Audio-Vi		Computer		Very Imp	Very Imp	Importan	Importan	Importan	Very Imp
55			Printed		Events	Computer		Very Imp	Importan	Importan	Importan	Not Very	Not Very
56	Seldom		Printed		Events	Computer		Very Imp	Very Imp	Not Very	Not Very	Very Imp	Very Imp
57			Printed		Events	Computer		Very Imp	Very Imp	Very Imp	Not Very	Very Imp	Very Imp
58			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp
59			Printed	Audio-Vi	Events	Computer		Very Imp	Importan	Importan	Importan	Very Imp	Not Very
60			Printed	Audio-Vi	Events	Computer		Importan	Very Imp	Very Imp	Very Imp	Very Imp	Importan
61			Printed	Audio-Vi	Events	Computer		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
62			Printed		Events	Computer		Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp
63			Printed	Audio-Vi	Events	Computer	Other	Very Imp	Importan	Importan	Importan	Very Imp	Very Imp
64			Printed		Events	Computer	Other	Very Imp	Importan	Importan	Not Very	Importan	Very Imp
65													
66			Printed		Events			Importan	Not Very	Not Very	Importan	Importan	Importan
67		Never					Other	Importan	Not Very	Not Very	Not Very	Importan	Importan
68			Printed	Audio-Vi				Very Imp	Not Very	Importan	Not Very	Importan	Very Imp
69		Never	Printed					Very Imp				Very Imp	Importan
70													
71	Seldom		Printed		Events			Very Imp	Importan	Importan		Importan	Very Imp
72	Seldom		Printed				Other	Very Imp	Unimport	Not Very	Not Very	Very Imp	Not Very
73			Printed					Importan					
74		Never											
75	Seldom		Printed		Events			Importan	Unimport	Unimport	Importan	Importan	Importan
76													
77	Seldom		Printed		Events			Importan	Not Very	Importan	Importan	Importan	Very Imp
78			Printed		Events			Importan	Not Very	Importan	Importan	Importan	Very Imp
79	Seldom		Printed		Events			Importan	Not Very	Not Very	Not Very	Very Imp	Very Imp
80	Seldom		Printed		Events			Not Very	Unimport	Unimport	Unimport	Very Imp	Very Imp
81			Printed	Audio-Vi	Events	Computer		Importan	Importan	Not Very	Not Very	Not Very	Very Imp
82			Printed	Audio-Vi		Computer		Very Imp	Not Very	Not Very	Not Very	Not Very	Importan
83	Seldom		Printed			Computer		Very Imp	Not Very	Not Very	Importan	Importan	Unimport
84			Printed		Events	Computer		Very Imp	Importan	Importan	Not Very	Importan	Importan
85			Printed		Events	Computer		Importan	Importan	Importan	Not Very	Not Very	Very Imp
86	Seldom		Printed			Computer		Very Imp	Importan	Importan	Unimport	Very Imp	Not Very
87		Never	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v5.1corr	v5.1oth	v5.2abst	v5.2book	v5.2rese	v5.2rep	v5.2papp	v5.2artr	v5.2news	v5.2tape	v5.2slid	v5.2micr	v5.2gues
1	Importan		Importan	Very Imp	Not Very	Importan	Importan	Importan	Importan	Not Very	Importan	Not Very	Not Very
2	Importan		Importan	Very Imp	Importan	Importan	Importan	Very Imp	Not Very	Unimport	Importan	Not Very	Not Very
3	Very Imp		Very Imp	Very Imp	Very Imp	Importan	Very Imp	Very Imp		Not Very	Not Very	Not Very	Very Imp
4	Importan		Very Imp	Importan	Importan	Very Imp	Very Imp	Very Imp	Importan	Not Very	Very Imp	Not Very	Very Imp
5	Importan		Very Imp	Very Imp	Not Very	Importan	Very Imp	Importan	Not Very	Unimport	Importan	Not Very	Importan
6		Very Imp		Importan	Not Very		Importan	Importan					
7	Very Imp		Very Imp	Importan	Very Imp	Very Imp	Very Imp	Importan	Importan				Very Imp
8	Very Imp		Importan	Importan	Not Very	Not Very	Not Very	Very Imp	Not Very	Unimport	Unimport	Unimport	Unimport
9	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Importan	Very Imp	Importan			Very Imp	Very Imp
10	Very Imp		Unimport	Very Imp	Not Very	Very Imp	Not Very	Very Imp	Importan	Not Very	Unimport	Unimport	Importan
11	Importan	Very Imp	Very Imp	Very Imp	Not Very		Very Imp	Importan	Not Very	Not Very	Not Very	Unimport	Unimport
12	Importan		Very Imp	Not Very	Not Very	Importan	Importan						
13	Importan		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Not Very	Not Very	Not Very	Not Very	Very Imp
14	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
15	Not Very		Importan	Importan	Not Very	Importan	Not Very	Importan	Not Very	Not Very	Not Very	Not Very	Importan
16	Importan		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Not Very	Not Very
17	Importan		Importan	Importan	Very Imp	Importan	Very Imp	Importan	Not Very	Not Very	Unimport	Unimport	Not Very
18	Importan		Very Imp	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Importan	Not Very	Not Very	Not Very	Not Very
19		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp					Very Imp
20	Importan		Very Imp	Very Imp	Not Very	Not Very	Very Imp	Very Imp	Not Very	Unimport	Unimport	Unimport	Importan
21	Importan		Importan	Importan	Very Imp	Not Very	Very Imp	Importan	Importan	Not Very	Unimport	Not Very	Not Very
22	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Very Imp	Not Very
23	Very Imp		Very Imp	Importan	Very Imp	Importan	Very Imp	Very Imp	Unimport	Unimport	Unimport	Unimport	Unimport
24	Importan		Very Imp	Very Imp	Very Imp	Importan	Very Imp	Importan	Not Very	Not Very	Importan	Importan	Very Imp
25	Importan		Very Imp	Very Imp	Not Very	Importan	Very Imp	Very Imp	Importan	Unimport	Not Very		Importan
26	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Very Imp	Very Imp		Very Imp
27	Very Imp		Importan	Very Imp	Importan	Importan	Importan	Importan					Very Imp
28	Importan		Importan	Very Imp	Not Very	Not Very	Not Very	Very Imp	Importan	Not Very	Importan	Unimport	Unimport
29	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	Not Very	Not Very
30	Importan		Very Imp	Very Imp	Importan	Importan	Very Imp	Importan	Not Very	Not Very	Not Very	Not Very	Importan
31	Very Imp		Not Very	Importan	Not Very	Importan	Very Imp	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very
32	Very Imp		Importan	Importan	Very Imp	Very Imp	Very Imp	Importan	Importan	Unimport	Not Very	Unimport	Importan
33	Not Very		Importan	Importan	Importan	Not Very	Very Imp	Importan	Not Very	Unimport	Not Very	Unimport	Not Very
34	Importan		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Unimport	Unimport	Unimport	Unimport
35	Very Imp		Importan	Importan	Not Very	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	Very Imp
36	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Not Very	Importan
37	Importan		Importan	Very Imp	Importan	Importan	Importan	Importan	Importan	Not Very	Importan	Not Very	Very Imp
38	Very Imp		Importan	Very Imp	Importan	Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Not Very	Not Very
39	Very Imp	Very Imp	Importan	Very Imp	Not Very	Importan	Importan	Very Imp	Importan	Not Very	Not Very	Not Very	Importan
40	Very Imp												
41	Not Very		Importan	Very Imp	Not Very	Importan	Very Imp	Very Imp	Not Very	Not Very	Not Very	Importan	Importan
42	Importan	Very Imp	Very Imp	Very Imp	Importan	Very Imp	Not Very	Importan	Not Very	Unimport	Importan	Importan	Not Very
43	Not Very		Importan	Very Imp	Importan	Importan	Importan	Importan	Importan	Not Very	Not Very	Not Very	Not Very
44	Very Imp		Very Imp	Very Imp	Very Imp	Importan	Importan	Very Imp	Importan	Not Very	Very Imp	Importan	Unimport
45	Importan		Not Very	Importan	Not Very	Importan	Importan	Very Imp	Importan	Not Very	Importan	Not Very	Not Very
46	Importan	Importan	Importan	Very Imp	Not Very	Not Very	Not Very	Very Imp	Importan	Not Very	Importan	Not Very	Not Very
47	Importan		Not Very	Importan	Importan	Not Very	Not Very	Importan	Not Very	Unimport	Unimport	Unimport	Unimport
48	Not Very		Importan	Importan	Importan	Importan	Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Importan
49	Importan		Importan	Very Imp	Not Very	Not Very	Importan	Very Imp	Unimport	Unimport	Not Very	Unimport	Unimport
50				Very Imp	Importan			Importan			Importan		Importan
51	Importan		Importan	Importan	Not Very		Importan	Importan	Very Imp	Not Very	Very Imp	Not Very	Not Very
52	Not Very		Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Importan	Not Very	Not Very	Not Very	Importan
53	Importan	Very Imp	Importan	Very Imp	Importan	Very Imp	Importan	Very Imp	Not Very	Not Very	Not Very	Unimport	Not Very
54	Very Imp		Very Imp	Very Imp	Importan	Importan	Very Imp	Importan	Not Very	Not Very	Not Very	Not Very	Importan
55	Importan		Very Imp	Importan	Importan	Importan	Importan	Very Imp	Unimport	Unimport	Unimport	Unimport	Importan
56	Very Imp		Unimport	Unimport	Unimport	Importan	Very Imp	Very Imp	Importan	Unimport	Not Very	Unimport	Unimport
57	Very Imp		Importan	Importan	Not Very	Not Very	Importan	Very Imp	Importan				
58	Very Imp		Very Imp	Very Imp	Importan	Importan	Importan	Very Imp	Not Very	Unimport	Very Imp	Unimport	Not Very
59	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Very Imp	Not Very	Unimport
60	Importan		Very Imp	Importan	Very Imp	Importan	Very Imp	Importan	Importan	Not Very	Importan	Unimport	Importan
61	Very Imp		Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp	Importan	Not Very	Not Very	Importan	Very Imp
62	Importan		Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp	Not Very	Not Very	Not Very	Unimport	Not Very
63	Importan		Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp	Importan	Not Very	Not Very	Not Very	Unimport
64	Importan		Very Imp	Very Imp	Importan	Unimport	Very Imp	Very Imp	Not Very	Unimport	Unimport	Not Very	Unimport
65													
66	Very Imp												
67	Not Very		Importan	Not Very	Unimport	Unimport	Unimport	Importan	Not Very	Unimport	Unimport	Unimport	Unimport
68	Importan		Importan	Very Imp	Unimport	Not Very	Unimport	Very Imp	Very Imp	Very Imp	Importan	Unimport	Importan
69				Very Imp				Very Imp					
70													
71	Importan		Very Imp	Very Imp	Not Very	Very Imp	Not Very	Very Imp	Importan	Unimport	Unimport		Not Very
72	Unimport		Importan	Very Imp	Unimport	Unimport	Unimport	Very Imp	Importan	Not Very	Very Imp	Not Very	Unimport
73						Importan	Importan	Importan					
74													
75	Importan							Very Imp	Very Imp		Very Imp		
76													
77	Very Imp		Not Very	Not Very	Not Very	Not Very	Not Very	Very Imp	Not Very	Not Very	Not Very	Not Very	Very Imp
78	Very Imp		Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Not Very	Not Very
79	Very Imp		Not Very	Not Very	Not Very	Not Very	Not Very	Very Imp	Very Imp	Not Very	Very Imp	Unimport	Not Very
80	Very Imp		Unimport	Unimport	Unimport	Importan	Unimport	Very Imp	Importan	Not Very	Importan	Unimport	Not Very
81	Very Imp		Not Very	Importan	Importan	Very Imp	Very Imp	Importan	Not Very	Unimport	Unimport	Not Very	Very Imp
82	Importan	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Not Very	Unimport	Very Imp	Not Very	Not Very
83	Importan	Very Imp	Not Very	Not Very	Unimport	Not Very	Unimport	Importan	Importan	Unimport	Unimport	Unimport	Importan
84	Very Imp		Importan	Very Imp	Importan	Not Very	Not Very	Very Imp	Very Imp	Not Very	Not Very	Not Very	Not Very
85	Very Imp		Importan	Importan	Not Very	Not Very	Importan	Very Imp	Very Imp	Unimport	Unimport	Unimport	Very Imp
86	Importan		Importan	Not Very	Not Very	Not Very	Not Very	Very Imp	Not Very	Importan	Importan	Not Very	Unimport
87	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v5.2dirc	v5.2mail	v5.2telf	v5.2oth	v6.1opac	v6.1teln	v6.1cdda	v6.1www	v6.1ftp	v6.1news	v6.1emai	v6.1mbas	v6.1othe
1	Very Imp	Not Very	Not Very		Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Not Very	Not Very	
2	Importan	Importan	Importan										
3	Very Imp	Very Imp	Very Imp		Very Imp	Not Very	Very Imp	Very Imp	Not Very	Not Very	Very Imp	Not Very	
4	Very Imp	Importan	Importan		Importan						Not Very	Importan	
5	Very Imp	Importan	Importan		Importan		Importan	Not Very	Importan		Not Very		
6				Very Imp			Importan	Importan			Very Imp	Very Imp	
7	Very Imp	Very Imp	Very Imp				Importan						Importan
8	Importan	Not Very	Importan		Very Imp	Importan	Importan	Importan	Not Very	Not Very	Very Imp	Not Very	
9	Very Imp	Very Imp	Very Imp					Very Imp			Very Imp		
10	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Very Imp	Very Imp			Importan		
11	Importan	Importan	Very Imp	Very Imp	Unimport	Unimport	Very Imp	Unimport	Unimport	Unimport	Unimport	Unimport	
12					Importan	Very Imp	Importan	Importan		Importan			
13	Very Imp	Importan	Importan		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	
14	Very Imp	Very Imp	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	
15	Importan	Importan	Importan										
16	Importan	Importan	Importan		Importan	Importan	Importan	Very Imp	Importan	Importan	Very Imp	Importan	
17	Importan	Not Very	Not Very		Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Importan	Not Very	
18	Importan	Importan	Importan		Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan	
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21	Importan	Importan	Importan		Not Very	Not Very	Importan	Importan	Not Very	Not Very	Importan	Not Very	
22	Not Very	Importan	Importan		Very Imp	Importan	Very Imp	Very Imp	Not Very	Very Imp	Importan	Unimport	
23	Unimport	Unimport	Unimport		Importan	Not Very	Very Imp	Very Imp	Not Very	Not Very	Very Imp	Not Very	
24	Importan	Importan	Importan		Very Imp	Importan	Importan	Importan	Importan	Importan	Importan	Importan	
25	Very Imp	Very Imp	Very Imp		Very Imp	Unimport	Very Imp	Not Very	Unimport	Unimport	Very Imp	Not Very	
26	Very Imp	Very Imp	Very Imp		Very Imp		Very Imp	Importan		Importan	Importan		
27	Very Imp	Importan	Very Imp		Importan	Not Very	Importan	Importan	Not Very	Not Very	Very Imp	Not Very	
28	Not Very	Importan	Importan		Unimport	Not Very	Unimport	Not Very	Not Very	Unimport	Importan	Unimport	
29	Very Imp	Very Imp	Very Imp			Importan		Importan			Importan		
30	Importan	Not Very	Importan			Importan	Importan			Importan	Importan	Importan	
31	Importan	Very Imp	Very Imp		Importan	Importan	Not Very	Very Imp	Not Very	Not Very	Very Imp	Importan	
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33	Importan	Not Very	Importan								Importan		
34	Importan	Importan	Very Imp		Unimport	Unimport	Importan	Unimport	Unimport	Unimport	Unimport	Unimport	
35	Very Imp	Importan	Very Imp				Importan	Not Very		Not Very	Very Imp		
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37	Very Imp	Not Very	Importan		Importan		Importan	Importan			Importan		
38	Very Imp	Very Imp	Very Imp		Importan	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp	Importan	
39	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Importan	Importan	Unimport	Importan	Very Imp	Importan	
40													
41	Very Imp	Importan	Importan		Importan	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Very Imp	Very Imp	
42	Very Imp	Very Imp	Very Imp	Very Imp	Unimport	Unimport	Importan	Not Very		Unimport	Not Very	Importan	
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44	Unimport	Unimport	Unimport		Unimport	Not Very	Importan	Very Imp	Unimport	Unimport	Very Imp	Unimport	
45	Not Very	Not Very	Very Imp				Not Very	Importan			Importan		
46	Importan	Importan	Importan	Importan	Not Very	Not Very	Not Very	Importan	Importan	Not Very	Very Imp	Not Very	
47	Importan	Importan	Importan		Unimport	Unimport	Unimport	Importan	Unimport	Unimport	Importan	Unimport	
48	Importan	Not Very	Not Very		Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Importan	Not Very	
49	Importan	Importan	Importan		Unimport	Unimport	Unimport	Importan	Unimport	Unimport	Very Imp	Unimport	
50	Very Imp							Not Very			Very Imp		
51	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Not Very	Not Very		Unimport	Very Imp	Not Very	
52	Importan	Not Very	Unimport				Not Very	Importan			Importan		
53	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	Not Very	Not Very	Unimport	Not Very	Importan	Very Imp
54	Very Imp	Importan	Very Imp		Very Imp	Not Very	Importan	Importan	Not Very	Importan	Very Imp	Not Very	
55	Very Imp	Importan	Importan		Importan	Not Very	Importan	Importan	Unimport	Unimport	Not Very	Not Very	
56	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Not Very	Importan	Unimport	Unimport	Importan	Unimport	
57	Very Imp	Very Imp	Very Imp		Unimport		Very Imp	Very Imp	Importan	Not Very	Importan		
58	Very Imp	Very Imp	Very Imp		Importan	Not Very	Very Imp	Very Imp	Not Very	Not Very	Very Imp	Importan	
59	Importan	Importan	Importan		Very Imp		Importan		Not Very	Unimport	Importan	Unimport	
60	Importan	Importan	Importan		Very Imp		Importan	Importan	Unimport	Not Very	Very Imp	Not Very	
61	Very Imp	Very Imp	Very Imp		Very Imp	Importan	Very Imp	Importan	Not Very	Importan	Importan	Very Imp	
62	Importan	Importan	Importan		Very Imp	Not Very	Very Imp	Very Imp	Unimport	Unimport	Importan	Importan	
63	Not Very	Importan	Importan		Very Imp	Importan	Not Very	Not Very			Not Very		
64	Very Imp	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Unimport	Unimport	Importan	Unimport	
65													
66					Importan	Importan	Importan	Importan	Importan	Not Very	Importan	Unimport	
67	Not Very	Importan	Importan		Unimport	Unimport	Unimport	Not Very	Unimport	Unimport	Unimport	Unimport	
68	Very Imp	Very Imp	Importan				Importan						
69													
70													
71	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	
72	Very Imp	Unimport	Importan										
73													
74													
75	Very Imp	Very Imp	Very Imp										
76													
77	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Importan	Importan	Unimport	Unimport	Importan	Unimport	Very Imp
78	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Unimport	Unimport	Importan	Unimport	Unimport	Unimport	Very Imp
79	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Not Very	Importan	Not Very	Not Very	Importan	Unimport	
80	Very Imp	Very Imp	Very Imp		Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	
81	Very Imp	Unimport	Very Imp		Importan	Not Very	Not Very	Not Very	Unimport	Unimport	Not Very	Unimport	
82	Very Imp	Very Imp	Very Imp		Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	
83	Very Imp	Importan	Importan		Unimport	Unimport	Not Very	Very Imp	Unimport	Unimport	Very Imp	Unimport	
84	Very Imp	Importan	Importan				Importan				Importan		
85	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Importan	Very Imp	Importan	Not Very	Importan	Not Very	Importan
86	Not Very	Importan	Importan		Importan		Very Imp	Very Imp			Unimport		
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v6.2adam	v6.2aria	v6.2abm	v6.2aind	v6.2bids	v6.2bubl	v6.2blds	v6.2bei	v6.2brtt	v6.2ctai	v6.2cti	v6.2crb	v6.2daai
1	Importan	Very Imp	Importan	Importan	Not Very	Not Very							Importan
2													
3	Importan	Importan	Importan	Importan	Not Very	Importan	Importan	Importan	Importan	Unimport	Importan	Importan	Importan
4	Importan	Very Imp	Importan	Importan				Importan	Not Very	Unimport	Importan	Very Imp	
5			Unimport	Unimport						Unimport			
6	Importan	Importan						Importan					Importan
7	Very Imp				Very Imp						Very Imp	Very Imp	Very Imp
8		Importan			Importan								Importan
9		Very Imp						Very Imp	Very Imp	Very Imp			Very Imp
10	Importan	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Importan
11	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
12													
13	Not Very	Not Very	Not Very	Not Very	Importan	Importan	Importan	Not Very	Very Imp	Importan	Very Imp	Very Imp	Not Very
14	Unimport	Unimport	Unimport	Unimport	Importan	Unimport	Very Imp	Unimport	Very Imp	Unimport	Very Imp	Very Imp	Unimport
15													
16	Importan	Importan	Unimport	Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Unimport	Not Very	Not Very	Importan
17	Unimport	Importan	Unimport	Unimport	Unimport	Unimport	Unimport	Importan	Importan	Unimport	Not Very	Importan	Not Very
18	Unimport	Unimport	Unimport	Unimport	Importan	Importan	Importan	Importan	Importan	Not Very	Importan	Importan	Unimport
19	Not Very	Not Very											Very Imp
20	Unimport	Importan	Not Very	Not Very	Not Very	Unimport	Not Very	Not Very	Importan	Unimport	Not Very	Not Very	Importan
21	Very Imp	Very Imp	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Unimport	Importan	Importan	Importan
22	Unimport	Unimport	Unimport	Unimport	Importan	Importan	Importan	Importan	Not Very	Importan	Importan	Very Imp	Not Very
23	Unimport	Not Very	Not Very	Not Very	Unimport	Unimport	Unimport	Not Very	Importan	Importan	Very Imp	Very Imp	Importan
24	Not Very	Not Very	Not Very	Not Very	Not Very	Unimport	Unimport	Not Very	Very Imp	Not Very	Importan	Importan	Not Very
25	Unimport	Unimport	Not Very	Not Very	Very Imp	Not Very	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Not Very
26		Very Imp		Very Imp	Importan								Very Imp
27	Not Very	Not Very	Not Very	Not Very	Not Very								Very Imp
28	Importan	Importan	Not Very	Not Very	Not Very	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
29		Importan		Importan			Importan				Very Imp		Importan
30				Importan									Importan
31		Not Very	Not Very	Not Very	Importan	Importan							
32	Not Very	Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Importan	Not Very	Importan	Importan	Not Very
33													Importan
34	Unimport	Importan	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Very Imp	Unimport	Unimport	Importan	Unimport
35	Unimport	Not Very	Unimport	Unimport	Very Imp	Very Imp	Unimport		Not Very	Unimport	Unimport		
36	Importan	Importan	Unimport	Unimport	Unimport	Not Very	Unimport	Not Very	Importan	Unimport	Importan	Importan	Not Very
37					Importan					Importan			Importan
38		Importan	Very Imp	Very Imp	Very Imp	Importan							Very Imp
39	Unimport	Importan	Unimport	Unimport	Unimport	Importan	Not Very	Not Very	Not Very	Unimport	Importan	Importan	Importan
40													
41	Not Very	Importan	Importan	Very Imp	Very Imp	Very Imp	Importan	Importan	Not Very	Not Very	Not Very	Importan	Importan
42	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very
43	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very
44	Very Imp	Importan	Very Imp	Importan	Unimport	Unimport	Unimport	Importan	Importan	Very Imp	Importan	Very Imp	Very Imp
45	Not Very	Importan	Not Very	Importan	Unimport	Unimport	Unimport	Not Very	Unimport	Importan	Unimport		
46	Very Imp	Very Imp	Very Imp	Very Imp									
47	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Importan	Not Very	Not Very
48	Importan	Importan											Importan
49	Importan	Importan	Importan	Very Imp	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Not Very
50													
51	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
52	Importan							Very Imp	Very Imp		Importan	Importan	Very Imp
53	Not Very	Not Very	Not Very	Not Very	Unimport	Importan	Not Very	Not Very	Not Very	Unimport	Unimport	Not Very	Importan
54													
55	Not Very	Importan	Unimport	Unimport	Unimport	Unimport	Unimport	Not Very	Not Very	Unimport	Unimport	Not Very	Not Very
56	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
57													
58	Not Very	Importan	Importan	Importan	Unimport	Unimport	Unimport	Importan	Importan	Unimport	Importan	Importan	Importan
59	Importan	Importan	Importan	Importan	Unimport	Unimport	Unimport	Unimport		Unimport	Importan	Not Very	Importan
60	Importan	Very Imp	Importan	Importan	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very
61	Very Imp	Very Imp	Importan	Importan	Unimport	Unimport	Unimport		Importan	Not Very	Unimport		Importan
62	Unimport	Not Very	Unimport	Unimport	Unimport	Unimport	Unimport	Not Very	Not Very	Unimport	Unimport	Not Very	Not Very
63													
64	Very Imp	Not Very	Unimport	Unimport	Very Imp	Unimport	Unimport	Not Very	Importan	Very Imp	Not Very	Not Very	Not Very
65													
66	Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Not Very	Importan
67	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
68													
69													
70													
71													
72													
73													
74													
75													
76													
77	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
78	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
79	Unimport	Importan	Not Very	Not Very	Unimport	Unimport	Unimport	Not Very	Not Very	Unimport	Not Very	Not Very	Importan
80	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
81	Not Very	Importan	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Not Very	Unimport	Not Very	Importan	Not Very
82	Importan	Importan	Very Imp	Very Imp	Unimport	Not Very	Unimport	Unimport	Not Very	Unimport	Unimport	Not Very	Not Very
83	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport
84	Unimport	Unimport	Importan	Importan									
85	Importan	Importan	Unimport	Unimport	Unimport	Unimport	Unimport	Not Very	Unimport	Unimport	Unimport	Not Very	Not Very
86				Importan									
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



Appendix I: Primary Research Tool Instruments and Data

nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v6.2eric	v6.2asli	v6.2maid	v6.2tttd	v6.2opac	v6.2othe	v7.1auth	v7.1titl	v7.1abst	v7.1aim	v7.1subj	v7.1keyw	v7.1ptyp
1							Useful	Useful	Useful	Useful	Useful	Useful	Useful
2													
3	Importan	Importan	Importan	Unimport	Importan		Very Use	Very Use	Very Use	Very Use	Very Use	Useful	Not Very
4		Very Imp	Importan	Unimport	Importan		Very Use	Very Use	Useful	Useful	Useful	Very Use	Useful
5				Unimport				Very Use	Very Use	Useful	Useful	Useful	Not Very
6		Not Very	Not Very			Very Imp							Very Use
7	Very Imp	Very Imp	Very Imp		Very Imp			Very Use	Very Use			Very Use	Very Use
8		Importan			Very Imp		Very Use	Not Very	Useful	Useful	Not Very	Not Very	Not Very
9		Very Imp					Very Use	Very Use	Very Use	Useful	Very Use	Very Use	Very Use
10	Not Very		Importan	Unimport	Unimport		Useful	Useful	Useful	Useful			
11	Unimport	Unimport	Unimport	Unimport	Unimport	Very Imp	Useful	Not Very	Very Use	Useful	Useful	Very Use	Useful
12				Very Imp			Useful	Useful	Useful			Useful	
13	Importan	Very Imp	Unimport	Importan	Very Imp		Useful	Very Use	Very Use	Very Use	Very Use	Very Use	Useful
14	Very Imp	Very Imp	Unimport	Unimport	Very Imp	Very Imp	Very Use	Very Use	Very Use	Very Use	Very Use	Useful	Useful
15													
16	Importan	Importan	Importan	Not Very	Importan		Useful	Very Use	Very Use	Very Use	Very Use	Very Use	Useful
17	Not Very	Importan	Unimport	Unimport	Importan		Very Use	Very Use	Very Use	Very Use	Useful	Useful	Useful
18	Importan	Importan	Unimport	Importan	Importan	Very Imp	Very Use	Very Use	Very Use	Useful	Very Use	Very Use	Useful
19	Importan	Importan							Very Use		Very Use	Very Use	
20	Not Very	Not Very	Unimport	Unimport	Importan		Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Useful
21	Importan	Importan	Very Imp	Unimport	Not Very		Useful	Very Use	Very Use	Very Use	Useful	Very Use	Not Very
22	Not Very	Importan	Importan	Importan	Importan		Useful	Useful	Useful	Useful	Useful	Useful	Not Very
23	Unimport	Very Imp	Unimport	Very Imp	Very Imp		Very Use	Very Use	Very Use	Not Usef	Not Very	Very Use	Very Use
24	Not Very	Importan	Unimport	Very Imp	Importan		Very Use	Very Use	Useful	Useful	Very Use	Very Use	Very Use
25	Unimport	Unimport	Unimport	Unimport	Importan		Very Use	Useful	Very Use	Not Very	Not Very	Very Use	Not Very
26					Very Imp		Useful	Very Use	Useful	Useful	Very Use	Very Use	Useful
27					Very Imp		Very Use	Useful	Very Use	Very Use	Useful	Useful	
28	Unimport	Unimport	Unimport	Unimport	Unimport		Very Use	Useful	Not Very	Not Very	Useful	Very Use	Useful
29		Very Imp		Very Imp			Very Use	Useful	Very Use				
30							Useful	Very Use	Very Use	Very Use	Very Use	Very Use	Not Very
31							Very Use	Very Use	Useful	Not Very	Not Very	Useful	Useful
32	Unimport	Unimport	Unimport	Not Very	Importan		Useful	Useful	Useful	Not Very	Very Use	Very Use	Not Very
33		Importan				Importan	Useful	Useful	Useful			Very Use	Useful
34	Unimport	Very Imp	Unimport	Unimport	Unimport		Useful	Very Use	Very Use	Very Use	Very Use	Very Use	Not Usef
35		Not Very	Unimport		Importan		Not Usef	Very Use	Very Use	Very Use	Not Very	Very Use	Not Usef
36	Unimport	Not Very	Unimport	Unimport	Unimport		Very Use	Not Very	Very Use	Very Use	Very Use	Very Use	Very Use
37					Importan				Useful		Useful	Useful	
38		Very Imp					Very Use	Useful	Useful	Useful	Useful	Very Use	Useful
39	Not Very	Importan	Not Very	Unimport	Importan	Very Imp	Very Use	Very Use	Useful	Useful	Useful	Useful	Not Very
40													
41	Importan	Importan	Unimport	Unimport	Importan		Not Very	Very Use	Very Use	Very Use	Useful	Very Use	Not Very
42	Not Very	Not Very	Not Very	Not Very	Not Very	Very Imp	Not Very	Useful	Very Use	Very Use	Very Use	Not Very	Very Use
43	Not Very	Not Very	Not Very	Not Very	Not Very		Very Use	Useful	Very Use	Very Use	Very Use	Very Use	Not Very
44	Importan	Importan	Not Very	Importan	Not Very		Very Use	Very Use	Very Use	Useful	Very Use	Very Use	Very Use
45				Importan	Not Very		Useful	Very Use	Very Use	Very Use	Very Use	Useful	Not Very
46							Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Useful
47	Not Very	Not Very	Not Very	Not Very	Not Very		Useful	Useful	Useful	Not Very	Useful	Useful	Useful
48	Importan						Useful	Very Use	Very Use		Very Use	Useful	Useful
49	Unimport	Unimport	Unimport	Unimport	Unimport		Very Use	Very Use	Very Use	Useful	Very Use	Very Use	Useful
50							Very Use	Useful			Useful	Useful	
51	Unimport	Unimport	Unimport	Unimport	Unimport		Useful	Not Very	Not Very	Not Very	Useful	Useful	Not Very
52							Useful	Useful	Useful				
53	Unimport	Unimport	Unimport	Unimport	Not Very	Very Imp	Very Use	Very Use	Useful	Useful	Useful	Not Very	Not Very
54													
55	Not Very	Not Very	Not Very	Unimport	Importan		Useful	Very Use	Very Use	Useful	Useful	Very Use	Useful
56	Unimport	Unimport	Unimport	Unimport	Unimport		Not Very	Not Very	Very Use	Not Usef	Not Usef	Very Use	Very Use
57							Useful	Useful	Very Use	Not Very	Very Use	Very Use	Very Use
58	Not Very	Unimport	Not Very	Unimport	Importan		Useful	Useful	Very Use	Useful	Very Use	Very Use	Useful
59				Not Very	Importan		Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Useful
60	Not Very	Importan	Not Very	Not Very	Importan		Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Very Use
61	Importan	Importan	Unimport	Unimport	Very Imp		Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Very Use
62	Not Very	Not Very	Not Very	Unimport	Very Imp		Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Very Use
63		Importan		Importan	Importan		Very Use	Useful	Very Use	Useful	Useful	Useful	Very Use
64	Unimport	Very Imp	Unimport	Very Imp	Very Imp		Very Use	Very Use	Very Use	Very Use	Very Use	Very Use	Not Very
65													
66	Not Very	Not Very	Importan	Not Very	Importan		Useful	Useful	Not Very	Not Very	Useful	Not Very	Not Very
67	Unimport	Unimport	Unimport	Unimport	Unimport		Not Usef	Not Usef	Not Usef	Not Usef	Not Usef	Not Usef	Not Usef
68							Useful	Not Usef	Useful	Not Very	Very Use	Very Use	Not Very
69													
70													
71													
72													
73													
74													
75													
76													
77	Unimport	Unimport	Unimport	Unimport	Unimport	Very Imp	Not Very	Useful	Useful	Not Very	Very Use	Very Use	Very Use
78	Unimport	Unimport	Unimport	Unimport	Unimport	Very Imp	Not Very	Not Very	Not Very	Not Very	Very Use	Very Use	Not Very
79	Not Very	Unimport	Not Very	Unimport	Unimport		Not Very	Useful	Very Use	Not Very	Very Use	Very Use	Useful
80	Unimport	Unimport	Unimport	Unimport	Unimport		Not Very	Not Very	Useful	Not Usef	Very Use	Very Use	Not Usef
81	Unimport	Not Very	Importan	Unimport	Importan		Useful	Useful	Useful	Very Use	Very Use	Not Very	Useful
82	Unimport	Not Very	Not Very	Unimport	Unimport		Very Use	Very Use	Useful	Useful	Very Use	Not Very	Useful
83	Unimport	Unimport	Unimport	Unimport	Unimport		Not Usef	Not Usef	Not Usef	Not Usef	Very Use	Not Usef	Not Usef
84							Not Very	Very Use	Useful	Useful	Useful	Very Use	Useful
85	Not Very	Unimport	Not Very	Unimport	Not Very	Importan	Not Very	Useful	Very Use	Useful	Very Use	Very Use	Very Use
86					Importan		Not Very	Very Use	Useful	Very Use	Very Use	Very Use	Not Very
87	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v7.1rtyp	v7.1chro	v7.1meth	v7.1coll	v7.1vism	v7.1othe	v8.101sa	v8.101sb	v8.101sc	v8.101sd	v8.101se	v8.101sf	v8.101sg
1	Useful	Useful	Useful	Useful	Useful								
2													
3	Not Very	Not Very	Useful	Not Very	Very Use		Function	Easy to	Easy to				Terminol
4	Not Very	Not Very	Very Use	Useful	Very Use		Function						
5	Not Very	Not Very	Useful	Not Very	Useful		Function	Easy to	Easy to		Graphica		
6						Very Use							
7			Very Use	Very Use									
8	Not Usef	Not Very	Not Very	Not Usef	Not Very			Easy to					
9	Useful	Useful	Not Very	Not Very	Not Very								
10					Useful								
11		Not Very	Very Use	Useful	Very Use								
12							Function	Easy to	Easy to				
13	Not Very	Useful	Useful	Not Very	Not Very		Function						Terminol
14	Very Use	Very Use	Very Use	Not Usef	Very Use		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol
15													
16	Useful	Not Very	Useful	Not Very	Useful		Function	Easy to	Easy to	Help Fac			
17	Not Very	Not Very	Useful	Useful	Useful		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol
18	Useful	Not Very	Useful	Useful	Useful								
19			Useful										
20	Useful	Useful	Very Use	Not Very	Very Use		Function	Easy to	Easy to	Help Fac			
21	Not Very	Not Very	Useful	Not Very	Useful			Easy to	Easy to			Layout	
22	Not Very	Not Very	Not Very	Not Very	Not Very		Function	Easy to	Easy to			Layout	
23	Useful	Not Usef	Not Usef	Not Usef	Not Very			Easy to	Easy to			Layout	Terminol
24	Useful	Useful	Useful	Useful	Not Very		Function	Easy to	Easy to			Layout	Terminol
25	Not Usef	Useful	Not Very	Not Very	Not Usef		Function	Easy to	Easy to				
26	Useful	Useful	Useful	Useful	Very Use								
27			Useful				Function	Easy to	Easy to		Graphica		
28	Not Very	Not Usef	Not Very	Not Very	Useful								
29													
30	Not Very	Not Very	Useful	Not Very	Not Very								
31	Not Very	Not Usef	Not Usef	Useful	Not Very		Function	Easy to	Easy to				
32	Not Very	Not Very	Useful	Not Very	Not Usef		Function	Easy to	Easy to				Terminol
33													
34	Not Usef	Not Usef	Not Usef	Not Usef	Not Usef								
35	Not Usef	Useful	Useful	Not Very	Not Very								
36	Useful	Useful	Very Use	Not Very	Very Use								
37					Useful								
38	Useful						Function						
39	Not Very	Useful	Very Use	Very Use	Useful								
40													
41	Not Very	Very Use	Useful	Not Very	Very Use		Function	Easy to	Easy to				Terminol
42	Useful	Not Very	Very Use	Not Very	Very Use								
43	Not Very	Not Very	Useful	Not Very	Useful		Function						
44	Not Very	Not Usef	Useful	Not Usef	Useful								
45	Not Very	Not Very	Useful	Useful	Useful		Function	Easy to	Easy to	Help Fac			Terminol
46	Useful	Useful	Useful	Useful	Very Use								
47	Useful	Not Very	Not Very	Not Very	Useful								
48	Useful												
49	Useful	Not Usef	Not Usef	Not Usef	Not Usef								
50													
51	Not Very	Not Usef	Not Usef	Not Usef	Useful								
52													
53	Not Very	Not Very	Useful	Useful	Very Use	Very Use							
54							Function	Easy to	Easy to				Terminol
55	Useful	Useful	Very Use	Not Very	Very Use		Function	Easy to	Easy to	Help Fac			
56	Very Use	Very Use	Not Usef	Very Use	Very Use								
57	Very Use	Very Use	Useful	Very Use	Very Use								
58	Useful	Not Very	Useful	Not Very	Very Use		Function	Easy to	Easy to	Help Fac			
59	Useful	Useful	Very Use	Useful	Very Use								
60	Very Use	Useful	Very Use	Useful	Very Use		Function	Easy to	Easy to				
61	Useful	Not Very	Very Use	Useful	Very Use		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol
62	Very Use	Useful	Very Use	Useful	Very Use		Function	Easy to	Easy to	Help Fac			Terminol
63	Useful	Useful	Very Use	Useful	Very Use								Terminol
64	Not Very	Useful	Useful	Useful	Very Use								
65													
66	Not Very	Not Very	Not Very	Not Very	Useful			Easy to	Easy to				Terminol
67	Not Usef	Not Usef	Not Usef	Not Usef	Not Usef								
68	Not Usef	Not Usef	Not Usef	Not Usef	Very Use								
69													
70													
71													
72													
73													
74													
75													
76													
77	Not Very	Very Use	Not Very	Very Use	Very Use								
78	Not Very	Not Very	Not Very	Not Very	Very Use								
79	Not Very	Not Very	Not Very	Useful	Very Use								
80	Not Usef	Not Usef	Not Usef	Not Usef	Very Use								
81	Useful	Not Usef	Very Use	Very Use	Useful		Function	Easy to	Easy to	Help Fac		Layout	
82	Not Very	Not Very	Useful	Not Very	Very Use	Very Use							
83	Not Usef	Not Usef	Not Usef	Not Usef	Very Use								
84	Useful	Not Very	Not Very	Useful	Useful								
85	Not Very	Not Very	Useful	Not Usef	Very Use								
86		Useful	Useful		Very Use		Function		Easy to				
87	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v8.101sh	v8.102wa	v8.102wb	v8.102wc	v8.102wd	v8.102we	v8.102wf	v8.102wg	v8.102wh	v8.103sa	v8.103sb	v8.103sc	v8.103sd
1													
2													
3	Speed				Help Fac	Graphica	Layout			Function			
4	Speed												
5													
6													
7													
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16	Speed					Graphica	Layout	Terminol					
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18		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed	Function	Easy to	Easy to	
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20	Speed					Graphica	Layout	Terminol					
21		Function			Help Fac	Graphica		Terminol	Speed				
22					Help Fac	Graphica		Terminol	Speed				
23	Speed	Function			Help Fac	Graphica						Easy to	
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27								Terminol	Speed				
28		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
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31	Speed				Help Fac	Graphica	Layout	Terminol		Function			
32					Help Fac	Graphica	Layout		Speed	Function	Easy to		
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61	Speed												
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64		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
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66		Function			Help Fac	Graphica	Layout		Speed	Function	Easy to	Easy to	
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81	Speed					Graphica		Terminol					
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87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

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18				Speed				Help Fac	Graphica	Layout	Terminol		Function
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22					Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed	Function
23			Terminol	Speed	Function	Easy to		Help Fac	Graphica	Layout			Function
24					Function	Easy to		Help Fac	Graphica	Layout	Terminol	Speed	Function
25						Easy to	Easy to						Function
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30				Speed		Easy to	Easy to	Help Fac	Graphica	Layout	Terminol		
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32				Speed			Easy to	Help Fac	Graphica	Layout	Terminol		Function
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38				Speed	Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol		Function
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63			Terminol		Function	Easy to	Easy to		Graphica	Layout		Speed	Function
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81	Graphica				Function	Easy to	Easy to	Help Fac		Layout	Terminol	Speed	Function
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84													Function
85													Function
86													Function
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

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3						Terminol			Easy to	Easy to	Help Fac	Graphica	Layout
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13		Easy to		Graphica			Speed						
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15	Easy to	Easy to					Speed				Help Fac	Graphica	Layout
16	Easy to	Easy to		Graphica	Layout		Speed				Help Fac		
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18	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
19	Easy to			Graphica	Layout	Terminol							
20		Easy to	Help Fac	Graphica		Terminol	Speed		Easy to				Layout
21	Easy to	Easy to	Help Fac	Graphica	Layout		Speed						
22	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
23	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
24	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
25	Easy to	Easy to					Speed						
26				Graphica									
27													
28	Easy to	Easy to		Graphica			Speed				Help Fac		Layout
29													
30	Easy to	Easy to					Speed				Help Fac		
31	Easy to			Graphica	Layout		Speed			Easy to	Help Fac		
32	Easy to	Easy to		Graphica	Layout	Terminol	Speed				Help Fac		
33	Easy to	Easy to			Layout		Speed				Help Fac		
34													
35													
36													
37													
38	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
39	Easy to	Easy to		Graphica	Layout	Terminol	Speed				Help Fac		
40													
41		Easy to		Graphica	Layout	Terminol	Speed		Easy to		Help Fac		
42													
43													
44	Easy to	Easy to				Terminol	Speed				Help Fac	Graphica	Layout
45	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
46	Easy to	Easy to					Speed				Help Fac	Graphica	Layout
47	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
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49	Easy to	Easy to	Help Fac		Layout	Terminol	Speed						
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51													
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53	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
54	Easy to	Easy to	Help Fac	Graphica	Layout		Speed						
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56	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed	Other					
57	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
58	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
59	Easy to	Easy to		Graphica	Layout								
60	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
61	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
62	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
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64		Easy to			Layout		Speed		Easy to		Help Fac	Graphica	
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85	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed						
86		Easy to					Speed		Easy to		Help Fac	Graphica	Layout
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.106wg	v8.106wh	v8.107sa	v8.107sb	v8.107sc	v8.107sd	v8.107se	v8.107sf	v8.107sg	v8.107sh	v8.108wa	v8.108wb	v8.108wc
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15	Terminol		Function	Easy to	Easy to				Terminol	Speed			
16	Terminol		Function	Easy to	Easy to					Speed			
17			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
18			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
19			Function	Easy to	Easy to								
20			Function	Easy to	Easy to					Speed			
21	Terminol			Easy to	Easy to					Speed	Function		
22			Function		Easy to			Layout		Speed		Easy to	
23			Function	Easy to	Easy to			Layout	Terminol	Speed			
24			Function	Easy to	Easy to	Help Fac		Layout	Terminol	Speed			
25			Function	Easy to	Easy to					Speed			
26										Speed			
27			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
28	Terminol		Function	Easy to	Easy to					Speed			
29													
30			Function	Easy to	Easy to			Layout					
31	Terminol		Function	Easy to	Easy to			Layout	Terminol	Speed			
32			Function	Easy to	Easy to	Help Fac	Graphica	Layout		Speed			
33			Function	Easy to	Easy to								
34													
35			Function	Easy to	Easy to		Graphica	Layout	Terminol	Speed			
36			Function	Easy to	Easy to	Help Fac	Graphica			Speed			
37			Function	Easy to	Easy to					Speed			
38			Function		Easy to					Speed		Easy to	
39			Function	Easy to	Easy to			Layout	Terminol	Speed			
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44			Function	Easy to	Easy to					Speed			
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47			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
48			Function	Easy to	Easy to					Speed			
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53			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
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56			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
57													
58			Function	Easy to	Easy to					Speed			
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60			Function	Easy to	Easy to			Layout	Terminol	Speed			
61			Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed			
62			Function	Easy to	Easy to					Speed			
63			Function	Easy to	Easy to		Graphica	Layout	Terminol				
64	Terminol		Function		Easy to			Layout		Speed		Easy to	
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83												Easy to	Easy to
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85			Function	Easy to	Easy to					Speed			
86				Easy to	Easy to			Layout			Function		
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.108wd	v8.108we	v8.108wf	v8.108wg	v8.108wh	v8.109sa	v8.109sb	v8.109sc	v8.109sd	v8.109se	v8.109sf	v8.109sg	v8.109sh
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16	Help Fac	Graphica	Layout	Terminol									
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19	Help Fac			Terminol									
20	Help Fac	Graphica	Layout	Terminol									
21	Help Fac	Graphica	Layout	Terminol									
22	Help Fac	Graphica		Terminol									
23	Help Fac	Graphica					Easy to	Easy to			Layout	Terminol	Speed
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28	Help Fac	Graphica	Layout	Terminol									
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31	Help Fac	Graphica											
32				Terminol		Function	Easy to					Terminol	Speed
33	Help Fac		Layout										
34													
35	Help Fac						Easy to	Easy to			Layout	Terminol	
36			Layout	Terminol		Function	Easy to	Easy to	Help Fac	Graphica		Terminol	Speed
37													
38	Help Fac	Graphica	Layout	Terminol		Function	Easy to	Easy to	Help Fac	Graphica	Layout		Speed
39	Help Fac	Graphica				Function	Easy to	Easy to		Graphica	Layout		Speed
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58	Help Fac	Graphica	Layout	Terminol									
59													
60	Help Fac	Graphica				Function							
61						Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	
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82				Terminol									
83	Help Fac	Graphica	Layout	Terminol									
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85	Help Fac	Graphica	Layout	Terminol									
86		Graphica											
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.110wa	v8.110wb	v8.110wc	v8.110wd	v8.110we	v8.110wf	v8.110wg	v8.110wh	v8.111sa	v8.111sb	v8.111sc	v8.111sd	v8.111se
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26									Function				
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28	Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed					
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30				Help Fac		Layout			Function	Easy to	Easy to		
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87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

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21		Terminol						Graphica	Layout		Speed		
22	Layout		Speed		Easy to	Easy to	Help Fac	Graphica		Terminol			
23		Terminol	Speed	Function			Help Fac	Graphica	Layout				Easy to
24		Terminol		Function	Easy to		Help Fac	Graphica	Layout		Speed		
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28				Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed		
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23	Easy to				Terminol	Speed	Function			Help Fac	Graphica	Layout	
24	Easy to						Function	Easy to		Help Fac	Graphica	Layout	Terminol
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27													
28							Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol
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31	Easy to			Layout			Function			Help Fac	Graphica		
32						Speed		Easy to	Easy to	Help Fac	Graphica	Layout	Terminol
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38			Graphica	Layout		Speed		Easy to	Easy to	Help Fac			Terminol
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85							Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol
86													
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.114wh	v8.115sa	v8.115sb	v8.115sc	v8.115sd	v8.115se	v8.115sf	v8.115sg	v8.115sh	v8.116wa	v8.116wb	v8.116wc	v8.116wd
1													
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3	Speed	Function	Easy to	Easy to		Graphica	Layout	Terminol					Help Fac
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5		Function									Easy to	Easy to	
6				Easy to									
7													
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9													
10		Function	Easy to	Easy to		Graphica	Layout		Speed				
11													
12		Function	Easy to	Easy to									
13		Function					Layout						
14		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
15		Function	Easy to	Easy to		Graphica	Layout	Terminol					Help Fac
16		Function	Easy to	Easy to		Graphica	Layout	Terminol	Speed				Help Fac
17			Easy to	Easy to		Graphica				Function			Help Fac
18		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
19		Function	Easy to	Easy to									Help Fac
20			Easy to	Easy to						Function			Help Fac
21			Easy to	Easy to		Graphica	Layout						Help Fac
22	Speed	Function	Easy to	Easy to	Help Fac	Graphica	Layout						
23		Function	Easy to		Help Fac	Graphica	Layout	Terminol				Easy to	
24	Speed	Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
25			Easy to	Easy to									
26		Function							Speed				
27		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
28	Speed	Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
29													
30		Function	Easy to	Easy to									Help Fac
31	Speed	Function	Easy to									Easy to	Help Fac
32		Function	Easy to	Easy to		Graphica	Layout	Terminol	Speed				Help Fac
33										Function	Easy to	Easy to	Help Fac
34													
35													
36		Function	Easy to	Easy to	Help Fac								
37		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
38		Function	Easy to	Easy to	Help Fac	Graphica	Layout						
39		Function	Easy to	Easy to	Help Fac	Graphica	Layout		Speed				
40													
41		Function	Easy to	Easy to		Graphica	Layout						Help Fac
42													
43													
44		Function	Easy to	Easy to					Speed				Help Fac
45		Function	Easy to	Easy to	Help Fac			Terminol	Speed				
46	Speed	Function	Easy to	Easy to					Speed				Help Fac
47			Easy to					Terminol		Function		Easy to	Help Fac
48		Function	Easy to	Easy to		Graphica	Layout						Help Fac
49		Function	Easy to	Easy to	Help Fac		Layout		Speed				
50		Function	Easy to	Easy to			Layout						
51													
52													
53		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
54		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
55		Function	Easy to	Easy to									Help Fac
56		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
57		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol	Speed				
58		Function	Easy to	Easy to		Graphica	Layout	Terminol					Help Fac
59		Function	Easy to	Easy to	Help Fac	Graphica		Terminol					
60		Function	Easy to	Easy to		Graphica	Layout	Terminol	Speed				Help Fac
61		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
62		Function	Easy to	Easy to		Graphica							Help Fac
63		Function	Easy to	Easy to		Graphica		Terminol	Speed				
64		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
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77		Function	Easy to	Easy to		Graphica			Speed				Help Fac
78			Easy to	Easy to		Graphica				Function			Help Fac
79		Function	Easy to	Easy to		Graphica			Speed				
80			Easy to	Easy to		Graphica	Layout		Speed	Function			Help Fac
81	Speed	Function	Easy to	Easy to	Help Fac			Terminol	Speed				
82													
83		Function	Easy to	Easy to		Graphica	Layout						Help Fac
84													
85	Speed	Function	Easy to	Easy to		Graphica							Help Fac
86		Function	Easy to	Easy to	Help Fac	Graphica	Layout	Terminol					
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.116we	v8.116wf	v8.116wg	v8.116wh	v8.201sa	v8.201sb	v8.201sc	v8.201sd	v8.201se	v8.201sf	v8.202wa	v8.202wb	v8.202wc
1													
2													
3				Speed	Structur	Content	Classifi	Represen	Reliabil	Search 0			
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9													
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11													
12						Content		Represen	Reliabil		Structur		Classifi
13				Speed		Content			Reliabil			Content	
14				Speed	Structur		Classifi			Search 0		Content	
15				Speed		Content	Classifi			Search 0	Structur		
16					Structur	Content	Classifi		Reliabil	Search 0			
17		Layout	Terminol	Speed	Structur	Content	Classifi		Reliabil				
18						Content	Classifi	Represen	Reliabil		Structur		
19			Terminol	Speed									
20	Graphica	Layout	Terminol	Speed	Structur	Content	Classifi		Reliabil				
21			Terminol	Speed									
22			Terminol	Speed	Structur	Content	Classifi	Represen	Reliabil				
23				Speed	Structur	Content	Classifi		Reliabil	Search 0			
24					Structur	Content	Classifi	Represen	Reliabil	Search 0			
25					Structur	Content	Classifi			Search 0			
26													
27													
28				Speed									
29													
30			Terminol										
31	Graphica	Layout	Terminol	Speed	Structur	Content	Classifi		Reliabil	Search 0			
32						Content	Classifi		Reliabil	Search 0	Structur		
33													
34													
35													
36	Graphica	Layout	Terminol	Speed									
37				Speed									
38			Terminol	Speed									
39			Terminol		Structur	Content	Classifi						
40													
41			Terminol	Speed		Content	Classifi		Reliabil		Structur		
42													
43													
44	Graphica	Layout	Terminol										
45	Graphica	Layout			Structur	Content			Reliabil				Classifi
46	Graphica	Layout	Terminol										
47	Graphica	Layout		Speed									
48			Terminol	Speed									
49	Graphica		Terminol										
50				Speed									
51													
52													
53													
54				Speed	Structur	Content	Classifi		Reliabil	Search 0			
55	Graphica	Layout	Terminol	Speed		Content			Reliabil		Structur		Classifi
56													
57													
58				Speed	Structur	Content	Classifi		Reliabil	Search 0			
59		Layout		Speed									
60					Structur	Content	Classifi		Reliabil				
61				Speed	Structur	Content	Classifi	Represen	Reliabil	Search 0			
62		Layout	Terminol	Speed	Structur	Content	Classifi		Reliabil				
63						Content	Classifi	Represen	Reliabil	Search 0	Structur		
64				Speed		Content	Classifi		Reliabil		Structur		
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77		Layout	Terminol										
78		Layout	Terminol	Speed									
79		Layout	Terminol										
80			Terminol										
81	Graphica	Layout			Structur		Classifi					Content	
82													
83			Terminol	Speed									
84													
85		Layout	Terminol	Speed									
86				Speed		Content			Reliabil		Structur		Classifi
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v8.202wd	v8.202we	v8.202wf	v8.203sa	v8.203sb	v8.203sc	v8.203sd	v8.203se	v8.203sf	v8.204wa	v8.204wb	v8.204wc	v8.204wd
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11													
12			Search 0	Structur		Classifi	Represen	Reliabil	Search 0		Content		
13	Represen							Reliabil					Represen
14	Represen	Reliabil		Structur	Content	Classifi	Represen	Reliabil					
15	Represen	Reliabil		Structur	Content	Classifi	Represen	Reliabil	Search 0				
16	Represen												
17			Search 0										
18			Search 0										
19													
20	Represen		Search 0										
21													
22			Search 0							Structur	Content	Classifi	Represen
23				Content	Classifi			Search 0	Structur				Represen
24												Classifi	Represen
25													
26													
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28													
29													
30					Content					Structur			
31								Reliabil		Structur	Content	Classifi	
32	Represen			Content	Classifi			Reliabil	Search 0	Structur			Represen
33													
34													
35													
36													
37													
38													
39	Represen	Reliabil	Search 0		Content		Represen	Reliabil		Structur		Classifi	
40													
41	Represen		Search 0		Content	Content		Reliabil	Search 0	Structur			Represen
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60	Represen		Search 0										
61													
62	Represen		Search 0										
63					Content	Classifi	Represen	Reliabil	Search 0	Structur			
64	Represen		Search 0		Content	Classifi		Reliabil		Structur			Represen
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81	Represen	Reliabil	Search 0	Structur	Content			Reliabil				Classifi	Represen
82													
83													
84													
85													
86	Represen		Search 0										
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.204we	v8.204wf	v8.205sa	v8.205sb	v8.205sc	v8.205sd	v8.205se	v8.205sf	v8.206wa	v8.206wb	v8.206wc	v8.206wd	v8.206we
1													
2													
3	Reliabil		Structur	Content	Classifi	Represen	Reliabil	Search 0					
4													
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6													
7				Content									
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9													
10					Classifi								
11													
12													
13				Content			Reliabil	Search 0					
14		Search 0		Content	Classifi		Reliabil		Structur			Represen	
15			Structur	Content	Classifi	Represen	Reliabil	Search 0					
16			Structur	Content			Reliabil	Search 0			Classifi	Represen	
17													
18			Structur	Content	Classifi	Represen	Reliabil	Search 0					
19				Content									
20			Structur	Content	Classifi	Represen	Reliabil	Search 0					
21				Content		Represen	Reliabil	Search 0	Structur		Classifi		
22	Reliabil	Search 0	Structur	Content	Classifi	Represen	Reliabil						
23	Reliabil		Structur	Content	Classifi		Reliabil	Search 0				Represen	
24	Reliabil	Search 0	Structur	Content	Classifi	Represen		Search 0					Reliabil
25													
26													
27													
28													
29													
30													
31		Search 0			Classifi		Reliabil		Structur	Content			
32			Structur	Content	Classifi	Represen	Reliabil	Search 0					
33			Structur	Content	Classifi								
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36													
37													
38													
39		Search 0	Structur	Content	Classifi							Represen	Reliabil
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41			Structur	Content	Classifi	Represen							Reliabil
42													
43													
44				Content	Classifi	Represen	Reliabil		Structur				
45			Structur			Represen				Content	Classifi		
46													
47			Structur	Content	Classifi	Represen	Reliabil	Search 0					
48													
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52													
53			Structur	Content	Classifi	Represen	Reliabil	Search 0					
54			Structur	Content	Classifi	Represen		Search 0					Reliabil
55			Structur	Content	Classifi		Reliabil	Search 0				Represen	
56			Structur	Content	Classifi							Represen	Reliabil
57			Structur	Content	Classifi	Represen	Reliabil	Search 0					
58			Structur	Content	Classifi	Represen	Reliabil	Search 0					
59													
60			Structur	Content	Classifi	Represen	Reliabil	Search 0					
61			Structur	Content	Classifi	Represen	Reliabil	Search 0					
62			Structur	Content	Classifi	Represen	Reliabil	Search 0					
63			Structur	Content	Classifi	Represen	Reliabil	Search 0					
64		Search 0	Structur	Content	Classifi	Represen							Reliabil
65													
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68			Structur	Content			Reliabil	Search 0					
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80													
81		Search 0	Structur			Represen				Content	Classifi		Reliabil
82													
83													
84			Structur	Content		Represen	Reliabil				Classifi		
85			Structur	Content	Classifi	Represen	Reliabil	Search 0					
86				Content	Classifi		Reliabil	Search 0	Structur			Represen	
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.206wf	v8.207sa	v8.207sb	v8.207sc	v8.207sd	v8.207se	v8.207sf	v8.208wa	v8.208wb	v8.208wc	v8.208wd	v8.208we	v8.208wf
1													
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3		Structur	Content	Classifi	Represen	Reliabil	Search 0						
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12		Structur	Content	Classifi	Represen	Reliabil	Search 0						
13			Content								Represen		
14	Search 0	Structur	Content	Classifi	Represen	Reliabil	Search 0						
15		Structur	Content			Reliabil				Classifi	Represen		Search 0
16						Reliabil	Search 0	Structur	Content	Classifi	Represen		
17		Structur				Reliabil			Content				
18		Structur	Content	Classifi									Search 0
19			Content			Reliabil							Search 0
20		Structur							Content	Classifi	Represen	Reliabil	Search 0
21		Structur				Reliabil			Content	Classifi	Represen		Search 0
22	Search 0	Structur	Content			Reliabil				Classifi	Represen		Search 0
23		Structur	Content	Classifi	Represen	Reliabil	Search 0						
24		Structur								Classifi	Represen	Reliabil	Search 0
25													
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27													
28		Structur	Content			Reliabil				Classifi	Represen		Search 0
29													
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31	Search 0		Content	Classifi		Reliabil		Structur					Search 0
32		Structur	Content		Represen	Reliabil				Classifi			Search 0
33		Structur											
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36		Structur	Content	Classifi		Reliabil					Represen		Search 0
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39	Search 0		Content		Represen	Reliabil		Structur		Classifi			Search 0
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44	Search 0	Structur				Reliabil			Content	Classifi	Represen		Search 0
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48		Structur	Content							Classifi	Represen	Reliabil	Search 0
49		Structur	Content	Classifi	Represen	Reliabil	Search 0						
50		Structur				Reliabil							Search 0
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53		Structur	Content	Classifi	Represen	Reliabil	Search 0						
54						Reliabil					Represen		
55								Structur	Content	Classifi	Represen	Reliabil	Search 0
56	Search 0					Reliabil		Structur	Content	Classifi	Represen		Search 0
57													
58								Structur	Content	Classifi	Represen	Reliabil	Search 0
59		Structur	Content			Reliabil							
60		Structur	Content			Reliabil				Classifi	Represen		Search 0
61		Structur	Content	Classifi	Represen	Reliabil	Search 0						
62		Structur	Content							Classifi	Represen	Reliabil	Search 0
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81	Search 0	Structur	Content			Reliabil				Classifi	Represen		Search 0
82		Structur	Content			Reliabil							
83													
84	Search 0												
85		Structur	Content			Reliabil				Classifi	Represen		Search 0
86								Structur	Content	Classifi	Represen	Reliabil	Search 0
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.209sa	v8.209sb	v8.209sc	v8.209sd	v8.209se	v8.209sf	v8.210wa	v8.210wb	v8.210wc	v8.210wd	v8.210we	v8.210wf	v8.211sa
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3		Content	Classifi			Search 0	Structur			Represen	Reliabil		
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14		Content	Classifi	Represen	Reliabil		Structur					Search 0	
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39	Structur	Content	Classifi			Search 0				Represen	Reliabil		
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61	Structur	Content	Classifi	Represen	Reliabil	Search 0							Structur
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80													
81			Classifi		Reliabil		Structur	Content		Represen		Search 0	
82													
83													
84													
85													
86													
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v8.211sb	v8.211sc	v8.211sd	v8.211se	v8.211sf	v8.212wa	v8.212wb	v8.212wc	v8.212wd	v8.212we	v8.212wf	v8.213sa	v8.213sb
1													
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3	Content	Classifi			Search 0	Structur			Represen	Reliabil			Content
4													
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10					Search 0								
11													
12												Structur	Content
13												Content	Content
14	Content					Structur		Classifi	Represen	Reliabil	Search 0	Structur	Content
15												Structur	
16													
17													
18													
19													
20													
21													
22	Content	Classifi	Represen							Reliabil	Search 0		Content
23		Classifi	Represen	Reliabil	Search 0		Content						
24		Classifi	Represen							Reliabil	Search 0		
25													
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30													
31	Content	Classifi			Reliabil	Search 0						Structur	Content
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39	Content				Reliabil	Structur		Classifi	Represen		Search 0		
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54	Content		Represen			Structur		Classifi		Reliabil	Search 0		
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56													
57												Structur	Content
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59													
60	Content				Reliabil	Structur		Classifi	Represen		Search 0		
61	Content	Classifi	Represen							Reliabil	Search 0		
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81	Content				Reliabil	Structur		Classifi	Represen		Search 0	Structur	Content
82													
83													
84													
85													Content
86													
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.213sc	v8.213sd	v8.213se	v8.213sf	v8.214wa	v8.214wb	v8.214wc	v8.214wd	v8.214we	v8.214wf	v8.215sa	v8.215sb	v8.215sc	
1														
2														
3	Classifi		Reliabil		Structur				Represen	Reliabil		Structur	Content	Classifi
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9														
10				Search 0									Content	
11														
12	Classifi	Represen	Reliabil	Search 0								Structur	Content	Classifi
13													Content	
14	Classifi	Represen	Reliabil	Search 0								Structur	Content	Classifi
15		Represen	Reliabil				Content	Classifi			Search 0	Structur	Content	Classifi
16												Structur	Content	
17													Content	
18												Structur	Content	Classifi
19														
20														
21													Content	
22					Structur		Classifi	Represen	Reliabil	Search 0	Structur	Content	Classifi	
23	Classifi	Represen	Reliabil		Structur	Content				Search 0	Structur	Content	Classifi	
24							Classifi	Represen	Reliabil	Search 0	Structur			Classifi
25														
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27														
28												Structur		
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31	Classifi			Search 0					Reliabil			Structur	Content	Classifi
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87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.215sd	v8.215se	v8.215sf	v8.216wa	v8.216wb	v8.216wc	v8.216wd	v8.216we	v8.216wf	v8.301sa	v8.301sb	v8.301sc	v8.301sd
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18	Represen		Search 0					Reliabil					
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22	Represen							Reliabil	Search 0	Communic	Interact		Extensib
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56	Represen							Reliabil	Search 0				
57	Represen							Reliabil	Search 0				
58	Represen			Structur	Content	Classifi		Reliabil	Search 0	Communic		Updateda	
59													
60	Represen		Search 0	Structur		Classifi		Reliabil					Extensib
61						Classifi	Represen	Reliabil	Search 0				
62	Represen		Search 0	Structur	Content	Classifi		Reliabil				Updateda	Extensib
63	Represen		Search 0					Reliabil				Updateda	
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79	Represen				Content	Classifi		Reliabil	Search 0				
80	Represen		Search 0	Structur	Content	Classifi		Reliabil					
81		Reliabil				Classifi	Represen		Search 0			Updateda	Extensib
82													
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85	Represen			Structur	Content	Classifi		Reliabil	Search 0				
86	Represen		Search 0			Classifi		Reliabil				Updateda	Extensib
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.302wa	v8.302wb	v8.302wc	v8.302wd	v8.303sa	v8.303sb	v8.303sc	v8.303sd	v8.304wa	v8.304wb	v8.304wc	v8.304wd	v8.305sa
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24	Communic	Interact	Updateda	Extensib	Communic		Updateda			Interact		Extensib	
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27	Communic	Interact	Updateda	Extensib									
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85													Communic
86	Communic	Interact											
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



Appendix I: Primary Research Tool Instruments and Data

nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v8.305sb	v8.305sc	v8.305sd	v8.306wa	v8.306wb	v8.306wc	v8.306wd	v8.307sa	v8.307sb	v8.307sc	v8.307sd	v8.308wa	v8.308wb
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10	Interact							Communic		Updateda	Extensib		
11													
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13								Communic					
14	Interact		Extensib	Communic		Updateda		Communic	Interact	Updateda	Extensib		
15	Interact	Updateda					Extensib	Communic	Interact	Updateda			
16			Extensib		Interact	Updateda							
17								Communic	Interact	Updateda	Extensib		
18													
19								Communic					
20	Interact	Updateda	Extensib					Communic	Interact	Updateda	Extensib		
21	Interact			Communic		Updateda	Extensib	Communic		Updateda	Extensib		Interact
22	Interact					Updateda	Extensib	Communic			Extensib		Interact
23	Interact					Updateda	Extensib	Communic		Updateda	Extensib		Interact
24			Extensib	Communic	Interact	Updateda		Communic	Interact	Updateda	Extensib		
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26													
27								Communic	Interact	Updateda			
28								Communic	Interact	Updateda	Extensib		
29													
30	Interact			Communic		Updateda		Communic	Interact	Updateda			
31	Interact			Communic		Updateda	Extensib	Communic		Updateda	Extensib		Interact
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33		Updateda						Communic	Interact				
34													
35													
36								Communic		Updateda			Interact
37													
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39	Interact			Communic		Updateda	Extensib	Communic	Interact	Updateda			
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41	Interact					Updateda	Extensib						
42													
43													
44					Interact	Updateda	Extensib	Communic	Interact	Updateda	Extensib		
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46													
47	Interact		Extensib	Communic		Updateda		Communic	Interact	Updateda	Extensib		
48								Communic					Interact
49								Communic	Interact	Updateda	Extensib		
50								Communic					Interact
51													
52													
53	Interact	Updateda	Extensib					Communic	Interact	Updateda	Extensib		
54	Interact			Communic		Updateda	Extensib	Communic	Interact	Updateda			
55	Interact	Updateda	Extensib					Communic	Interact	Updateda	Extensib		
56				Communic	Interact	Updateda	Extensib	Communic	Interact	Updateda	Extensib		
57		Updateda		Communic	Interact		Extensib						
58					Interact	Updateda	Extensib	Communic	Interact	Updateda	Extensib		
59													
60	Interact					Updateda	Extensib	Communic	Interact	Updateda	Extensib		
61	Interact	Updateda	Extensib					Communic	Interact	Updateda	Extensib		
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63	Interact					Updateda		Communic	Interact	Updateda			
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83					Interact			Communic	Interact	Updateda			
84		Updateda	Extensib		Interact								
85	Interact					Updateda	Extensib	Communic		Updateda	Extensib		Interact
86			Extensib	Communic	Interact	Updateda		Communic	Interact	Updateda			
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



Appendix I: Primary Research Tool Instruments and Data

nbessis:submittedthesis:Primary Research Tool:SURVEYIIIs

	v8.308wc	v8.308wd	v8.309sa	v8.309sb	v8.309sc	v8.309sd	v8.310wa	v8.310wb	v8.310wc	v8.310wd	v8.311sa	v8.311sb	v8.311sc
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87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.311sd	v8.312wa	v8.312wb	v8.312wc	v8.312wd	v8.313sa	v8.313sb	v8.313sc	v8.313sd	v8.314wa	v8.314wb	v8.314wc	v8.314wd
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87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v8.315sa	v8.315sb	v8.315sc	v8.315sd	v8.316wa	v8.316wb	v8.316wc	v8.316wd	v8.4a	v8.4b	v8.4c	v9.1onli	v9.1inte
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9												Very Imp	
10	Communic		Updateda	Extensib								Very Imp	Very Imp
11												Very Imp	Very Imp
12	Interact				Communic		Updateda	Extensib				Very Imp	Very Imp
13	Communic			Extensib			Updateda		CRIB	CTI	WWW	Very Imp	Importan
14	Communic	Interact	Updateda	Extensib					Humaniti	SSI	WWW	Very Imp	Very Imp
15	Communic	Interact	Updateda	Extensib							WWW	Very Imp	Very Imp
16	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
17		Interact	Updateda	Extensib	Communic							Very Imp	Very Imp
18									WTA			Very Imp	Very Imp
19		Interact	Updateda									Very Imp	Very Imp
20	Communic	Interact	Updateda	Extensib							WWW	Very Imp	Very Imp
21	Communic		Updateda	Extensib		Interact						Very Imp	Very Imp
22	Communic	Interact	Updateda	Extensib					WTA	OPAC's		Very Imp	Very Imp
23				Extensib					WTA			Very Imp	Very Imp
24		Interact	Updateda	Extensib	Communic				WTA	ResThesI	CurResB	Very Imp	Very Imp
25									Guardian			Very Imp	Unimport
26												Importan	Importan
27	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
28	Communic											Importan	Very Imp
29													
30	Communic		Updateda			Interact					WWW	Importan	Importan
31	Communic	Interact	Updateda	Extensib					Books	E-mail	WWW	Very Imp	Importan
32	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
33				Extensib						E-mail		Very Imp	Not Very
34												Very Imp	Very Imp
35													Very Imp
36	Communic		Updateda			Interact		Extensib				Importan	Importan
37												Very Imp	Very Imp
38												Not Very	Not Very
39	Communic	Interact	Updateda	Extensib								Importan	Importan
40												Importan	Importan
41	Communic	Interact	Updateda	Extensib					BIDS			Very Imp	Very Imp
42												Importan	Importan
43												Importan	Importan
44	Communic		Updateda	Extensib		Interact				E-mail	WWW	Importan	Very Imp
45	Communic		Updateda	Extensib		Interact			SupJanet			Very Imp	Importan
46												Importan	Importan
47		Interact	Updateda	Extensib	Communic							Very Imp	Very Imp
48	Communic		Updateda	Extensib		Interact						Very Imp	Very Imp
49	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
50	Communic	Interact	Updateda	Extensib									Very Imp
51												Not Very	Unimport
52													
53	Communic	Interact	Updateda	Extensib								Importan	Very Imp
54	Communic	Interact	Updateda	Extensib					Phone	E-Mail	WWW	Very Imp	Very Imp
55	Communic	Interact	Updateda	Extensib							WWW	Very Imp	Very Imp
56	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
57	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
58	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
59										E-mail	WWW	Very Imp	Not Very
60	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
61												Very Imp	Very Imp
62	Communic	Interact	Updateda	Extensib							WWW	Very Imp	Very Imp
63	Communic	Interact	Updateda									Not Very	Not Very
64	Communic	Interact	Updateda									Very Imp	Very Imp
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76													
77	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
78		Interact	Updateda	Extensib	Communic						WWW	Very Imp	Very Imp
79	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
80	Communic	Interact	Updateda	Extensib								Very Imp	
81	Communic	Interact	Updateda	Extensib					OPAC		WWW	Very Imp	Importan
82												Very Imp	Very Imp
83	Communic	Interact	Updateda										
84												Importan	
85	Communic	Interact	Updateda	Extensib								Very Imp	Very Imp
86	Communic	Interact	Updateda	Extensib								Importan	Not Very
87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		



nbessis:submittedthesis:Primary Research Tool:SURVEYIIs

	v9.1hype	v9.1spee	v9.1help	v9.1qui	v9.1upda	v9.1exte	v9.1refe	v9.1clas	v9.12d	v9.1soun	v9.1vide	v9.1virt	v9.1keyw
1	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan
2	Importan	Importan	Very Imp	Importan	Very Imp	Importan	Importan	Importan	Importan	Not Very	Importan	Not Very	Importan
3	Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp	Importan	Importan	Very Imp	Not Very	Importan	Importan	Importan
4		Very Imp	Very Imp	Importan	Very Imp			Very Imp					Very Imp
5		Very Imp	Importan	Importan	Very Imp		Importan	Importan	Importan	Not Very	Not Very	Not Very	Importan
6													
7		Very Imp	Very Imp		Very Imp			Very Imp	Very Imp				
8	Importan				Very Imp			Very Imp					Very Imp
9			Very Imp		Very Imp		Very Imp						Very Imp
10	Very Imp	Very Imp	Importan	Importan	Very Imp	Importan	Not Very	Importan	Not Very	Not Very	Not Very	Importan	Importan
11		Very Imp	Very Imp										
12	Importan	Very Imp	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Not Very	Importan	Not Very	Importan
13	Importan	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Not Very	Importan	Importan	Importan
14	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
15	Very Imp	Very Imp	Importan	Very Imp	Importan	Importan	Not Very	Importan	Not Very	Not Very	Importan	Not Very	Importan
16	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Importan	Very Imp	Very Imp	Importan	Importan	Not Very	Very Imp
17		Importan	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Not Very	Importan	Not Very	Importan
18	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Importan	Importan	Very Imp	Not Very	Not Very	Not Very	Not Very	Very Imp
19		Very Imp			Very Imp		Very Imp						Very Imp
20	Very Imp	Very Imp	Importan	Very Imp	Importan	Importan	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp
21	Importan	Importan	Importan	Very Imp	Importan	Importan	Importan	Importan	Not Very	Not Very	Not Very	Very Imp	Very Imp
22	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp
23	Not Very	Very Imp	Importan	Not Very	Very Imp	Not Very	Unimport	Not Very	Not Very	Unimport	Unimport	Unimport	Importan
24	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Not Very	Importan	Not Very	Very Imp
25		Very Imp	Importan	Very Imp	Very Imp		Very Imp	Importan					
26	Importan	Importan	Not Very		Very Imp		Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp
27	Very Imp	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Importan		Importan
28	Not Very	Very Imp	Very Imp	Importan	Very Imp	Importan	Importan	Very Imp	Very Imp	Importan	Not Very	Not Very	Very Imp
29													
30	Importan	Importan	Importan	Importan	Importan	Importan	Importan			Not Very	Not Very	Not Very	Importan
31	Not Very	Not Very	Not Very	Importan	Very Imp	Very Imp	Not Very	Not Very	Importan	Not Very	Not Very	Not Very	Very Imp
32	Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp	Importan	Importan	Not Very	Not Very	Not Very	Not Very	Very Imp
33		Very Imp	Very Imp				Importan						Very Imp
34	Unimport	Importan	Importan	Unimport	Importan	Not Very	Very Imp	Very Imp	Importan	Unimport	Unimport	Unimport	Very Imp
35		Very Imp	Very Imp	Very Imp	Very Imp		Very Imp	Very Imp		Unimport	Not Very	Not Very	Very Imp
36	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Importan	Not Very	Not Very	Not Very	Very Imp
37	Very Imp	Very Imp		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp					Very Imp
38	Not Very	Importan	Importan	Not Very	Very Imp	Very Imp	Very Imp	Importan	Importan	Not Very	Not Very	Unimport	Very Imp
39	Not Very	Importan	Importan	Importan	Very Imp	Importan	Importan	Very Imp	Importan	Not Very	Importan	Importan	Importan
40	Importan	Very Imp	Importan	Importan				Importan	Importan	Importan	Importan	Not Very	Very Imp
41	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Not Very	Not Very	Importan	Very Imp
42	Not Very	Importan	Not Very	Importan	Importan		Importan	Importan	Importan	Unimport	Not Very	Not Very	Importan
43	Not Very	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Not Very	Not Very	Not Very	Very Imp
44	Very Imp	Very Imp	Not Very	Importan	Importan	Importan	Importan	Importan	Very Imp	Importan	Not Very	Not Very	Importan
45	Importan	Very Imp	Importan	Very Imp	Importan	Importan	Not Very	Not Very	Very Imp	Not Very	Not Very	Importan	Importan
46	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Importan	Not Very	Importan	Not Very	Importan
47		Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Importan	Very Imp	Importan	Not Very	Not Very	Not Very	Importan
48	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Importan	Very Imp	Importan	Importan	Importan	Not Very	Very Imp
49	Very Imp	Very Imp	Very Imp	Not Very	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Importan	Not Very	Very Imp
50	Importan	Very Imp	Importan	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Not Very	Not Very	Not Very	Very Imp
51	Importan	Very Imp	Very Imp	Very Imp	Importan	Very Imp	Importan	Unimport	Importan	Not Very	Not Very	Unimport	Not Very
52	Very Imp	Very Imp	Very Imp		Very Imp		Very Imp	Very Imp					Very Imp
53	Importan	Importan	Very Imp	Not Very	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Importan
54	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Very Imp
55	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp
56	Very Imp	Very Imp		Very Imp	Very Imp		Very Imp	Very Imp					Very Imp
57	Very Imp	Very Imp		Very Imp	Very Imp	Very Imp						Very Imp	Very Imp
58	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Very Imp	Very Imp	Very Imp
59	Importan	Importan	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan
60	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
61	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp
62	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Very Imp
63	Very Imp	Very Imp	Not Very	Very Imp	Very Imp		Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	Very Imp
64	Very Imp	Very Imp	Importan	Importan	Very Imp		Very Imp	Importan	Not Very	Not Very	Not Very	Unimport	Very Imp
65													
66													
67	Importan	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	Not Very	Importan
68		Very Imp	Very Imp	Very Imp	Importan				Very Imp	Very Imp	Very Imp	Very Imp	Very Imp
69													
70													
71													
72													
73		Importan											
74													
75													
76													
77		Very Imp		Very Imp	Very Imp		Very Imp	Very Imp					Very Imp
78	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp		Very Imp	Very Imp	Not Very		Very Imp	Very Imp
79	Very Imp	Very Imp	Very Imp	Very Imp	Importan		Importan	Importan	Importan		Importan		Very Imp
80		Very Imp	Very Imp	Very Imp	Importan					Not Very	Not Very		Importan
81	Not Very	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp	Not Very	Importan	Not Very	Very Imp
82		Very Imp						Very Imp		Very Imp		Very Imp	
83													
84				Importan					Importan				
85	Importan	Importan	Importan	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Unimport	Not Very	Not Very	Very Imp
86	Very Imp	Very Imp	Importan	Very Imp	Very Imp	Very Imp		Very Imp	Very Imp	Unimport	Not Very	Very Imp	Very Imp
87			Importan		Importan				Importan				



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	v9.1push	v9.1orde	v9.1emai	v9.1texc	v9.1voic	v9.1vidc	v9.1file	v9.1appl	v9.1publ	v9.1whit	v9.1othe	v9.201	v9.202
1	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan			Professi
2	Importan			Not Very	Not Very	Importan	Not Very	Not Very	Importan	Importan			
3	Importan	Very Imp	Very Imp	Not Very	Not Very	Not Very	Very Imp	Very Imp	Very Imp	Unimport			Professi
4				Very Imp		Very Imp							
5	Importan	Importan	Importan	Not Very	Not Very	Importan	Very Imp	Very Imp	Importan				
6													
7								Very Imp					
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9			Very Imp										Professi
10	Importan	Not Very	Importan	Not Very	Importan	Importan	Importan	Not Very	Not Very	Importan			
11		Importan											
12	Not Very	Not Very	Very Imp	Importan	Not Very	Not Very	Importan	Not Very	Not Very	Not Very		Standard	
13	Very Imp	Importan	Importan	Importan	Importan	Importan	Very Imp	Importan	Importan	Importan			Professi
14	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp			
15	Not Very	Importan	Very Imp	Importan	Importan	Importan	Importan	Importan	Importan	Importan			
16	Very Imp	Importan	Very Imp	Very Imp	Importan	Not Very	Very Imp	Not Very	Importan	Not Very			Professi
17	Importan	Importan	Importan	Importan	Not Very	Importan	Importan	Importan	Importan	Importan			
18	Importan	Importan	Importan	Not Very	Not Very	Not Very	Importan	Importan	Importan	Not Very		Standard	
19		Very Imp											
20	Importan	Importan	Very Imp	Importan	Importan	Importan	Very Imp	Importan	Very Imp	Very Imp			
21	Very Imp	Not Very	Importan	Importan	Not Very	Not Very	Importan	Not Very	Not Very	Not Very			
22	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Very Imp	Importan	Very Imp	Importan			
23	Not Very	Unimport	Not Very	Unimport	Unimport	Unimport	Importan	Not Very	Unimport	Unimport			
24	Importan	Very Imp	Very Imp	Importan	Importan	Importan	Very Imp	Importan	Very Imp	Importan			
25		Very Imp	Not Very									Standard	
26	Importan	Importan	Very Imp	Importan	Importan	Importan	Importan	Importan	Importan	Not Very		Standard	Professi
27	Very Imp		Very Imp	Importan	Importan	Importan	Very Imp	Very Imp	Importan	Importan			
28	Very Imp	Not Very	Very Imp	Not Very	Not Very	Not Very	Very Imp	Not Very	Not Very	Not Very			Professi
29													
30	Importan	Not Very	Importan	Importan	Not Very	Not Very	Importan	Importan	Not Very	Importan			
31	Importan	Unimport	Importan	Importan	Not Very	Not Very	Importan	Very Imp	Very Imp	Importan			
32	Very Imp	Importan	Very Imp	Importan	Not Very	Not Very	Very Imp	Very Imp	Very Imp	Very Imp			
33			Very Imp				Very Imp						
34	Importan	Not Very	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport	Unimport			
35	Very Imp	Importan	Importan	Unimport	Unimport	Unimport	Very Imp	Importan	Importan				
36	Importan	Not Very	Importan	Importan	Not Very	Not Very	Importan	Importan	Importan	Not Very			
37		Very Imp	Very Imp				Very Imp		Very Imp	Very Imp			
38	Importan	Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Not Very			
39	Importan	Not Very	Importan	Importan	Importan	Importan	Very Imp	Importan	Very Imp	Very Imp			
40	Very Imp	Importan	Importan	Importan	Importan	Importan	Very Imp	Importan	Not Very	Importan			
41	Very Imp	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Importan	Very Imp	Very Imp			Professi
42	Not Very	Not Very	Not Very	Importan	Importan	Importan	Very Imp	Very Imp	Very Imp	Not Very			
43	Unimport	Not Very	Importan	Importan	Not Very	Importan	Importan	Not Very	Importan	Importan			
44	Importan	Unimport	Importan	Importan	Unimport	Unimport	Very Imp	Importan	Very Imp	Unimport			
45	Importan	Not Very	Importan	Importan	Importan	Very Imp	Very Imp	Importan	Not Very				
46	Importan	Importan	Importan	Not Very	Not Very	Not Very	Importan	Not Very	Importan	Not Very			
47	Very Imp	Importan	Very Imp	Not Very	Not Very	Not Very	Importan	Very Imp	Very Imp	Not Very			
48	Importan	Not Very	Very Imp	Importan	Not Very	Not Very	Importan	Not Very	Importan	Not Very			Professi
49	Very Imp	Not Very	Very Imp	Very Imp	Not Very	Not Very	Very Imp	Not Very	Very Imp	Not Very			
50	Importan		Very Imp				Not Very	Not Very					
51	Importan	Not Very	Importan	Not Very	Not Very	Not Very	Not Very	Not Very	Importan	Importan			
52			Very Imp	Very Imp					Very Imp				Professi
53	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Importan	Importan	Very Imp	Importan		Standard	
54	Very Imp	Importan	Very Imp	Very Imp	Importan	Importan	Very Imp	Importan	Importan	Importan			
55	Very Imp	Very Imp	Very Imp	Not Very	Not Very	Not Very	Very Imp	Not Very	Very Imp	Very Imp			
56		Very Imp	Very Imp				Very Imp		Very Imp	Very Imp			Professi
57	Very Imp	Very Imp	Very Imp				Very Imp	Very Imp	Very Imp				
58	Importan	Very Imp	Very Imp	Not Very	Not Very	Not Very	Very Imp	Not Very	Very Imp	Not Very			
59	Importan	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Importan	Importan	Importan			Professi
60	Importan	Not Very	Very Imp	Very Imp	Importan	Importan	Importan	Importan	Very Imp	Very Imp			
61	Importan	Importan	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp			
62	Importan	Importan	Very Imp	Not Very	Not Very	Not Very	Importan	Importan	Importan	Importan			
63	Very Imp	Not Very	Very Imp	Importan	Importan	Importan	Very Imp	Not Very	Importan	Importan			Professi
64			Very Imp	Not Very	Not Very	Not Very	Very Imp	Not Very	Importan	Unimport			
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67	Importan	Importan	Importan	Unimport	Unimport	Unimport	Importan	Not Very	Not Very	Not Very			
68	Very Imp	Importan	Importan	Not Very	Not Very	Not Very	Importan	Not Very	Not Very	Unimport			Professi
69													
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72													
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76													
77		Very Imp	Very Imp	Very Imp	Very Imp	Very Imp	Very Imp		Very Imp	Very Imp			Professi
78	Very Imp	Very Imp	Not Very	Not Very	Not Very	Not Very	Not Very	Not Very	Very Imp	Very Imp		Standard	
79	Not Very	Importan	Importan						Importan				
80	Not Very	Not Very	Not Very										
81	Importan	Importan	Importan	Importan	Not Very	Not Very	Importan	Importan	Importan	Importan			Professi
82			Very Imp		Very Imp								Professi
83													Professi
84		Importan	Importan		Importan	Importan	Importan	Very Imp	Very Imp	Importan		Standard	
85	Not Very	Importan	Very Imp	Not Very	Not Very	Importan	Importan	Not Very	Not Very	Importan			
86	Very Imp	Not Very	Not Very	Not Very	Not Very	Importan	Unimport						
87	Importan		Importan				Importan					Standard	



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	v9.203	v9.204	v9.205	v9.206	v9.3mbas	v9.3cd	v9.3www	v9.3othe	Future
1	Events	Complete	Current	Indinvid	Appropri	Very App	Very App		No
2	Events				Appropri	Appropri	Appropri		Yes
3	Events	Complete	Current	Indinvid	Appropri	Appropri	Very App		No
4		Complete				Appropri			Yes
5									No
6									
7		Complete				Appropri			Yes
8		Complete			Not Very	Very App	Appropri		Yes
9									
10		Complete			Appropri	Appropri	Very App		
11									Yes
12	Events	Complete			Very App	Appropri	Very App		No
13					Appropri	Appropri	Very App		Yes
14				Indinvid	Not Very	Appropri	Very App		No
15		Complete			Appropri	Very App	Very App		Yes
16	Events				Appropri	Appropri	Very App		Yes
17		Complete			Not Very	Not Very	Appropri		Yes
18					Appropri	Very App	Very App		No
19		Complete	Current	Indinvid			Very App		
20		Complete			Not Very	Appropri	Very App		No
21			Current		Not Very	Appropri	Very App		Yes
22		Complete				Very App	Very App		Yes
23			Current		Very App	Very App	Very App		No
24		Complete				Very App	Very App		Yes
25				Indinvid	Appropri	Not Very	Appropri		No
26	Events	Complete	Current	Indinvid		Very App	Very App		Yes
27			Current		Not Very	Not Very	Very App		Yes
28							Very App		Yes
29			Current		Very App	Very App	Appropri		
30		Complete			Appropri	Not Very	Appropri		Yes
31		Complete			Not Very	Appropri	Very App		Yes
32				Indinvid	Very App	Appropri	Very App		Yes
33		Complete				Appropri			No
34		Complete			Appropri	Very App	Inapprop		Yes
35		Complete			Inapprop	Very App	Very App		No
36		Complete			Appropri	Not Very	Very App		Yes
37							Very App		Yes
38		Complete			Appropri	Very App	Appropri		Yes
39		Complete			Not Very	Appropri	Very App		Yes
40			Current		Appropri	Not Very	Very App		No
41					Not Very	Appropri	Very App		Yes
42					Appropri	Appropri	Not Very		No
43			Current		Appropri	Appropri	Appropri		Yes
44		Complete	Current	Indinvid	Appropri	Appropri	Appropri		No
45			Current			Not Very	Appropri		Yes
46	Events				Appropri	Appropri	Appropri		No
47	Events				Appropri	Not Very	Appropri		Yes
48					Appropri	Appropri	Very App		Yes
49			Current		Appropri	Not Very	Very App		Yes
50		Complete			Appropri		Very App		No
51									Yes
52						Very App	Very App		Yes
53			Current	Indinvid		Very App	Very App		Yes
54		Complete			Appropri	Not Very	Very App		Yes
55		Complete			Inapprop	Inapprop	Very App		
56	Events	Complete				Appropri	Very App		No
57		Complete			Inapprop	Inapprop	Very App		Yes
58		Complete			Inapprop	Appropri	Very App		No
59	Events	Complete	Current	Indinvid	Not Very	Very App	Very App		Yes
60			Current		Appropri	Appropri	Very App		No
61		Complete			Very App	Appropri	Very App		No
62		Complete	Current		Not Very	Appropri	Very App		No
63	Events	Complete	Current		Appropri	Inapprop	Very App		No
64			Current		Appropri	Not Very	Very App		Yes
65									Yes
66									
67	Events				Not Very	Appropri	Not Very		Yes
68					Very App	Appropri	Very App		No
69									Yes
70		Complete	Current				Very App		No
71						Very App			Yes
72									Yes
73									Yes
74	Events					Appropri	Appropri		No
75		Complete	Current				Very App		
76									
77							Very App		No
78					Inapprop	Appropri	Very App		Yes
79		Complete					Very App		
80	Events						Very App		
81					Appropri	Appropri	Very App		Yes
82									No
83					Very App	Appropri	Very App		No
84						Appropri	Very App		No
85		Complete			Inapprop	Very App	Very App		No
86	Events				Not Very	Appropri	Very App		Yes
87							Very App		Yes



**SECTION 1**

<u>Title</u>	<u>Count</u>	<u>%</u>
	1	1.1%
Professor	8	9.2%
Dr	18	20.7%
Mr	34	39.1%
Mrs	4	4.6%
Ms	15	17.2%
Miss	7	8.0%

<u>Sex</u>	<u>Count</u>	<u>%</u>
	4	4.6%
Male	47	54.0%
Female	36	41.4%

<u>Age</u>	<u>Count</u>	<u>%</u>
below the age of 28	12	13.8%
29-34	18	20.7%
35-44	23	26.4%
45-58	29	33.3%
59+	5	5.7%

<u>Educ. Qual</u>	<u>Count</u>	<u>%</u>
Basic	24	27.6%
Advanced	33	37.9%
Very Advanced	26	29.9%
Other	4	4.6%

<u>Main Discipline</u>	<u>Count</u>	<u>%</u>
	76	87.4%
Design Managment	11	12.6%
	67	77.0%
Fashion/Textiles	20	23.0%
	75	86.2%
Interior/Furniture		
Design	12	13.8%
	72	82.8%
Industrial/Product		
Design	15	17.2%
	71	81.6%
Graphics/Multimedia		
Design	16	18.4%
	68	78.2%
Other Design Discipline		
	19	21.8%
	77	88.5%
Other Non Design		
Discipline	10	11.5%

<u>Occupation</u>	<u>Count</u>	<u>%</u>
EducBased	67	77.0%
InduBased	20	23.0%



<u>V1.7 Members</u>	<u>Count</u>	<u>%</u>
No	25	28.7%
Yes	62	71.3%

<u>member</u>	<u>Count</u>	<u>%</u>
	34	39.1%
CSD Member	22	25.3%
CSD Fellow	7	8.0%
NA	24	27.6%
	67	77.0%
DRS Member	17	19.5%
DRS Council	1	1.1%
DRS Officer	1	1.1%
DRS Fellow	1	1.1%

## SECTION 2

<u>V2.1A</u>	<u>Count</u>	<u>%</u>
Yes	64	73.6%
No	23	26.4%

<u>V2.1B</u>	<u>Count</u>	<u>%</u>
	2	2.3%
Full Time	27	31.0%
Part Time	35	40.2%
NA	23	26.4%

<u>V2.2</u>	<u>Count</u>	<u>%</u>
One to Two years	8	9.2%
Three to Five years	19	21.8%
Five to Ten years	10	11.5%
More than Ten years	26	29.9%
Other	1	1.1%
NA	23	26.4%

<u>V2.3</u>	<u>Count</u>	<u>%</u>
Yes	35	40.2%
No	30	34.5%
NA	22	25.3%

## SECTION 3

this is based on 54 research active subjects who are using computer based materials (see section 4)

<u>V3.1</u>	<u>Count</u>	<u>Col %</u>
	1	1.9%
Yes	53	98.1%

<u>V3.2</u>	<u>Count</u>	<u>Col %</u>
Yes	53	98.1%
No	1	1.9%



<u>V3.5</u>	<u>Count</u>	<u>Col %</u>
Less than five hours per week	2	3.7%
Five to Ten hours per week	16	29.6%
Ten to Twenty hours per week	16	29.6%
More than Twenty hours per week	19	35.2%
NA	1	1.9%

V3.6A

Count	25
Col %	46.3%
Teaching	
Count	28
Col %	51.9%
NA	
Count	1
Col %	1.9%

V3.6B

Count	2
Col %	3.7%
Research and Development	
Count	51
Col %	94.4%
NA	
Count	1
Col %	1.9%

V3.6C

Count	32
Col %	59.3%
Design Practice	
Count	21
Col %	38.9%
NA	
Count	1
Col %	1.9%

V3.6D

Count	15
Col %	27.8%
Administration	
Count	38
Col %	70.4%
NA	
Count	1
Col %	1.9%

V3.7

WPROCESSING		
Very Experienced	25	46.3%
Experienced	27	50.0%
Not Very Experienced	1	1.9%
NA	1	1.9%

## WWWAUTHORING

Very Experienced	4	7.4%
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Experienced	6	11.1%
Not Very Experienced	10	18.5%
Not Experienced	33	61.1%
NA	1	1.9%

**WWWBROWSING**

Very Experienced	17	31.5%
Experienced	18	33.3%
Not Very Experienced	13	24.1%
Not Experienced	5	9.3%
NA	1	1.9%

**SPREADSHEET**

Very Experienced	4	7.4%
Experienced	21	38.9%
Not Very Experienced	18	33.3%
Not Experienced	10	18.5%
NA	1	1.9%

**PAGE LAYOUT**

Very Experienced	7	13.0%
Experienced	26	48.1%
Not Very Experienced	10	18.5%
Not Experienced	10	18.5%
NA	1	1.9%

**NEWSGROUPS**

Very Experienced	4	7.4%
Experienced	10	18.5%
Not Very Experienced	15	27.8%
Not Experienced	24	44.4%
NA	1	1.9%

**MULTIMEDIA**

Very Experienced	4	7.4%
Experienced	14	25.9%
Not Very Experienced	19	35.2%
Not Experienced	16	29.6%
NA	1	1.9%

**MAILBASE**

Very Experienced	3	5.6%
Experienced	13	24.1%
Not Very Experienced	9	16.7%
Not Experienced	28	51.9%
NA	1	1.9%

**IMAGE MANIPULATION**

Very Experienced	13	24.1%
Experienced	13	24.1%
Not Very Experienced	12	22.2%
Not Experienced	15	27.8%
NA	1	1.9%

**FTP / GOPHER**

Very Experienced	3	5.6%
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Experienced	12	22.2%
Not Very Experienced	9	16.7%
Not Experienced	29	53.7%
NA	1	1.9%

**DATABASES**

Very Experienced	7	13.0%
Experienced	14	25.9%
Not Very Experienced	18	33.3%
Not Experienced	14	25.9%
NA	1	1.9%

**CAD / CAM**

Very Experienced	11	20.4%
Experienced	15	27.8%
Not Very Experienced	6	11.1%
Not Experienced	21	38.9%
NA	1	1.9%

**EMAIL**

Very Experienced	21	38.9%
Experienced	27	50.0%
Not Very Experienced	4	7.4%
Not Experienced	1	1.9%
NA	1	1.9%

<b><u>V3.8</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
Yes	52	96.3%
No	1	1.9%
NA	1	1.9%

<b><u>V3.9</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
Less than five hours per week	33	61.1%
Five to Ten hours per week	13	24.1%
Ten to Twenty hours per week	3	5.6%
More than Twenty hours per week	2	3.7%
Not at All	2	3.7%
NA	1	1.9%

<b><u>V3.10A</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	39	72.2%
Governmental	12	22.2%
NA	3	5.6%

<b><u>V3.10B</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	31	57.4%
Commercial	20	37.0%
NA	3	5.6%

<b><u>V3.10C</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	34	63.0%
Scientific	17	31.5%
NA	3	5.6%

<b><u>V3.10D</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	7	13.0%



Academic / Higher Education	44	81.5%
NA	3	5.6%
<b><u>V3.10E</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	26	48.1%
Technological	25	46.3%
NA	3	5.6%
<b><u>V3.10F</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	39	72.2%
Social	12	22.2%
NA	3	5.6%
<b><u>V3.11A</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	41	75.9%
FTP / Gopher	10	18.5%
NA	3	5.6%
<b><u>V3.11B</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	4	7.4%
WWW	47	87.0%
NA	3	5.6%
<b><u>V3.11C</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	2	3.7%
E-mail	49	90.7%
NA	3	5.6%
<b><u>V3.11D</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	45	83.3%
Newsgroups	5	9.3%
Other	1	1.9%
NA	3	5.6%
<b><u>V3.12</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
Yahoo	33	61.1%
Lycos	19	35.2%
Altavista	14	25.9%
Other	17	31.5%
NA	3	5.6%

## SECTION 4

this is based on all subjects

<b><u>V4.1</u></b>	<b><u>Count</u></b>	<b><u>%</u></b>
	3	3.4%
Always	39	44.8%
Frequently	26	29.9%
Seldom	15	17.2%
Never	4	4.6%
<b><u>V4.2A</u></b>	<b><u>Count</u></b>	<b><u>%</u></b>
	6	6.9%
Printed Materials	80	92.0%
NA	1	1.1%



<b><u>V4.2B</u></b>	<b><u>Count</u></b>	<b><u>%</u></b>
	61	70.1%
Audio-Visual Materials	25	28.7%
NA	1	1.1%

<b><u>V4.2C</u></b>	<b><u>Count</u></b>	<b><u>%</u></b>
	36	41.4%
Events	50	57.5%
NA	1	1.1%

<b><u>V4.2D</u></b>	<b><u>Count</u></b>	<b><u>%</u></b>
	26	29.9%
Computer based Materials	60	69.0%
NA	1	1.1%

V4.2E	Count	%
	77	88.5%
Other	10	11.5%

**SECTION 4**

**this is based on 64 research active subjects who are actively involved in design research**

<b><u>V4.1</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
Always	35	54.7%
Frequently	22	34.4%
Seldom	7	10.9%

<b><u>V4.2A</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	1	1.6%
Printed Materials	63	98.4%

<b><u>V4.2B</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	42	65.6%
Audio-Visual Materials	22	34.4%

<b><u>V4.2C</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	24	37.5%
Events	40	62.5%

<b><u>V4.2D</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	10	15.6%
Computer based Materials	54	84.4%

**SECTION 5**

**this is based on 63 research active subjects who are actively involved in design research**

<b><u>V5.1 CONFERENCES</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	3	4.8%
Very Important	29	46.0%
Important	23	36.5%
Not Very Important	7	11.1%
Unimportant	1	1.6%



**V5.1CORRESPONDENCE CONTACTS**

	<u>Count</u>	<u>Col %</u>
	3	4.8%
Very Important	24	38.1%
Important	30	47.6%
Not Very Important	6	9.5%

**V5.1EXHIBITIONS**

	<u>Count</u>	<u>Col %</u>
	7	11.1%
Very Important	17	27.0%
Important	20	31.7%
Not Very Important	13	20.6%
Unimportant	6	9.5%

**V5.1LITERATURE / PERIODICALS**

	<u>Count</u>	<u>Col %</u>
	1	1.6%
Very Important	55	87.3%
Important	6	9.5%
Not Very Important	1	1.6%

**V5.1MEETINGS**

	<u>Count</u>	<u>Col %</u>
	4	6.3%
Very Important	24	38.1%
Important	22	34.9%
Not Very Important	11	17.5%
Unimportant	2	3.2%

**V5.1OTHER**

	<u>Count</u>	<u>Col %</u>
	55	87.3%
Very Important	7	11.1%
Important	1	1.6%

**V5.1SEMINARS**

	<u>Count</u>	<u>Col %</u>
	6	9.5%
Very Important	15	23.8%
Important	29	46.0%
Not Very Important	10	15.9%
Unimportant	3	4.8%

**V5.1WORKSHOPS**

	<u>Count</u>	<u>Col %</u>
	4	6.3%
Very Important	9	14.3%
Important	30	47.6%
Not Very Important	18	28.6%
Unimportant	2	3.2%

**V5.2ABSTRACTS / INDEXES / CATALOGUES**

	<u>Count</u>	<u>Col %</u>
	3	4.8%
Very Important	33	52.4%
Important	22	34.9%
Not Very Important	3	4.8%
Unimportant	2	3.2%



**V5.2ARTICLES / REVIEWS**

	<u>Count</u>	<u>Col %</u>
	1	1.6%
Very Important	35	55.6%
Important	25	39.7%
Not Very Important	2	3.2%

**V5.2BOOKS**

	<u>Count</u>	<u>Col %</u>
	1	1.6%
Very Important	42	66.7%
Important	19	30.2%
Unimportant	1	1.6%

**V5.2DIRECT CONTACTS / INTERVIEWS**

	<u>Count</u>	<u>Col %</u>
	2	3.2%
Very Important	32	50.8%
Important	22	34.9%
Not Very Important	5	7.9%
Unimportant	2	3.2%

**V5.2MAIL**

	<u>Count</u>	<u>Col %</u>
	3	4.8%
Very Important	19	30.2%
Important	28	44.4%
Not Very Important	11	17.5%
Unimportant	2	3.2%

**V5.2MICROFORM**

	<u>Count</u>	<u>Col %</u>
	9	14.3%
Very Important	3	4.8%
Important	6	9.5%
Not Very Important	27	42.9%
Unimportant	18	28.6%

**V5.2NEWSLETTERS**

	<u>Count</u>	<u>Col %</u>
	6	9.5%
Very Important	4	6.3%
Important	27	42.9%
Not Very Important	23	36.5%
Unimportant	3	4.8%

**V5.2OTHER**

	<u>Count</u>	<u>Col %</u>
	56	88.9%
Very Important	6	9.5%
Important	1	1.6%

**V5.2PAPERS / PROCEEDINGS**

	<u>Count</u>	<u>Col %</u>
	2	3.2%
Very Important	36	57.1%
Important	16	25.4%
Not Very Important	9	14.3%

**V5.2QUESTIONNAIRES**

	<u>Count</u>	<u>Col %</u>
	3	4.8%
Very Important	13	20.6%



Important	16	25.4%
Not Very Important	19	30.2%
Unimportant	12	19.0%

<b><u>V5.2REPORTS</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	5	7.9%
Very Important	19	30.2%
Important	28	44.4%
Not Very Important	10	15.9%
Unimportant	1	1.6%

<b><u>V5.2RESEARCH THESES</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	1	1.6%
Very Important	21	33.3%
Important	21	33.3%
Not Very Important	19	30.2%
Unimportant	1	1.6%

<b><u>V5.2SLIDES</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	8	12.7%
Very Important	7	11.1%
Important	13	20.6%
Not Very Important	25	39.7%
Unimportant	10	15.9%

<b><u>V5.2TAPES</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	8	12.7%
Very Important	2	3.2%
Important	4	6.3%
Not Very Important	33	52.4%
Unimportant	16	25.4%

<b><u>V5.2TELEPHONE / FAX</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	3	4.8%
Very Important	25	39.7%
Important	29	46.0%
Not Very Important	3	4.8%
Unimportant	3	4.8%

## SECTION 6

this is based on 54 research active subjects who are using computer based materials (see section 4)

<b><u>V6.1CDDATABASES</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	6	11.1%
Very Important	16	29.6%
Important	19	35.2%
Not Very Important	10	18.5%
Unimportant	3	5.6%

<b><u>V6.1EMAIL</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	3	5.6%
Very Important	21	38.9%



Important	22	40.7%
Not Very Important	6	11.1%
Unimportant	2	3.7%

<b><u>V6.1FTP / GOPHER</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	16	29.6%
Very Important	4	7.4%
Important	7	13.0%
Not Very Important	15	27.8%
Unimportant	12	22.2%

<b><u>V6.1MAILBASE</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	15	27.8%
Very Important	4	7.4%
Important	12	22.2%
Not Very Important	13	24.1%
Unimportant	10	18.5%

<b><u>V6.1NEWSGROUPS</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	10	18.5%
Very Important	2	3.7%
Important	11	20.4%
Not Very Important	16	29.6%
Unimportant	15	27.8%

<b><u>V6.1OPACs</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	10	18.5%
Very Important	14	25.9%
Important	12	22.2%
Not Very Important	7	13.0%
Unimportant	11	20.4%

<b><u>V6.1OTHER</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	53	98.1%
Very Important	1	1.9%

<b><u>V6.1TELNET</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	13	24.1%
Very Important	7	13.0%
Important	9	16.7%
Unimportant	9	16.7%

<b><u>V6.1WWW</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	5	9.3%
Very Important	14	25.9%
Important	24	44.4%
Not Very Important	9	16.7%
Unimportant	2	3.7%

<b><u>V6.2ART BIBLIOGRAPHIES MODERN</u></b>	<b><u>Count</u></b>	<b><u>Col %</u></b>
	15	27.8%
Very Important	3	5.6%
Important	6	11.1%
Not Very Important	15	27.8%
Unimportant	15	27.8%



**V6.2ART, DESIGN & ARCHITECTURE MEDIA INFORMATION GATEWAY (ADAM)**

	<u>Count</u>	<u>Col %</u>
	14	25.9%
Very Important	5	9.3%
Important	8	14.8%
Not Very Important	13	24.1%
Unimportant	14	25.9%

**V6.2ART INDEX**

	<u>Count</u>	<u>Col %</u>
	12	22.2%
Very Important	5	9.3%
Important	8	14.8%
Not Very Important	15	27.8%
Unimportant	14	25.9%

**V6.2ALLISON RESEARCH INDEX of ART & DESIGN (ARIAD)**

	<u>Count</u>	<u>Col %</u>
	11	20.4%
Very Important	5	9.3%
Important	17	31.5%
Not Very Important	14	25.9%
Unimportant	7	13.0%

**V6.2ASLIB INDEX TO THESES**

	<u>Count</u>	<u>Col %</u>
	16	29.6%
Very Important	7	13.0%
Important	14	25.9%
Not Very Important	8	14.8%
Unimportant	9	16.7%

**V6.2BRITISH EDUCATIONAL INDEX (BEI)**

	<u>Count</u>	<u>Col %</u>
	20	37.0%
Very Important	1	1.9%
Important	6	11.1%
Not Very Important	17	31.5%
Unimportant	10	18.5%

**V6.2BATH INFORMATION & DATA SERVICES (BIDS)**

	<u>Count</u>	<u>Col %</u>
	14	25.9%
Very Important	5	9.3%
Important	8	14.8%
Not Very Important	10	18.5%
Unimportant	17	31.5%

**V6.2BLDS CONFERENCE PROCEEDINGS**

	<u>Count</u>	<u>Col %</u>
	18	33.3%
Very Important	1	1.9%
Important	5	9.3%
Not Very Important	10	18.5%
Unimportant	20	37.0%



**V6.2 BRITISH REPORTS TRANSLATION & THESES (BRTT)**

	<u>Count</u>	<u>Col %</u>
	19	35.2%
Very Important	5	9.3%
Important	11	20.4%
Not Very Important	12	22.2%
Unimportant	7	13.0%

**V6.2 BULLETIN BOARD for LIBRARIES (BUBL)**

	<u>Count</u>	<u>Col %</u>
	17	31.5%
Very Important	2	3.7%
Important	7	13.0%
Not Very Important	9	16.7%
Unimportant	19	35.2%

**V6.2 CURRENT RESEARCH in BRITAIN (CRIB)**

	<u>Count</u>	<u>Col %</u>
	15	27.8%
Very Important	7	13.0%
Important	15	27.8%
Not Very Important	11	20.4%
Unimportant	6	11.1%

**V6.2 The CLOTHING & TEXTILES ARTS INDEX (CTAI)**

	<u>Count</u>	<u>Col %</u>
	17	31.5%
Very Important	3	5.6%
Important	6	11.1%
Not Very Important	8	14.8%
Unimportant	20	37.0%

**V6.2 CURRENT TECHNOLOGY INDEX (CTI)**

	<u>Count</u>	<u>Col %</u>
	18	33.3%
Very Important	3	5.6%
Important	12	22.2%
Not Very Important	8	14.8%
Unimportant	13	24.1%

**V6.2 DESIGN & APPLIED ARTS INDEX (DAAD)**

	<u>Count</u>	<u>Col %</u>
	15	27.8%
Very Important	4	7.4%
Important	13	24.1%
Not Very Important	15	27.8%
Unimportant	7	13.0%

**V6.2 EDUCATIONAL RESEARCH INFORMATION CENTRE (ERIC)**

	<u>Count</u>	<u>Col %</u>
	20	37.0%
Very Important	1	1.9%
Important	9	16.7%
Not Very Important	12	22.2%
Unimportant	12	22.2%



**V6.2MULTIMEDIA ASSETS for INDUSTRIAL DESIGN**

	<u>Count</u>	<u>Col %</u>
	21	38.9%
Very Important	1	1.9%
Important	2	3.7%
Not Very Important	9	16.7%
Unimportant	21	38.9%

**V6.2ONLINE PUBLIC ACCESS CATALOGUES (OPACs)**

	<u>Count</u>	<u>Col %</u>
	15	27.8%
Very Important	8	14.8%
Important	17	31.5%
Not Very Important	7	13.0%
Unimportant	7	13.0%

**V6.2OTHER**

	<u>Count</u>	<u>Col %</u>
	47	87.0%
Very Important	6	11.1%
Important	1	1.9%

**V6.2TEXTILES TECHNOLOGY DIGEST (TTD)**

	<u>Count</u>	<u>Col %</u>
	17	31.5%
Very Important	5	9.3%
Important	6	11.1%
Not Very Important	7	13.0%
Unimportant	19	35.2%

**SECTION 7**

this is based on 54 research active subjects who are using computer based materials (see section 4)

**V7.1 ABSTRACT**

Count	4
Col %	7.4%
Very Useful	
Count	35
Col %	64.8%
Useful	
Count	13
Col %	24.1%
Not Very Useful	
Count	2
Col %	3.7%

**V7.1AIMS & OBJECTIVES**

Count	11
Col %	20.4%
Very Useful	
Count	21
Col %	38.9%
Useful	
Count	13



Col %	24.1%
Not Very Useful	
Count	7
Col %	13.0%
Not Useful	
Count	2
Col %	3.7%

**V7.1AUTHOR**

Count	5
Col %	9.3%
Very Useful	
Count	26
Col %	48.1%
Useful	
Count	19
Col %	35.2%
Not Very Useful	
Count	3
Col %	5.6%
Not Useful	
Count	1
Col %	1.9%

**V7.1CHRONOLOGICAL & DEMOGRAPHIC DETERMINATION**

Count	13
Col %	24.1%
Very Useful	
Count	4
Col %	7.4%
Useful	
Count	15
Col %	27.8%
Not Very Useful	
Count	14
Col %	25.9%
Not Useful	
Count	8
Col %	14.8%

**V7.1COLLABORATION / SPONSOR BODY**

Count	13
Col %	24.1%
Very Useful	
Count	3
Col %	5.6%
Useful	
Count	15
Col %	27.8%
Not Very Useful	
Count	17
Col %	31.5%
Not Useful	
Count	6
Col %	11.1%



**V7.1KEYWORD(S)**

Count	5
Col %	9.3%
Very Useful	
Count	33
Col %	61.1%
Useful	
Count	14
Col %	25.9%
Not Very Useful	
Count	2
Col %	3.7%

**V7.1METHODOLOGY**

Count	11
Col %	20.4%
Very Useful	
Count	12
Col %	22.2%
Useful	
Count	21
Col %	38.9%
Not Very Useful	
Count	4
Col %	7.4%
Not Useful	
Count	6
Col %	11.1%

**V7.1PUBLICATION TYPE**

Count	10
Col %	18.5%
Very Useful	
Count	11
Col %	20.4%
Useful	
Count	19
Col %	35.2%
Not Very Useful	
Count	12
Col %	22.2%
Not Useful	
Count	2
Col %	3.7%

**V7.1RESOURCE TYPE**

Count	12
Col %	22.2%
Very Useful	
Count	5
Col %	9.3%
Useful	
Count	18
Col %	33.3%
Not Very Useful	
Count	16



Col %	29.6%
Not Useful	
Count	3
Col %	5.6%

**V7.1SUBJECT**

Count	7
Col %	13.0%
Very Useful	
Count	26
Col %	48.1%
Useful	
Count	16
Col %	29.6%
Not Very Useful	
Count	4
Col %	7.4%
Not Useful	
Count	1
Col %	1.9%

**V7.1TITLE of RESEARCH**

Count	5
Col %	9.3%
Very Useful	
Count	28
Col %	51.9%
Useful	
Count	17
Col %	31.5%
Not Very Useful	
Count	4
Col %	7.4%

**V7.1VISUAL MATERIAL**

Count	12
Col %	22.2%
Very Useful	
Count	19
Col %	35.2%
Useful	
Count	12
Col %	22.2%
Not Very Useful	
Count	7
Col %	13.0%
Not Useful	
Count	4
Col %	7.4%

**SECTION 8**

**this is based on 54 research active subjects who are using computer based materials  
(see section 4)**

S=Strength, W=Weakness



<u>OPAC's</u>		<u>Count</u>
V8.101SA	Functionality	22
V8.102WA	Functionality	6
V8.101SB	Easy to learn	21
V8.102WB	Easy to learn	5
V8.101SC	Easy to use	22
V8.102WC	Easy to use	5
V8.101SD	Help Facility	9
V8.102WD	Help Facility	12
V8.101SE	Graphical User Interface	4
V8.102WE	Graphical User Interface	22
V8.101SF	Layout	7
V8.102WF	Layout	16
V8.101SG	Terminology	12
V8.102WG	Terminology	14
V8.101SH	Speed	17
V8.102WH	Speed	10
<u>TELNET</u>		<u>Count</u>
V8.103SA	Functionality	9
V8.104WA	Functionality	8
V8.103SB	Easy to learn	7
V8.104WB	Easy to learn	10
V8.103SC	Easy to use	8
V8.104WC	Easy to use	9
V8.103SD	Help Facility	2
V8.104WD	Help Facility	12
V8.103SE	Graphical User Interface	-
V8.104WE	Graphical User Interface	17
V8.103SF	Layout	1
V8.104WF	Layout	13
V8.103SG	Terminology	4
V8.104WG	Terminology	10
V8.103SH	Speed	7
V8.104WH	Speed	9
<u>CD ROMs</u>		<u>Count</u>
V8.105SA	Functionality	35
V8.106WA	Functionality	-
V8.105SB	Easy to learn	32
V8.106WB	Easy to learn	4
V8.105SC	Easy to use	35
V8.106WC	Easy to use	1
V8.105SD	Help Facility	19
V8.106WD	Help Facility	12
V8.105SE	Graphical User Interface	27
V8.106WE	Graphical User Interface	6
V8.105SF	Layout	28
V8.106WF	Layout	6
V8.105SG	Terminology	22
V8.106WG	Terminology	8
V8.105SH	Speed	35
V8.106WH		
<u>E-Mail</u>		<u>Count</u>
V8.107SA	Functionality	40



V8.108WA	Functionality	1
V8.107SB	Easy to learn	38
V8.108WB	Easy to learn	3
V8.107SC	Easy to use	39
V8.108WC	Easy to use	1
V8.107SD	Help Facility	14
V8.108WD	Help Facility	22
V8.107SE	Graphical User Interface	13
V8.108WE	Graphical User Interface	22
V8.107SF	Layout	20
V8.108WF	Layout	16
V8.107SG	Terminology	18
V8.108WG	Terminology	17
V8.107SH	Speed	36
V8.108WH	Speed	1

<u>Mailbase</u>		<u>Count</u>
V8.109SA	Functionality	9
V8.110WA	Functionality	3
V8.109SB	Easy to learn	10
V8.110WB	Easy to learn	4
V8.109SC	Easy to use	10
V8.110WC	Easy to use	3
V8.109SD	Help Facility	5
V8.110WD	Help Facility	9
V8.109SE	Graphical User Interface	4
V8.110WE	Graphical User Interface	8
V8.109SF	Layout	6
V8.110WF	Layout	8
V8.109SG	Terminology	6
V8.110WG	Terminology	6
V8.109SH	Speed	7
V8.110WH	Speed	3

<u>Newsgroups</u>		<u>Count</u>
V8.111SA	Functionality	11
V8.112WA	Functionality	4
V8.111SB	Easy to learn	8
V8.112WB	Easy to learn	7
V8.111SC	Easy to use	8
V8.112WC	Easy to use	5
V8.111SD	Help Facility	2
V8.112WD	Help Facility	10
V8.111SE	Graphical User Interface	2
V8.112WE	Graphical User Interface	11
V8.111SF	Layout	4
V8.112WF	Layout	9
V8.111SG	Terminology	7
V8.112WG	Terminology	6
V8.111SH	Speed	5
V8.112WH	Speed	8

<u>FTP</u>		<u>Count</u>
V8.113SA	Functionality	8
V8.114WA	Functionality	6
V8.113SB	Easy to learn	7
V8.114WB	Easy to learn	7



V8.113SC	Easy to use	9
V8.114WC	Easy to use	5
V8.113SD	Help Facility	2
V8.114WD	Help Facility	10
V8.113SE	Graphical User Interface	3
V8.114WE	Graphical User Interface	10
V8.113SF	Layout	3
V8.114WF	Layout	9
V8.113SG	Terminology	5
V8.114WG	Terminology	6
V8.113SH	Speed	7
V8.114WH	Speed	5

<u>WWW</u>		<u>Count</u>
V8.115SA	Functionality	39
V8.116WA	Functionality	4
V8.115SB	Easy to learn	42
V8.116WB	Easy to learn	1
V8.115SC	Easy to use	39
V8.116WC	Easy to use	4
V8.115SD	Help Facility	20
V8.116WD	Help Facility	19
V8.115SE	Graphical User Interface	28
V8.116WE	Graphical User Interface	9
V8.115SF	Layout	27
V8.116WF	Layout	11
V8.115SG	Terminology	22
V8.116WG	Terminology	17
V8.115SH	Speed	16
V8.116WH	Speed	25

<u>Structure</u>	<u>Count</u>	<u>%</u>
V8.201 S OPAC	6	29.6%
V8.202 W OPAC	8	14.8%
V8.203 S TELNET	3	5.6%
V8.204 W TELNET	9	16.7%
V8.205 S CD ROMS	24	44.4%
V8.206 W CD ROMS	4	7.4%
V8.207 S E-MAIL	25	46.3%
V8.208 W E-MAIL	6	11.1%
V8.209 S MAILBASE	4	7.4%
V8.210 W MAILBASE	3	5.6%
V8.211 S NEWSGROUPS	5	9.3%
V8.212 W NEWSGROUPS	4	7.4%
V8.213 S FTP	5	9.3%
V8.214 W FTP	3	5.6%
V8.215 S WWW	25	46.3%
V8.216 W WWW	10	18.5%

<u>CONTENT</u>	<u>Count</u>	<u>%</u>
V8.201 S OPAC	24	44.4%
V8.202 W OPAC	2	3.7%
V8.203 S TELNET	9	16.7%
V8.204 W TELNET	3	5.6%
V8.205 S CD ROMS	28	51.9%
V8.206 W CD ROMS	2	3.7%
V8.207 S E-MAIL	20	37.0%



V8.208 W E-MAIL	8	14.8%
V8.209 S MAILBASE	6	11.1%
V8.210 W MAILBASE	1	1.9%
V8.211 S NEWSGROUPS	7	13.0%
V8.212 W NEWSGROUPS	1	1.9%
V8.213 S FTP	7	13.0%
V8.214 W FTP	2	3.7%
V8.215 S WWW	25	46.3%
V8.216 W WWW	9	16.7%

<u>CLASSIFICATION/TAXONOMY</u>	<u>Count</u>	<u>%</u>
V8.201 S OPAC	21	38.9%
V8.202 W OPAC	3	5.6%
V8.203 S TELNET	7	13.0%
V8.204 W TELNET	4	7.4%
V8.205 S CD ROMS	25	46.3%
V8.206 W CD ROMS	3	5.6%
V8.207 S E-MAIL	9	16.7%
V8.208 W E-MAIL	16	29.6%
V8.209 S MAILBASE	5	9.3%
V8.210 W MAILBASE	2	3.7%
V8.211 S NEWSGROUPS	5	9.3%
V8.212 W NEWSGROUPS	4	7.4%
V8.213 S FTP	7	13.0%
V8.214 W FTP	4	7.4%
V8.215 S WWW	16	29.6%
V8.216 W WWW	16	29.6%

<u>REPRESENTATION</u>	<u>Count</u>	<u>%</u>
V8.201 S OPAC	6	11.1%
V8.202 W OPAC	15	27.8%
V8.203 S TELNET	5	9.3%
V8.204 W TELNET	3	5.6%
V8.205 S CD ROMS	20	37.0%
V8.206 W CD ROMS	6	11.1%
V8.207 S E-MAIL	8	14.8%
V8.208 W E-MAIL	17	31.5%
V8.209 S MAILBASE	4	7.4%
V8.210 W MAILBASE	3	5.6%
V8.211 S NEWSGROUPS	5	9.3%
V8.212 W NEWSGROUPS	3	5.6%
V8.213 S FTP	6	11.1%
V8.214 W FTP	2	3.7%
V8.215 S WWW	25	46.3%
V8.216 W WWW	5	9.3%

<u>RELIABILITY/VALIDITY</u>	<u>Count</u>	<u>%</u>
V8.201 S OPAC	21	38.9%
V8.202 W OPAC	3	5.6%
V8.203 S TELNET	10	18.5%
V8.204 W TELNET	3	5.6%
V8.205 S CD ROMS	21	38.9%
V8.206 W CD ROMS	6	11.1%
V8.207 S E-MAIL	25	46.3%
V8.208 W E-MAIL	6	11.1%
V8.209 S MAILBASE	5	9.3%
V8.210 W MAILBASE	2	3.7%



V8.211 S NEWSGROUPS	4	7.4%
V8.212 W NEWSGROUPS	5	9.3%
V8.213 S FTP	4	7.4%
V8.214 W FTP	5	9.3%
V8.215 S WWW	9	16.7%
V8.216 W WWW	25	46.3%

**SEARCH OPTIONS**

	<b><u>Count</u></b>	<b><u>%</u></b>
V8.201 S OPAC	12	22.2%
V8.202 W OPAC	11	20.4%
V8.203 S TELNET	6	11.1%
V8.204 W TELNET	6	11.1%
V8.205 S CD ROMS	19	35.2%
V8.206 W CD ROMS	8	14.8%
V8.207 S E-MAIL	7	13.0%
V8.208 W E-MAIL	20	37.0%
V8.209 S MAILBASE	4	7.4%
V8.210 W MAILBASE	3	5.6%
V8.211 S NEWSGROUPS	2	3.7%
V8.212 W NEWSGROUPS	7	13.0%
V8.213 S FTP	3	5.6%
V8.214 W FTP	6	11.1%
V8.215 S WWW	28	51.9%
V8.216 W WWW	7	13.0%

**COMMUNICATION**

	<b><u>Count</u></b>	<b><u>%</u></b>
V8.301 S OPAC	10	18.5%
V8.302 W OPAC	12	22.2%
V8.303 S TELNET	9	16.7%
V8.304 W TELNET	5	9.3%
V8.305 S CD ROMS	16	29.6%
V8.306 W CD ROMS	11	20.4%
V8.307 S E-MAIL	33	61.1%
V8.308 W E-MAIL		
V8.309 S MAILBASE	6	11.1%
V8.310 W MAILBASE	1	1.9%
V8.311 S NEWSGROUPS	9	16.7%
V8.312 W NEWSGROUPS		
V8.313 S FTP	7	13.0%
V8.314 W FTP	4	7.4%
V8.315 S WWW	30	55.6%
V8.316 W WWW	4	7.4%

**INTERACTIVITY**

	<b><u>Count</u></b>	<b><u>%</u></b>
V8.301 S OPAC	7	13.0%
V8.302 W OPAC	12	22.2%
V8.303 S TELNET	5	9.3%
V8.304 W TELNET	8	14.8%
V8.305 S CD ROMS	20	37.0%
V8.306 W CD ROMS	6	11.1%
V8.307 S E-MAIL	24	44.4%
V8.308 W E-MAIL	7	13.0%
V8.309 S MAILBASE	4	7.4%
V8.310 W MAILBASE	3	5.6%
V8.311 S NEWSGROUPS	7	13.0%
V8.312 W NEWSGROUPS	2	3.7%
V8.313 S FTP	6	11.1%



V8.314 W FTP	4	7.4%
V8.315 S WWW	26	48.1%
V8.316 W WWW	6	11.1%

<u>UPDATEDABILITY</u>	<u>Count</u>	<u>%</u>
V8.301 S OPAC	11	20.4%
V8.302 W OPAC	9	16.7%
V8.303 S TELNET	7	13.0%
V8.304 W TELNET	4	7.4%
V8.305 S CD ROMS	7	13.0%
V8.306 W CD ROMS	20	37.0%
V8.307 S E-MAIL	27	50.0%
V8.308 W E-MAIL	2	3.7%
V8.309 S MAILBASE	7	13.0%
V8.310 W MAILBASE		
V8.311 S NEWSGROUPS	8	14.8%
V8.312 W NEWSGROUPS	1	1.9%
V8.313 S FTP	5	9.3%
V8.314 W FTP	6	11.1%
V8.315 S WWW	32	59.3%
V8.316 W WWW	2	3.7%

<u>EXTENSIBILITY</u>	<u>Count</u>	<u>%</u>
V8.301 S OPAC	8	14.8%
V8.302 W OPAC	9	16.7%
V8.303 S TELNET	5	9.3%
V8.304 W TELNET	5	9.3%
V8.305 S CD ROMS	8	14.8%
V8.306 W CD ROMS	15	27.8%
V8.307 S E-MAIL	20	37.0%
V8.308 W E-MAIL	5	9.3%
V8.309 S MAILBASE	6	11.1%
V8.310 W MAILBASE		
V8.311 S NEWSGROUPS	6	11.1%
V8.312 W NEWSGROUPS	2	3.7%
V8.313 S FTP	6	11.1%
V8.314 W FTP	4	7.4%
V8.315 S WWW	30	55.6%
V8.316 W WWW	2	3.7%

**V8.4**

BIDS	1	Col %	1.9%
Books	1	Col %	1.9%
Current Res. In Br	2	Col %	3.8%
Guardian	1	Col %	1.9%
Humanities	1	Col %	1.9%
Telephone	1	Col %	1.9%
SuperJanet	1	Col %	1.9%
WTA	4	Col %	7.4%
CTI	1	Col %	1.9%
E-mail	5	Col %	9.3%
OPAC's	1	Col %	1.9%
ResThesI	1	Col %	1.9%
SSI	1	Col %	1.9%
WWW	11	Col %	20.4%



**SECTION 9**

this is based on 54 research active subjects who are using computer based materials (see section 4)

**V9.12D Visual Representation**

Very Important	Count	15	Col %	27.8%
Important	Count	21	Col %	38.9%
Not Very Important	Count	7	Col %	13.0%

**V9.1Application Sharing**

Very Important	Count	8	Col %	14.8%
Important	Count	21	Col %	38.9%
Not Very Important	Count	16	Col %	29.6%
Unimportant	Count	1	Col %	1.9%

**V9.1Indexed Classification System**

Very Important	Count	32	Col %	59.3%
Important	Count	13	Col %	24.1%
Not Very Important	Count	3	Col %	5.6%
Unimportant	Count	1	Col %	1.9%

**V9.1E-mail**

Very Important	Count	30	Col %	55.6%
Important	Count	16	Col %	29.6%
Not Very Important	Count	4	Col %	7.4%
Unimportant	Count	1	Col %	1.9%

**V9.1Extensible**

Very Important	Count	22	Col %	40.7%
Important	Count	16	Col %	29.6%
Not Very Important	Count	3	Col %	5.6%

**V9.1File Transfer**

Very Important	Count	26	Col %	48.1%
Important	Count	20	Col %	37.0%
Not Very Important	Count	2	Col %	3.7%
Unimportant	Count	1	Col %	1.9%

**V9.1Graphical User Interface**

Very Important	Count	28	Col %	51.9%
Important	Count	15	Col %	27.8%
Not Very Important	Count	4	Col %	7.4%
Unimportant	Count	1	Col %	1.9%

**V9.1Help Facility**

Very Important	Count	17	Col %	31.5%
Important	Count	26	Col %	48.1%
Not Very Important	Count	5	Col %	9.3%

**V9.1Hyperlinks**

Very Important	Count	25	Col %	46.3%
Important	Count	13	Col %	24.1%
Not Very Important	Count	7	Col %	13.0%
Unimportant	Count	1	Col %	1.9%



**V9.1Interactive**

Very Important	Count	35	Col %	64.8%
Important	Count	11	Col %	20.4%
Not Very Important	Count	4	Col %	7.4%
Unimportant	Count	2	Col %	3.7%

**V9.1Keywords, Image Search System**

Very Important	Count	35	Col %	64.8%
Important	Count	15	Col %	27.8%
Not Very Important	Count	1	Col %	1.9%

**V9.1Online**

Very Important	Count	36	Col %	66.7%
Important	Count	11	Col %	20.4%
Not Very Important	Count	3	Col %	5.6%

**V9.1Ordering System**

Very Important	Count	12	Col %	22.2%
Important	Count	17	Col %	31.5%
Not Very Important	Count	16	Col %	29.6%
Unimportant	Count	3	Col %	5.6%

**V9.1Publication Facility**

Very Important	Count	21	Col %	38.9%
Important	Count	18	Col %	33.3%
Not Very Important	Count	7	Col %	13.0%
Unimportant	Count	2	Col %	3.7%

**V9.1Refined Intelligent Search System**

Very Important	Count	17	Col %	31.5%
Important	Count	23	Col %	42.6%
Not Very Important	Count	4	Col %	7.4%
Unimportant	Count	1	Col %	1.9%

**V9.1Refereed Information Content**

Very Important	Count	29	Col %	53.7%
Important	Count	16	Col %	29.6%
Not Very Important	Count	3	Col %	5.6%
Unimportant	Count	1	Col %	1.9%

**V9.1Sound Representation**

Very Important	Count	3	Col %	5.6%
Important	Count	14	Col %	25.9%
Not Very Important	Count	24	Col %	44.4%
Unimportant	Count	4	Col %	7.4%

**V9.1Speed**

Very Important	Count	41	Col %	75.9%
Important	Count	11	Col %	20.4%
Not Very Important	Count	1	Col %	1.9%

**V9.1Text Conferencing**

Very Important	Count	8	Col %	14.8%
Important	Count	24	Col %	44.4%
Not Very Important	Count	10	Col %	18.5%
Unimportant	Count	3	Col %	5.6%



**V9.1 Video Conferencing**

Very Important	Count	4	Col %	7.4%
Important	Count	17	Col %	31.5%
Not Very Important	Count	19	Col %	35.2%
Unimportant	Count	4	Col %	7.4%

**V9.1 Video-based Representation**

Very Important	Count	3	Col %	5.6%
Important	Count	20	Col %	37.0%
Not Very Important	Count	20	Col %	37.0%
Unimportant	Count	2	Col %	3.7%

**V9.1 Virtual Reality Representation**

Very Important	Count	6	Col %	11.1%
Important	Count	11	Col %	20.4%
Not Very Important	Count	23	Col %	42.6%
Unimportant	Count	5	Col %	9.3%

**V9.1 Voice Conferencing**

Very Important	Count	3	Col %	5.6%
Important	Count	17	Col %	31.5%
Not Very Important	Count	20	Col %	37.0%
Unimportant	Count	4	Col %	7.4%

**V9.1 White Board Facility**

Very Important	Count	10	Col %	18.5%
Important	Count	15	Col %	27.8%
Not Very Important	Count	15	Col %	27.8%
Unimportant	Count	4	Col %	7.4%

**V9.1 Updated**

Very Important	Count	37	Col %	68.5%
Important	Count	13	Col %	24.1%

**V9.201 Index of Standards**                      Count    5            Col %    9.3%

**V9.202 Index of Professional  
Organisations**                      Count    10           Col %    18.5%

**V9.203 Index of Events**                      Count    8            Col %    14.8%

**V9.204 Index of Completed  
Research**                              Count    27           Col %    50.0%

**V9.205 Index of Current  
Research**                              Count    17           Col %    31.5%

**V9.206 Index of Individuals**              Count    8            Col %    14.8%

These are scores based on 50 cases, where 1st choice scores 6 points and 6th choice 1 point respectively



Appendix I: Primary Research Tool Instruments and Data

STANDARDS	ORGANISATIONS	EVENTS	COMPLETED	CURRENT	INDIVID
5	4	5	5	4	3
4	6	5	1	2	3
1	2	3	4	5	6
4	3	2	6	5	1
1	6	6	5	5	5
1	4	2	6	5	3
6	4	5	1	2	3
.	.	.	6	6	6
.	.	.	6	.	.
1	3	4	5	6	2
1	2	3	6	5	4
4	3	1	5	6	2
3	1	4	6	5	2
1	3	4	5	5	1
6	6	6	6	6	6
1	2	3	5	6	4
1	6	2	3	4	5
1	5	4	3	6	2
1	2	3	6	5	4
1	2	3	6	5	4
1	2	4	3	5	6
.	.	.	6	5	4
1	3	2	6	5	4
1	2	3	6	5	4
1	2	4	6	5	3
1	2	3	6	5	4
3	1	2	5	6	4
.	4	2	5	6	3
3	6	1	2	4	5
1	2	3	5	6	4
1	4	2	6	6	6
3	4	1	2	6	5
1	5	6	3	2	4
1	2	6	5	4	3
1	6	2	5	4	3
1	3	4	5	6	2
.	.	.	6	.	.
.	6	5	4	.	3
6	5	4	5	6	6
1	3	2	6	5	4
1	3	2	6	4	5
5	6	6	6	4	3
.	.	.	.	6	.
.	4	3	6	5	.
4	5	6	6	6	6
1	2	3	5	6	4
1	3	4	6	5	2
.	.	.	6	6	.
1	6	6	6	6	5
1	2	3	4	6	5
84	160	154	244	238	184

**V9.3CD ROM**

Very Appropriate	Count	13	Col %	24.1%
Appropriate	Count	21	Col %	38.9%
Not Very Appropriate	Count	11	Col %	20.4%
Inappropriate	Count	3	Col %	5.6%

**V9.3Mailbase**

Very Appropriate	Count	5	Col %	9.3%
Appropriate	Count	22	Col %	40.7%
Not Very Appropriate	Count	10	Col %	18.5%
Inappropriate	Count	4	Col %	7.4%

**V9.3WWW**

Very Appropriate	Count	39	Col %	72.2%
Appropriate	Count	10	Col %	18.5%
Not Very Appropriate	Count	1	Col %	1.9%
Inappropriate	Count	1	Col %	1.9%



## **Structured Interviews (Validation of the Specification Framework)**

This Appendix consists of the instrument used for the evaluation of the specification framework which is a structured interview questionnaire. It also provides the list of its participants as well as detail of the participants' response.

### **List of Participants**

The following interviewers were appointed:

**Prof. Rachel Davies Cooper, University College Salford, Salford**

**Dr Nancy Flint, John Moores University, Liverpool**

**Prof. James Woodhuysen, Samuel-Powell**

**Prof. Brian Allison, De Montfort University, Leicester**

**Prof. Jeremy Myerson, De Montfort University, Leicester**

### **Description of the Structured Exercise and Instrument**

The following brief given to the subjects prior to the exercises:

#### **Summary**

This paper focuses on a brief description of a proposed new communication gateway for the academic design research community. The *neroid-networked REsearch in Design* will facilitate the users with the cutting edge of today's available technology, to provide them with an improved communication system. This paper is compiled with the aim of giving interviewees' an understanding of the proposed new communication system. This project and the *neroid's* concept is an on-going result of the author's PhD research undertaken in the Faculty of Art and Design, School of Design and Manufacture, De Montfort University, Leicester, UK.

#### **Introduction**

*neroid - networked REsearch in Design* is the proposed communication gateway for people within the academic design discipline active in research, and will facilitate access to high quality information of both completed and current research within the academic design discipline, as well as, discussion with other individuals / users and groups. The major step forward compared with other communication gateways within or outside the design research domain will be the ability to identify and communicate with users (individuals or groups) specialised in a specified area of interest. In addition closely related services, facilities and available documented and networked resources will also be identified. The basic concept is simple, to link researchers in design all over the world, with the aim of providing them with a relevant updated information resource and a supporting discussion environment.



### **Key dates and deliverables**

- The PhD commenced at the beginning of Sept. 1995 and the registration was in Jan. 1996.
- The *neroid's* communication model concept was developed at the end of May 1998 after a scholarly literature search and a survey which was conducted with the design community.
- By September 1998 a qualitative interview method will be employed to test the *neroid's* concept and the main issue needed to be explored and implemented. Main proposals are already identified within the system's concept, however they need to be tested.
- By September 1999 a prototype will be ready for use and testing by a group of specialists.
- By the end of 1999 all workshops (testing, evaluation and final modifications) will be finished, as well as, a working model in a working order will be introduced.
- By July 2000 a written documentation in the form of a PhD thesis will be presented to the examination board.

### **The Need**

Interviews are being conducted with a selected group of experts in the field. Their purpose is to evaluate the *neroid* concept prior to the development of a prototype. To this extent a framework has been designed in order to evaluate the proposed communication system's strengths, and its recommended forms. This framework has been designed to examine the following issues:

- whether the system is useful,
- whether the system is suitable for the design research community,
- whether there is a need for additional services or modifications,
- what are the key elements of the system.

The expert feedback will compose the basic core of the system which needs to be applied and implemented.

### **A Brief description of the *neroid***

The *neroid* communication system will be based on a World-Wide Web interface. It hopes to bridge communication gaps and to facilitate bespoke services. Clearly *neroid* does not aim to replace other available tools but hopes to establish a union between them and to support communication. The proposed on-line system consists of following major services:

- **Channelling Data: Registration and Submission on a basis of updateble data.**
- **Refereed Research Data System: Indexes of research within the academic design.**
- **Communicating with each other.**
- **Subscription to Push-Channels.**

- **Channelling Data: Registration and Submission on a basis of updateble data.**

All people who wish to have access to the system will be required to fill an on-line submission form in order to register and qualify their submission. This submission form will ask potential users to represent themselves in a ready preformatted keyword form. A refereed board will



control access to those qualified. When a potential user submits this data, the system will receive it and after the refereed board approves of the submission the data will be classified according to the keywords.

- **Refereed Research Data System: Indexes of research within the academic design.**

The Indexes of completed and current research will be automatically created since users will submit a personal data file describing research which has been done and their current research activities. These Indexes can be searched.

- **Communicating with each other.**

Users will be able to identify and communicate with each other through an enquiry form. As mentioned above, all users will be classified in the system under a set of keywords, as, users will have already identified what their main area of interest and activity in the submission form. In this way, when an enquirer-user wants to make an enquiry, he/she will be able to address the enquiry only to those users selected by the system whose specified keyword for the area of interest and activity matches the set enquiry keywords.

- **Subscription to Push-Channels.**

Users will be able to subscribe to specially enquires and designed channels such as research articles, papers, projects, groups, organisations, governmental bodies, societies, journals with the aim of receiving pre-requested services which match their research needs. User need to fill a subscription form for each particular channel requesting some services. These services could be newsletters, articles, forthcoming events, such as, exhibitions, conferences and so on.

### **Questions to Interviewers**

According to a survey conducted with the design community, a WWW system is proposed. At present, the WWW is a chaotic bazaar of world wide information which is difficult to search, navigate through, slow to access and of variable quality. As described in this paper, the proposed communication system will facilitate users with Referred Indexes of completed, current research, a discussion environment for communication, a bulletin board to browse or search others' non-private discussions and subscription to design-related channels (such as: design research journals, design research societies, bodies,...) in order to keep you informed about their news and changes.

*1. How useful would such a system be?*

*2. How important is that information available in the system is refereed?*

*3. What facilities should the communication channels provide?*

*4. How important are the Push-Channels to the system and what facilities should they provide?*

*5. How should research be represented?*

*6. How important is the proposed system's ability to match the user with other users or users*



*with information?*

- 7. Are keywords sufficient to match user with other user or user with information?*
- 8. What categories of keywords will be most important, eg.: users' identity/status, subject, current area of interest/activity,...?*
- 9. Besides keywords in what other ways could matching be achieved?*
- 10. What do you consider are the most important features of such a system?*
- 11. What features if any are missing?*
- 12. Can you see any weaknesses or problems with such a system? Any other comments.?*

The duration of the interview is not expected to exceed the time of 45-50 minutes. Thank you in advance for your time and co-operation. Nick Bessis, PhD Design Research, Design + Manufacture, Tel.: 0116 2551551, ext 8575, 0116 2230687, 0410 390548.

In addition to this, the initial nereid specification framework diagram as seen on figure 5.16, page 172 of this thesis was also given to the subjects. Finally, the following nomenclatures were given as other alternative names for the nereid system: Hydra / Hydra: Hyper Design Research Academia and Hydron: Hyper Design Research On-line. The following paragraphs will present in detail the participants' response:

***Prof. R. Cooper***

1. Any name(nereid) is fine. It is useful of dissemination information, it is useful for me in terms of directing PhD students to and people just beginning research because it is difficult in design to find the appropriate people, the appropriate places, the appropriate research results, so as an starting point for postgraduate and PhD will be excellent. PhD candidates should not just rely on what I know but find out if any new coming to the field, find what is going on. For me will be a good way of dissemination and a good way for enabling students to get for the research process.
2. It is very important, you have to build up a wild network of people, which they should show a record of producing a critical output, usually they are in the Universities. Also, you could look the editorial boards, the co-editors and the associate editors of journals.
3. In fact you should not make communication very easy, before they start to contact they have to be sure is that the right person? not just send an e-mail, it should be a filter, it should be a mechanism to confirm these are compatible and not to loose each other time.
4. Extremely complex, but it is very very useful.
5. You have to allow visual material I think you need all of those, also you need aims and objectives.
6. The people have to be sure to provide the right keywords, it is more important to match user with the information and then with users.
7. If they are not general will be fine.



8. All of them. Interest, how many years have been study in this, experience.
9. There is not other way, if you think you are in a conference you are looking for people you maybe interesting work with, then, you could can match people by methodology.
10. For any system the knowing of where you are, the understanding. You should always need to feel in control.
11. I do not think is missing you have a lot of them.
12. Contributions, you should be have marketing support, you can not control everything. If you built a prototype and test it it is definitely a PhD. It is a very useful system.

***Dr N. Flint***

1. It will be extremely useful, for instance, when I was doing my PhD research and searched to find information, others used the WWW for retrieval purposes, however, WWW does not offer a systematic view of information, if it will, it comes accidentally at the moment.
2. Referee panel it is useful but suspicious sometimes, if it is used, it should very broad, very updated, very progressive and should be consists of both professionals and practitioners.
3. To clearly identified people in the area, communication should be structured and formal.
4. Subscription on channels are very useful. It is not fundamental but in terms of time is very useful.
5. Sometimes, visual material is better than selecting keywords, refereed panel should establish those keywords. Visual is enriched representation. Keywords is not invaluable but is the only way. You can use instance of words, there is no problem. When users will submit how they identify their work, refereed board how the work fit into the category, and give predefined keyword to help them.
6. To be honest information come first to the user and then user to the user, you need both.
7. Categories have to be set by the refereed panel, but in-depth keywords authors should set because it is their own experience, you need both facilities.
8. All.
9. see 5
10. Matching people is very useful, exhibition and conference information and their proceedings is very useful, current research is extremely useful, I will be extremely interested for completed research, connecting with content is very extremely useful and then with user.
11. It is very comprehensive. Extremely useful to talk with other director of studies, other supervisors, and talking about experiences. Because it is a database, information about area and types of different PhD then, we can draw conclusion if the area offers theoretical or practical research.
12. It could be problems with passwords, with filling forms, with the refereed board, but at the end of the day it is an attempt to something that it is not there, maybe some problems, but when you do not have something out there this is a great step forward. In the diagrammatic form it seems very logical, very solid, however, you need a prototype, to test the functionality.



***Prof. J. Woodhuysen***

1. In my view you need a better name, a diagram on the screen format, you need a bubble to ask yourself a very searching question: outside the academy community; what population? 200 people. Am I build a system of any use to companies like Samuel-Powell, beyond the academic community, they would actually help them doing the research that industry desperately need, then 200000 population, it is a very different proposition. With all the respect, the world of academia and especially the design research community is extremely esoteric, narrow, backward. Am I doing this for a career designer or for a researcher (the character that described before)? Possibly 200 students around the world are thinking of a www solution. In principle it is very useful, in practice I have ask myself to who am I going for, what they want, what I am offering that can succeed when the Ariad is failed. We had no idea about the Ariad, I have to came here to inform about it, there is no communication enriched.

2. Well, it is useful but I think you need an either role there, you need a common man-channel like I am coming and named specialists in both practical and theoretical matters.

3. The important thing is the content, name it agenda, what issues are going to discussed is the important. Content is key. Innovation of the interface as Apple Macintosh did. Discussion should sure not replay the 60's debate, the sure the agenda setting ahead.

4. I like them.

5. no answer

6. It is very important. I want to reach names, no hundreds names, you should not neglect location, age and company name.

7. Yes, a group of keywords is sufficient.

8. All of them.

9. see 5

10. The design of the interface has got to be pretty clever, attractive, desirable, also time benefits against others.

11. Integrating message with video-conferencing.

12. Integrating message with video-conferencing, e-mail, fax, printing labels and how many buttons need to send any kind of information is very important. Use different media to work closed to the system. In my view it is useful but you also need a better name.

***Prof. B. Allison***

1. Until something is not in existence, how people they know they needed? 239 registered with DRS, thousands on their mailbase because it is free. The attempts that I did was not so successful, I think what you doing with the survey ask people is the most useful thing what you can do, I never did a survey about Ariad, feedback is minimum what is used for, how often, what they like to see. This system is extremely useful.

2. Any member to be accepted by the CSD should have to show a portfolio. Personally as an editor I need to check the content's appropriateness literally, however, for an e-system such as



an e-journal refereed is fine.

3. no answer

4. Very useful.

5. Keywords, use of both textual and visual material.

6. I think they are of equal importance. Very important however, matching users with information seems slightly more important.

7. Yes. General keywords should be defined by experts in the field .

8. All.

9. see 5

10. The ability to match users with information is slightly more important than matching users with other users, however, users with users is still very important.

11. I do not see any major missing parts.

12. People professional interchange, that is the problem. The members of CSD are not seem interesting about research, any designer doing any design does some research sometime, what we called research is a different matter, the problem is we change having being a public, a purpose, a goal, a method, a way of analysing the information you collect and arriving to a conclusion give some kind of communication of the report that is a particular kind of research mostly to do with research degree committee or commission research that is not the way that done in normal practice, I think that is the real problem. The Ariad is only concerned with completed research reports, so from the design profession there are very few because that is not the way done. It is nice to have a clear picture, it will be nice to have a clear communication system, but people are not clear, the information are not clear, the attitudes are not clear. I do not know if designers communicate, I think yes but I am not sure. Design researchers are communicate with each other, yes they do. Current research should be communicate, any designer should be accessing update research, to help and eliminate, this is a rational, logical, professional attitude, arguing for a professional attitude for as long as I can remember now, two things: if you done research you have responsibility to communicate to the field, if you are doing research you are responsible to check what has been done, do not reinvert the wheel. Any professional field should be keep informed and updated. Unpublished research is perfectly valid and Ariad provide to the field these information. I would like to see the Ariad and the Applied Art Index as parallel publications on the Web. This system is extremely useful.

***Prof. J. Myerson***

1. When I informed what ne•reid means I love it, Hydra is good as well. On the WWW there is no quality, I think it will be very useful, the usefulness is speed, relevance of quality of information, accessibility, easy of navigation. The interface is very important, the how of communicating with the users. It will be work for all form of postgraduate design students, on the MA it will help students to get some background knowledge and not to reinvert the wheel. People think for example if you design an office desk, they do not understand literature, to design a desk is like designing a car is a massive massive development project, if they had



something like this and could see the literature and books, the ergonomics, discussion around those artifacts for all these years then, they will set that project into context . PhD students, yes, it will very very good, I think it will be very useful but for every level of postgraduate.

2. This is my biggest problem on this project. The problem is, design research is very broad subject and some people have very narrow view of design research they think design research is all about the written word and the academic dissemination, it is very formal. It would be better than a referred board to have a very large panel of advisors in every subject, a small executives who administrating and operating the system, and then a panel of experts advisors. And then, you cover most of the major areas of design scholarly diver who are not only experts in theoretical concepts like postmodernism, modernism but then sectors like medical equipment, furniture, textiles. Then, you have a very large panel of experts so if something came in it will be sent to the expert for duty commission. They will communicate by e-mail, phone, etc..., and also, you do not need meetings of the board. Then it is useful.

3. The environment should be warm and friendly. Easy to understand. Unfortunately, the use of iconography is much underrating.

4. This is a great idea, but you should not relying on theses information providers.

5. Design research is boring, is esoteric, your system should be fun, lively, you should use both verbal and visual material.

6. This is the key, I see the most important is to have an ongoing list of whose doing what in which University will be brilliant, the dateline aspects of this it will be absolutely fantastic. Matching users with information or with other users are equally important, possibly, slightly the users, you could have an additional sector of help/wanted, the social networking aspect of this.

7. You should group keywords into generic design: industry sector, medical, toys, games, house, and then the discipline: information design, interface design, furniture design, and then words which may decide research further like: commercial effectiveness, ergonomics, heath, the area of concern, the market sector and the design discipline and then what you can do is to have a map of world for the location.

8. All.

9. see 5

10. Speed, a lovely environment in which to navigate, which it give you pleasure as well being functional, access to relevant information and relevant people, and a social aspect of networking.

11. You cover most of the ground.

12. It is the gap that currently exists between the world of design practice and the way information is presented to design practice and the way that the formal academic design research community puts across their case, because it a is different development. For your system to be successful I think you got to keep all the academics outside, you also got to put out all practice side things and get industrial companies, and design consultancies involved with it. Set the language and the interface. Look in magazines for contributors. It is a great project and extremely useful.



## **Secondary Evaluation Exercises**

Appendix III consists of the instruments used for the two secondary evaluation exercises, which is the formative approach. It also provides details of these two exercises results. The first exercise is the one-to-one with five experts in the content, design and research matters and the second exercise is the user group exercise with fifteen participants as the end-users of the prototype from De Montfort University.

### ***One-to-One Expert Formative Evaluation Method (Secondary Exercise 1)***

The exercise consisted of a brief introduction and demonstration of the prototype's functions after which the participants were allowed to browse and explore the system themselves.

#### **Participants:**

Ray Holland, MA / MSC Programme Leader, Design and Manufacture, De Montfort University

Nick Higgett, Principal Lecturer in Multimedia Design, De Montfort University

Joseph Amoah-Nyako, Supervisor, Graduate School, Design & Manufacture, De Montfort University

Ed Chester, Lecturer in Multimedia Design, De Montfort University

Rob Snow, MA student & Lecturer in Multimedia Design, De Montfort University

The instrument used is as seen on the next page. Following to this sample, it presents the participants response.



## One-to-One Formative Evaluation Method (Secondary Exercise1)

Name of the Participant:.....

Venue.....

Date.....

### Q1. Overall Reactions to the System:

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

### Q2. Screen Layout:

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

### Q3. Terminology:

- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

### Q4. Functionality of System:

- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy

### Q5. Speed of System:

too slow	-2	-1	0	1	2	fast enough
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### Q6. Overall comments in relation to the efficient working order of the prototype

.....  
 .....



**Participant 1: Ray Holland, 7th CAD LAB, De Montfort University, June 1999**

<b>Q1. Overall Reactions to the System:</b>	terrible	-2	-1	0	1	2	wonderful
	frustrating	-2	-1	0	1	2	satisfying
	dull	-2	-1	0	1	2	stimulating
	difficult	-2	-1	0	1	2	easy
	rigid	-2	-1	0	1	2	flexible

**Q2. Screen Layout:**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q3. Terminology:**

- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q4. Functionality of System:**

- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy

<b>Q5. Speed of System:</b>	too slow	-2	-1	0	1	2	fast enough
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**Q6. Overall comments in relation to the efficient working order of the prototype**

text size could be increased

black background fits to the scope of the user.



**Participant 2: Nick Higgett, 7th CAD LAB, De Montfort University, June 1999**

<b>Q1. Overall Reactions to the System:</b>	terrible	-2	-1	0	1	2	wonderful
	frustrating	-2	-1	0	1	2	satisfying
	dull	-2	-1	0	1	2	stimulating
	difficult	-2	-1	0	1	2	easy
	rigid	-2	-1	0	1	2	flexible
<b>Q2. Screen Layout:</b>							
- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear
<b>Q3. Terminology:</b>							
- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear
<b>Q4. Functionality of System:</b>							
- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy
<b>Q5. Speed of System:</b>	too slow	-2	-1	0	1	2	fast enough

**Q6. Overall comments in relation to the efficient working order of the prototype**

text size should increased

black background is not nice and may affect user productivity in relation to the environment light sources. Think about to change text colour.



**Participant 3: Joseph Amoah-Nyako, 7th CAD LAB, De Montfort University, June 1999**

<b>Q1. Overall Reactions to the System:</b>	terrible	-2	-1	0	1	2	wonderful
	frustrating	-2	-1	0	1	2	satisfying
	dull	-2	-1	0	1	2	stimulating
	difficult	-2	-1	0	1	2	easy
	rigid	-2	-1	0	1	2	flexible
<b>Q2. Screen Layout:</b>							
- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear
<b>Q3. Terminology:</b>							
- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear
<b>Q4. Functionality of System:</b>							
- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy
<b>Q5. Speed of System:</b>	too slow	-2	-1	0	1	2	fast enough

**Q6. Overall comments in relation to the efficient working order of the prototype**

It is overall good.

However in the future section you could recommend for the subscription form to work with both the 'and' and 'or' boolean logic.



**Participant 4: Ed Chester, 7th CAD LAB, De Montfort University, June 1999**

<b>Q1. Overall Reactions to the System:</b>	terrible	-2	-1	0	1	2	wonderful
	frustrating	-2	-1	0	1	2	satisfying
	dull	-2	-1	0	1	2	stimulating
	difficult	-2	-1	0	1	2	easy
	rigid	-2	-1	0	1	2	flexible

**Q2. Screen Layout:**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q3. Terminology:**

- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q4. Functionality of System:**

- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy

<b>Q5. Speed of System:</b>	too slow	-2	-1	0	1	2	fast enough
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**Q6. Overall comments in relation to the efficient working order of the prototype**

Increase text size.

Consistent graphics are not nice. Change them.



**Participant 5: Rob Snow, 7th CAD LAB, De Montfort University, June 1999**

<b>Q1. Overall Reactions to the System:</b>	terrible	-2	-1	0	1	2	wonderful
	frustrating	-2	-1	0	1	2	satisfying
	dull	-2	-1	0	1	2	stimulating
	difficult	-2	-1	0	1	2	easy
	rigid	-2	-1	0	1	2	flexible

**Q2. Screen Layout:**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q3. Terminology:**

- Use of terms throughout the system	inconsistent	-2	-1	0	1	2	consistent
- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Relevance of terminology to the requirement of searching data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q4. Functionality of System:**

- Operating the system	difficult	-2	-1	0	1	2	easy
- Filling in the contribution form	difficult	-2	-1	0	1	2	easy
- Filling in the search form	difficult	-2	-1	0	1	2	easy
- Filling in the subscription form	difficult	-2	-1	0	1	2	easy
- Communicating with others	difficult	-2	-1	0	1	2	easy

<b>Q5. Speed of System:</b>	too slow	-2	-1	0	1	2	fast enough
-----------------------------	----------	----	----	---	---	---	-------------

**Q6. Overall comments in relation to the efficient working order of the prototype**

cool.



## **User Group based Formative Evaluation Method (Secondary Exercise 2)**

The exercise consisted of a brief introduction and the participants were asked to accomplish the following tasks and answer the appropriate questions.

### **Participants:**

- Francois Bellet-Odent, MA/MSc Product and Industrial Design, De Montfort University
- Kimberly Beng Kcun Yeap, MA/MSc Interior Design, De Montfort University
- Coco (Cynthia) Chu, MA/MSc Graphic and Multimedia Design, De Montfort University
- Sara Ekenger, MA/MSc Design Management, De Montfort University
- Noel Healy, MA/MSc Graphic and Multimedia Design, De Montfort University
- Andy Grecory, MA/MSc Graphic and Multimedia Design, De Montfort University
- Dav Tara, MA/MSc Graphic and Multimedia Design, De Montfort University
- C. Volkan Demirel, MA/MSc Interior Design, De Montfort University
- Peter Chen, PhD Graphic and Multimedia Design, De Montfort University
- Carolyn Hardaker, PhD Fashion and Textiles Design, De Montfort University
- Jinho Jeong, PhD Product and Industrial Design, De Montfort University
- Hsueh-shu Liao, PhD Product and Industrial Design, De Montfort University
- Olga Miggou, PhD Interior Design, De Montfort University
- Claire Orwin, PhD Fashion and Textiles Design, De Montfort University
- Puindita Tantiwong, PhD Fashion and Textiles Design, De Montfort University

The instrument used is as seen on the next page. Following to this sample, it presents the participants response.







**Section 2: Searching Task**

Please follow the instructions:

A. Please load the URL: <http://146.227.33.75:591/neroid/welcome.htm>

B. Follow the appropriate hyperlinks to reach the Search page

C. Please search for:

subject of research	<i>Graphics / Multimedia</i>
other keyword	<i>Medical</i>
visual	<i>Yes</i>
match logic	<i>And</i>

(do this by typing and selecting the criteria using the form)

D. Please click on the Start Search button

E. When you have retrieved results, check whether you have relevant matches

F. To do this, click on the Record's ID link to get details of the research work

G. Then click on the image link to get the relevant audio-visual material

H. Then go back & click on the full content link to get the whole document of the research work

I. Click on Start New Search & then repeat steps B - E by replacing the search values using the following:

project status	<i>Completed</i>
deliverable status	<i>Unpublished</i>
deliverable	<i>MA</i>
subject of research	<i>Management</i>
match logic	<i>Or</i>

J. Click on Start New Search & then repeat steps B - E by replacing the search values using the following:

projects status	<i>Completed</i>
subject of research	<i>Management</i>
match logic	<i>And</i>

K. Circle / filling in questions in relation to this task which are as follows:

**Q2. Reactions in relation to Searching (searching task):**

terrible	-2 -1 0 1 2	wonderful
frustrating	-2 -1 0 1 2	satisfying
dull	-2 -1 0 1 2	stimulating
difficult	-2 -1 0 1 2	easy
rigid	-2 -1 0 1 2	flexible

**Q3. Screen Layout in relation to Searching (searching task):**

- Characters on screen	hard to read	-2 -1 0 1 2	easy to read
- Graphics on screen	unhelpful	-2 -1 0 1 2	helpful
- Arrangement of information	illogical	-2 -1 0 1 2	logical
- Amount of information	inadequate	-2 -1 0 1 2	adequate







(you should get one relevant match with Record ID: 192)

F. Then, follow the appropriate hyperlinks to reach the Subscription of Updates page

G. Please subscribe with the criteria entered on the step C (excluding the *And* match logic)

H. When you have finished, type your e-mail address and name and click on the Subscribe button

I. Questions in relation to this task will presented on section 5. Proceed to next section

#### Section 4: Contributing Task

Please follow the instructions:

A. Please load the URL: <http://146.227.33.75:591/neroid/welcome.htm>

B. Follow the appropriate hyperlinks to reach the Contributions page

C. Please provide details about yourself and your research work as appropriate

- to submit the abstract and / or the aim of your work that is located in a disk, please open document from the file menu, select all, copy and paste to the appropriate place

D. If you wish to submit audio-visual and the research document itself, please select Yes and the type of the file that is being submitted and finally, click on the Submit button. When your contribution is accepted you will get instructions of how to submit audio-visual and the research document itself, in particular, to:

submit the whole document and the audio-visual material from a disk, please locate them on the desktop and drag and drop on the nereid's appropriate folder

E. When you finished with your submission, go to the Search Form

F. Search for your Name or any other combination to retrieve your contribution

G. Check the relevance of the retrieved match with your submission

H. At this point, administer contributes relevant research work to the subscribed criteria entered on step C - section 3 in which the main difference with the one matched on the previous task is that is concerned with a published article and not an unpublished current PhD

I. Circle / filling in questions in relation to this task which are as follows:

#### Q2. Reactions in relation to Contributing (contribution task):

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

#### Q3. Screen Layout in relation to Contributing (contribution task):

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful



- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q4. Terminology in relation to Contributing (contribution task):**

- Relevance of terminology to the requirement of contributing data	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q5. Functionality of System in relation to Contributing (contribution task):**

- Filling the contribution form	difficult	-2	-1	0	1	2	easy
- Relevance of your contribution with the one you submitted	unrelated	-2	-1	0	1	2	related

**Q6. Speed of System in relation to Contributing (contribution task):**

too slow	-2	-1	0	1	2	fast enough
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**Q7. Error Messages in relation to Contributing (contribution task):**

- Did you experience error messages	always	-2	-1	0	1	2	never
- If error messages, were	unhelpful	-2	-1	0	1	2	helpful

**Q8. Please feel free to print some comments according to the task accomplished**

.....  
 .....

**Section 5: Subscription of Updates Task**

Please follow the instructions:

- A. Wait for up a short period of time and then check your e-mail
- B. Follow the instructions given
- C. Load the nereid's Search page and search for the ID provided in the e-mail
- D. Check whether the retrieval is relevant to the subscribed search and different than the one matched on section 3 (you may check the different Record ID numbers)
- E. Then click on the Record's ID link to get details of this research work
- F. Please do not close (log off) this page
- G. Circle / filling in questions in relation to this task which are as follows:



**Q2. Reactions in relation to Subscribing of Updates (subscription to updates task):**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Screen Layout in relation to Subscribing of Updates (subscription to updates task):**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q4. Terminology in relation to Subscribing of Updates (subscription to updates task):**

- Relevance of terminology to the requirement of subscribing to updates	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q5. Functionality of System in relation to Subscribing of Updates (subscription to updates task):**

- Filling the submission form	difficult	-2	-1	0	1	2	easy
- Relevance of the subscription to updates method matches with the criteria initially entered in the subscription form	unrelated	-2	-1	0	1	2	related

**Q6. Speed of System in relation to Subscribing of Updates (subscription to updates task):**

too slow	-2	-1	0	1	2	fast enough
----------	----	----	---	---	---	-------------

**Q7. Error Messages in relation to Subscribing of Updates (subscription to updates task):**

- Did you experience error messages	always	-2	-1	0	1	2	never
- If error messages, were	unhelpful	-2	-1	0	1	2	helpful

**Q8. Please feel free to print some comments according to the task accomplished**

.....  
 .....



**Section 6: Communicating with each other Task**

Please follow the instructions::

**Method 1**

- A. Please click on the e-mail provided and send an enquiry in relation to this research
- B. Wait for a short time and then check your e-mail

**Method 2**

- A. Please load the URL: <http://146.227.33.75:591/neroid/welcome.htm>
- B. Follow the appropriate hyperlinks to reach the Communicating with each other page
- C. Please search for:
 

projects status	<i>Current</i>
subject of research	<i>Graphics / Multimedia</i>
match logic	<i>And</i>
- D. Please click on the Submit button
- E. When you have retrieved results, check whether you have relevant matches
- F. Please click on the e-mail provided and send an enquiry in relation to this research
- G. Wait for a short time and then check your e-mail
- H. Circle / filling in questions in relation to this task which are as follows:

**Q2. Reactions in relation to Communicating with each other (Communicating with each other task):**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Functionality of System in relation to Communicating with each other (Communicating with each other task):**

- Communicating with others	difficult	-2	-1	0	1	2	easy
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**Q4. Speed of System in relation to Communicating with each other (Communicating with each other task):**

too slow	-2	-1	0	1	2	fast enough
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**Q5. Error Messages in relation to Communicating with each other (Communicating with each other task):**

- Did you experience error messages	always	-2	-1	0	1	2	never
- If error messages, were	unhelpful	-2	-1	0	1	2	helpful

**Q6. Please feel free to print some comments according to the task accomplished**

.....

.....

.....

.....



**Section 7: Navigating throughout the nereid system Task**

Please follow the instructions:

- A. Please load the URL: <http://146.227.33.75:591/nereid/welcome.htm>
- B. Then follow all hyperlinks and mouseovers to browse the system
- C. Circle / filling in questions in relation to this task which are as follows:

**Q2. Reactions in relation to Navigating the system (navigating task):**

terrible	-2	-1	0	1	2	wonderful
frustrating	-2	-1	0	1	2	satisfying
dull	-2	-1	0	1	2	stimulating
difficult	-2	-1	0	1	2	easy
rigid	-2	-1	0	1	2	flexible

**Q3. Screen Layout in relation to Navigating the system (navigating task):**

- Characters on screen	hard to read	-2	-1	0	1	2	easy to read
- Graphics on screen	unhelpful	-2	-1	0	1	2	helpful
- Arrangement of information	illogical	-2	-1	0	1	2	logical
- Amount of information	inadequate	-2	-1	0	1	2	adequate
- Screen layout	unhelpful	-2	-1	0	1	2	helpful
- Colour scheme	frustrating	-2	-1	0	1	2	satisfying
- Screen navigation	confusing	-2	-1	0	1	2	clear

**Q4. Terminology in relation to Navigating the system (navigating task):**

- Relevance of terminology to the requirement of navigating the system	unrelated	-2	-1	0	1	2	related
- Meaning of messages which appeared on screen	confusing	-2	-1	0	1	2	clear

**Q5. Functionality of System in relation to Navigating the system (navigating task):**

- Relevance of links in relation to the navigation of the system	unrelated	-2	-1	0	1	2	related
--	-----------	----	----	---	---	---	---------

**Q6. Speed of System in relation to Navigating the system (navigating task):**

too slow	-2	-1	0	1	2	fast enough
----------	----	----	---	---	---	-------------

**Q7. Error Messages in relation to Navigating the system (navigating task):**

- Did you experience error messages	always	-2	-1	0	1	2	never
- If error messages, were	unhelpful	-2	-1	0	1	2	helpful

**Q8. Please feel free to print some comments according to the task accomplished**



.....  
.....

**Q0. Please feel free to print some overall comments**

.....  
.....  
.....  
.....

Your Name.....

Many Thanks for participating in this exercise,

Nikolaos Bessis  
PhD Design and Manufacture Research  
Faculty of Art and Design  
De Montfort University, Leicester  
August, 2000

**Numbering of Participants:**

- 1 Francois Bellet-Odent, MA/MSc Product and Industrial Design, De Montfort University
- 2 Kimberly Beng Kcun Yeap, MA/MSc Interior Design, De Montfort University
- 3 Coco (Cynthia) Chu, MA/MSc Graphic and Multimedia Design, De Montfort University
- 4 Sara Ekenger, MA/MSc Design Management, De Montfort University
- 5 Noel Healy, MA/MSc Graphic and Multimedia Design, De Montfort University
- 6 Andy Grecory, Graphic and Multimedia Research, De Montfort University
- 7 Dav Tara, MA/MSc Graphic and Multimedia Design, De Montfort University
- 8 C. Volkan Demirel, MA/MSc Interior Design, De Montfort University
- 9 Peter Chen, PhD Graphic and Multimedia Design, De Montfort University
- 10 Carolyn Hardaker, Fashion and Textiles Research, De Montfort University
- 11 Jinho Jeong, PhD Product and Industrial Design, De Montfort University
- 12 Hsueh-shu Liao, PhD Product and Industrial Design, De Montfort University
- 13 Olga Miggou, PhD Interior Design, De Montfort University
- 14 Claire Orwin, PhD Fashion and Textiles Design, De Montfort University
- 15 Puindita Tantiwong, PhD Fashion and Textiles Design, De Montfort University



**Section 1**

Q1.1 Please indicate your age (in years)

Q1.2 Please indicate your gender (M=Male, F=Female)

Q1.3 Please indicate your nationality (E=English, OE=Other European, OnE=Other non-European)

Q1.4 When you conduct research in design, how often do you search for previous and / or current research relevant to your area of enquiry? (A=Always, F=Frequently, S=Seldom, N=Never)

Q1.5 Do you currently use the WWW for searching information relevant to your area of enquiry? (Y=Yes, N=No)

Q1.6 Please indicate if you are actively involved in research and if so to what extent (Y=Yes, N=No, FT=Full Time, PT=Part Time, S=Student, SF=Staff)

Q1.7 Please indicate your computer literacy (VH=Very High, H=High, A=Average, L=Low)

No Participant	Q1.1	Q1.2	Q1.3	Q1.4	Q1.5	Q1.6	Q1.7
1	27	M	OE	A	Y	Y, FT, S, MA/MSc	H
2	23	F	OnE	A	N	Y, FT, S, MA/MSc	A
3	22	F	OnE	F	Y	Y, FT, S, MA/MSc	H
4	27	F	OE	A	Y	Y, FT, S, SF (PT), MA/MSc	A
5	64	M	E	F	Y	Y, PT, SF, MA/MSc	VH
6	26	M	E	A	Y	Y, FT, SF, Other Research	VH
7	43	M	E	A	Y	Y, FT, S, SF, MA/MSc	VH
8	24	M	OE	A	Y	Y, FT, S, MA/MSc	A
9	26	M	OnE	F	Y	Y, FT, S, PhD	H
10	37	F	E	F	Y	Y, PT, SF, Other Research	VH
11	31	M	OnE	F	Y	Y, FT, S, PhD	A
12	40	M	OnE	A	Y	Y, PT, S, PhD	H
13	32	F	OE	A	Y	Y, FT, S, PhD	A
14	29	F	E	A	Y	Y, FT, S, PhD	A
15	33	F	OnE	A	Y	Y, FT, S, PhD	A

All numbering under the assigned numerical values are concerned with the identity number of each participant in relation to the response.

**Section 2, Searching Task****Q2. Reactions in relation to Searching (searching task):**

terrible	-2	-1	0	1	2	wonderful
			9	2,3,4,5,6,7,8,10,11,14	1,12,13,15	
frustrating	-2	-1	0	1	2	satisfying
				1,3,4,5,6,9,10	2,7,8,11,12,13,14,15	
dull	-2	-1	0	1	2	stimulating



			<b>5,6,9,10</b>	<b>1,3,4,7,8,13,14</b>	<b>2,11,12,15</b>	
difficult	-2	-1	0	1	2	easy
				<b>3,4, 6,11,</b>	<b>1,2,5,7,8,9,10,12,13,14,15</b>	
rigid	-2	-1	0	1	2	flexible
		<b>6</b>	<b>8</b>	<b>1,4,5,11,13,15</b>	<b>2,3,7,9,10,12,14</b>	

**Q3. Screen Layout in relation to Searching (searching task):**

**- Characters on screen**

hard to read	-2	-1	0	1	2	easy to read
		<b>4</b>	<b>9,11</b>	<b>1,6,7,10,15</b>	<b>2,3,5,8,12,13,14</b>	

**- Graphics on screen**

unhelpful	-2	-1	0	1	2	helpful
		<b>1</b>	<b>4,9,10,11</b>	<b>2,3,6,7</b>	<b>5,8,12,13,14,15</b>	

**- Arrangement of information**

illogical	-2	-1	0	1	2	logical
			<b>6</b>	<b>1,3,4,5,8,9,10,11,12</b>	<b>2,7,13,14,15</b>	

**- Amount of information**

inadequate	-2	-1	0	1	2	adequate
			<b>10,15</b>	<b>2,3,4,5,6,7,8,9,11</b>	<b>1,12,13,14</b>	

**- Screen layout**

unhelpful	-2	-1	0	1	2	helpful
		<b>4</b>	<b>1</b>	<b>5,6,9,10,11,12</b>	<b>2,3,7,8,13,14,15</b>	

**- Colour scheme**

frustrating	-2	-1	0	1	2	satisfying
		<b>4</b>	<b>9,14</b>	<b>1,3,6,10,11,12,15</b>	<b>2,5,7,8,13</b>	

**- Screen navigation**

confusing	-2	-1	0	1	2	clear
		<b>1</b>	<b>4,6,9,10,11</b>	<b>14</b>	<b>2,3,5,7,8,12,13,15</b>	

**Q4. Terminology in relation to Searching (searching task):**

**- Relevance of terminology to the requirement of searching data**

unrelated	-2	-1	0	1	2	related
			<b>1,8</b>	<b>2,3,4,5,6,7,10,11,14</b>	<b>9,12,13,15</b>	

**- Meaning of messages which appeared on screen**

confusing	-2	-1	0	1	2	clear
			<b>6,8,11</b>	<b>1,4,5,7,12,14</b>	<b>2,3,9,10,13,15</b>	

**Q5. Functionality of System in relation to Searching (searching task):**

**- Filling the search form**



difficult	-2	-1	0	1	2	easy
			4	1,3,5,6,8,11,13	2,7,9,10,12,14,15	
- Relevance of your search criteria with those retrieved						
unrelated	-2	-1	0	1	2	related
			9	2,3,6,7,11,14	1,4,5,8,10,12,13,15	

**Q6. Speed of System in relation to Searching (searching task):**

too slow	-2	-1	0	1	2	fast enough
				3,6,9,11	1,2,4,5,7,8,10,12,13,14,15	

**Q7. Error Messages in relation to Searching (searching task):**

- Did you experience error messages

always	-2	-1	0	1	2	never
			4	15	1,2,3,5,6,7,8,9,10,11,12,13,14	

- If error messages, were

unhelpful	-2	-1	0	1	2	helpful
				4,15		

**Q8. Comments (searching task)**

Participant 2: I like the fast and easy way of searching information needed.

Participant 6: Record ID to bottom; makes you feel like you must enter a value.

Participant 8: The and/or buttons in the search page are not very clear to understand.

Participant 9: The find all records is confusing.

Participant 13: In the search screen the name could be replaced with author because this is the current terminology used by researchers.

Participant 14: Notes on and/or searching should be more prominent to alter user system will work between fields - good concept though.

**Section 3: Subscription of Updates Task**

see section 5.

**Section 4: Contributing Task**

**Q2. Reactions in relation to Contributing (contribution task):**

terrible	-2	-1	0	1	2	wonderful
			4	1,2,3,5,6,7,8,10,11,13,14	9,12,15	
frustrating	-2	-1	0	1	2	satisfying
			4	1,3,5,6, 9,10,11,13	2,7,8,12,14,15	
dull	-2	-1	0	1	2	stimulating



			<b>4,6,9,10</b>	<b>1,3,5,7,8,11,13,14</b>	<b>2,12,15</b>	
difficult	-2	-1	0	1	2	easy
		4	<b>6,9,10</b>	<b>1,11</b>		<b>1,2,3,5,7,12,13,14,15</b>
rigid	-2	-1	0	1	2	flexible
		4	<b>6,9,10</b>	<b>11,12,15</b>		<b>1,2,3,5,7,8,13,14</b>

**Q3. Screen Layout in relation to Contributing (contribution task):****- Characters on screen**

hard to read	-2	-1	0	1	2	easy to read
			4	<b>1,5,6,7,10,11,15</b>		<b>2,3,8,9,12,13,14</b>

**- Graphics on screen**

unhelpful	-2	-1	0	1	2	helpful
			<b>4,6,9,19</b>	<b>1,3,5,7,11,13</b>		<b>2,8,12,14,15</b>

**- Arrangement of information**

illogical	-2	-1	0	1	2	logical
		6	4	<b>1,5,10,11,12,13,14,15</b>		<b>2,3,7,8,9</b>

**- Amount of information**

inadequate	-2	-1	0	1	2	adequate
			4	<b>1,3,5,6,7,9,11,13</b>		<b>2,8,10,12,14,15</b>

**- Screen layout**

unhelpful	-2	-1	0	1	2	helpful
		6	<b>4,9</b>	<b>5,10,11,14,15</b>		<b>1,2,3,7,8,12,13</b>

**- Colour scheme**

frustrating	-2	-1	0	1	2	satisfying
			<b>4,6,9,11</b>	<b>10,12,14,15</b>		<b>1,2,3,5,7,8,13</b>

**- Screen navigation**

confusing	-2	-1	0	1	2	clear
		4,6	<b>10,11</b>	<b>5,9</b>		<b>1,2,3,7,8,12,13,14,15</b>

**Q4. Terminology in relation to Contributing (contribution task):****- Relevance of terminology to the requirement of contributing data**

unrelated	-2	-1	0	1	2	related
		6	<b>4,9,11</b>	<b>5,10,14</b>		<b>1,2,3,7,8,12,13,15</b>

**- Meaning of messages which appeared on screen**

confusing	-2	-1	0	1	2	clear
			<b>4,6,9,11</b>	<b>2,5,7,10,14</b>		<b>1,3,8,12,13,15</b>

**Q5. Functionality of System in relation to Contributing (contribution task):****- Filling the contribution form**



difficult	-2	-1	0	1	2	easy
			4,6	3,8,10,11		1,2,5,7,9,12,13,14,15
- Relevance of your contribution with the one you submitted						
unrelated	-2	-1	0	1	2	related
			4	6,11,13		1,2,3,5,7,8,9,10,12,14,15

**Q6. Speed of System in relation to Contributing (contribution task):**

too slow	-2	-1	0	1	2	fast enough
			9	6,10,11		1,2,3,4,5,7,8,12,13,14,15

**Q7. Error Messages in relation to Contributing (contribution task):**

- Did you experience error messages

always	-2	-1	0	1	2	never
			13	3,10		1,2,4,5,6,7,8,9,11,12,14,15

- If error messages, were

unhelpful	-2	-1	0	1	2	helpful
		3,13		10		

**Q8. Comments (Contribution task)**

Participant 6: Layout of contribution form could have been more flowing.

Participant 13: I would like to have a multiselection in the box subject of research. The field title in the search menu did not work.

Participant 14: Compulsory fields should be marked eg. by asteria. Flexibility of contribution very good.

**Section 5: Subscription of Updates Task**

**Q2. Reactions in relation to Subscribing of Updates (subscription to updates task):**

terrible	-2	-1	0	1	2	wonderful
				1,3,4,5,6,8,9,10,14		2,7,11,12,13,15
frustrating	-2	-1	0	1	2	satisfying
				1,4,5,6,9,10		2,3,7,8,11,12,13,14,15
dull	-2	-1	0	1	2	stimulating
			6,9,10	1,4,5,8,13,14,15		2,3,7,11,12
difficult	-2	-1	0	1	2	easy
				1,3,5,6,8		2,4,7,9,10,11,12,13,14,15
rigid	-2	-1	0	1	2	flexible
			6,9	1,4,5,8,10,12		2,3,7,11,13,14,15

**Q3. Screen Layout in relation to Subscribing of Updates (subscription to updates task):**



**- Characters on screen**

hard to read	-2	-1	0	1	2	easy to read
			4	1,5,6,7,9,10,11,15	2,3,8,12,13,14	

**- Graphics on screen**

unhelpful	-2	-1	0	1	2	helpful
			4,6,9,10	1,3,5,7,11	2,8,12,13,14,15	

**- Arrangement of information**

illogical	-2	-1	0	1	2	logical
			4,10	1,5,6,11	2,3,7,8,9,12,13,14,15	

**- Amount of information**

inadequate	-2	-1	0	1	2	adequate
			4,9	1,3,5,6,7,12	2,8,10,11,13,14,15	

**- Screen layout**

unhelpful	-2	-1	0	1	2	helpful
			4,9,10	1,3,5,6,11,13,14	2,7,8,12,15	

**- Colour scheme**

frustrating	-2	-1	0	1	2	satisfying
			4,6,9	1,10,11,12,13,14,15	2,3,5,7,8	

**- Screen navigation**

confusing	-2	-1	0	1	2	clear
		4	1	3,6,9,10,11,13,14	2,5,7,8,12,15	

**Q4. Terminology in relation to Subscribing of Updates (subscription to updates task):****- Relevance of terminology to the requirement of subscribing to updates**

unrelated	-2	-1	0	1	2	related
				4,5,6,7,9,14	1,2,3,8,10,11,12,13,15	

**- Meaning of messages which appeared on screen**

confusing	-2	-1	0	1	2	clear
			4	5,6,7,11,14	1,2,3,8,9,10,12,13,15	

**Q5. Functionality of System in relation to Subscribing of Updates (subscription to updates task):****- Filling the submission form**

difficult	-2	-1	0	1	2	easy
				4,6,14	1,2,3,5,7,8,9,10,11,12,13,15	

**- Relevance of the subscription to updates method matches with the criteria initially entered in the subscription form**

unrelated	-2	-1	0	1	2	related
			4	5,6,9	1,2,3,7,8,10,11,12,13,14,15	

**Q6. Speed of System in relation to Subscribing of Updates (subscription to updates task):**



too slow	-2	-1	0	1	2	fast enough
			1	5,6,9	2,3,4,7,8,10,11,12,13,14,15	

**Q7. Error Messages in relation to Subscribing of Updates (subscription to updates task):**

- Did you experience error messages

always	-2	-1	0	1	2	never
			1		2,3,4,5,6,7,8,9,10,11,12,13,14,15	

- If error messages, were

unhelpful	-2	-1	0	1	2	helpful
			1			

**Q8. Comments (Subscribing to updates task)**

Participant 2: I find this convenient, easy and fast way of doing research.

Participant 14: It would be useful to have the and/or options for subscribing.

**Section 6: Communicating with each other Task****Q2. Reactions in relation to Communicating with each other (Communicating with each other task):**

terrible	-2	-1	0	1	2	wonderful
			4	1,5,6,9,10,13,14	2,3,7,8,11,12,15	
frustrating	-2	-1	0	1	2	satisfying
			4,9	1,5,6,10	2,3,7,8,11,12,13,14,15	
dull	-2	-1	0	1	2	stimulating
		9	4	1,5,6,10,13,14	2,3,7,8,11,12,15	
difficult	-2	-1	0	1	2	easy
			4	5,6,9,10	1,2,3,7,8,11,12,13,14,15	
rigid	-2	-1	0	1	2	flexible
			4,9,10	5,6	1,2,3,7,8,11,12,13,14,15	

**Q3. Functionality of System in relation to Communicating with each other (Communicating with each other task):**

- Communicating with others

difficult	-2	-1	0	1	2	easy
				5,10	1,2,3,4,6,7,8,9,11,12,13,14,15	

**Q4. Speed of System in relation to Communicating with each other (Communicating with each other task):**

too slow	-2	-1	0	1	2	fast enough
			9	5,6,10	1,2,3,4,7,8,11,12,13,14,15	

**Q5. Error Messages in relation to Communicating with each other (Communicating with each other task):**

- Did you experience error messages

always	-2	-1	0	1	2	never
				10	1,2,3,4,5,6,7,8,9,11,12,13,14,15	



- If error messages, were

unhelpful	-2	-1	0	1	2	helpful
				10		

### Q6. Comments (Communicating with each other task)

Participant 2: I love the way being able to communicate with the author of the published work.

Participant 9: More methods to contact people (ie. icq, phone number, post address).

Participant 13: I believe that on the search field for others in the conduct field the option of retrieving the data ID or details of publications by these authors would be very helpful because we can predict or tell the experience of the author / how many years is working on the subject, if he is energetic researcher, etc.

Participant 14: Search for individuals very flexible and easy to complete.

### Section 7: Navigating throughout the nereid system Task

#### Q2. Reactions in relation to Navigating the system (navigating task):

terrible	-2	-1	0	1	2	wonderful
			4,6,9,10	1,2,3,5,7,8,13,14,15	11,12	
frustrating	-2	-1	0	1	2	satisfying
		4	6,10	1,3,5,8,9,13	2,7,11,12,14,15	
dull	-2	-1	0	1	2	stimulating
		9	4,10	1,3,5,6,7,8,13,14,15	2,11,12,	
difficult	-2	-1	0	1	2	easy
		4	6,10	3,5,11	1,2,7,8,9,12,13,14,15	
rigid	-2	-1	0	1	2	flexible
			4,6,9,10	5,8,11,13	1,2,3,7,12,14,15	

#### Q3. Screen Layout in relation to Navigating the system (navigating task):

- Characters on screen

hard to read	-2	-1	0	1	2	easy to read
			4	1,5,6,7,9,11,15	2,3,8,10,12,13,14	

- Graphics on screen

unhelpful	-2	-1	0	1	2	helpful
		9	1,4	5,6,7,10,11,13	2,3,8,12,14,15	

- Arrangement of information

illogical	-2	-1	0	1	2	logical
			10	1,4,5,6	2,3,7,8,9,11,12,13,14,15	

- Amount of information

inadequate	-2	-1	0	1	2	adequate
				1,3,4,5,6,7,9,13,14	2,8,10,11,12,15	



**- Screen layout**

unhelpful	-2	-1	0	1	2	helpful
		4	1,6,9	3,5,8,10,11,14	2,7,12,13,15	

**- Colour scheme**

frustrating	-2	-1	0	1	2	satisfying
		4	6,9,11	1,3,8,10,12,14	2,5,7,13,15	

**- Screen navigation**

confusing	-2	-1	0	1	2	clear
		4,6,9	1,11	5,10	2,3,7,8,12,13,14,15	

**Q4. Terminology in relation to Navigating the system (navigating task):****- Relevance of terminology to the requirement of navigating the system**

unrelated	-2	-1	0	1	2	related
			4	1,5,6,7,8,9,10,11,13,14	2,3,12,15	

**- Meaning of messages which appeared on screen**

confusing	-2	-1	0	1	2	clear
			4	1,5,6,7,8,9,10,11,14	2,3,12,13,15	

**Q5. Functionality of System in relation to Navigating the system (navigating task):****- Relevance of links in relation to the navigation of the system**

unrelated	-2	-1	0	1	2	related
			4	5,6,9,10,11	1,2,3,7,8,12,13,14,15	

**Q6. Speed of System in relation to Navigating the system (navigating task):**

too slow	-2	-1	0	1	2	fast enough
				5,6,9,10	1,2,3,4,7,8,11,12,13,14,15	

**Q7. Error Messages in relation to Navigating the system (navigating task):****- Did you experience error messages**

always	-2	-1	0	1	2	never
			4,9	10,13	1,2,3,5,6,7,8,11,12,14,15	

**- If error messages, were**

unhelpful	-2	-1	0	1	2	helpful
			4	9,10,13		

**Q8. Comments (navigating task)**

Participant 4: Slightly strange choice of words for the evaluation stage.

Participant 6: Navigation and interactivity could be improved.

Participant 10: My main comment is that there are a few navigation problems - eg. the need for



a back button on all pages.

Participant 13: For the purpose of this preliminary test / the layout and usability of the system is adequate since it covers the researcher's needs. Probably on the contribution or search fields the names of referees or the validity of the findings should be included.

Participant 15: If you separate a series of functions there are in the system (eg. colour) it may help to attract visitor and recognise quickly.

#### **Q0. Overall Comments**

Participant 1: The prototype is ok for the functionality aspect. Improve style.

Participant 2: I enjoyed using the system. I found it easy to use (for someone with average computer knowledge) and a fast way to obtain information needed.

Participant 4: Could be a very useful and time saving device in particular with reference to the current interlibrary loan system and possible frustration when surfing the net.

Participant 5: The system of retrieving and submitting information works well and overall would appear to be a worthwhile and usable interactive method of communicating past and present research electronically.

Participant 6: Concept is sound and feasible.

Participant 7: Excellent prototype model. Works without any flows. Nick has a thorough grasp of his work and methodology used.

Participant 9: Superb functionality and new ideas but lack of usability concerns for users.

Participant 10: Overall the system has a lot of potential to store valuable research with the ability to locate and access it very quickly - looks good!

Participant 11: For a first time user it would be a bit difficult to navigate, but as it is getting used to do it is quite ok to work with it.

Participant 13: Overall the system's strength lies on the aspect of contribution and most of all the information push. This aspect is a unique feature of nereid and is an attribute which makes nereid different from all the existing systems ie. ASLIB, CRIB, OPAC, ARIAD.

Participant 14: Good system. Very flexible compared to commercial systems used in my current work.



## **Primary Evaluation Exercise**

### **One-to-One Expert Summative Evaluation Review as a Primary Exercise**

Appendix IV consists of the instrument used for the primary evaluation exercise, which is the summative approach. It also provides details of this exercise results.

This exercise is the one-to-one expert exercise with five experts in the field. In particular, all of them are active design researchers, supervisors or examiners and experts in design research issues. They included:

#### **Participants:**

- A. Robertson, De Montfort University
- J. Wood, Goldsmiths College
- N. Cross, The Open University
- K. Wells, De Montfort University
- G. Bunce, Nottingham Trent University

However, as explained in Chapter 6 and 7, technical and other reasons reduced the number of the participants. The following experts had also contacted and accepted their participation to the evaluation exercise:

- B. Jerrard, University Central England
- P. Isherwood, Brunel University
- M. Bruce / R. Spudd, UMIST
- M. Tovey, Coventry University

The participant brief and the instrument used is as seen on the next pages:



## **The Aim of the PhD Research**

This aim of this research is to formulate a theoretical communication and information model in which design research results can be more effectively and efficiently communicated between design researchers.

## **The 5 step Research Framework**

- stage 1**      To review the background area of Information Systems Development Methodologies (ISDMs), including Soft Systems Methodology (SSM) in order to identify methodological approaches potentially applicable to support the achievement of the aim of this research study
- stage 2**      To explore and understand the nature of the problem by using SSM, i.e.. to draw a rich picture, examine the interventions, the cultural and political aspects of the problem situation, identify relevant conceptual systems and describe a root definition in relation to communicating design research results, as well as, the identification and formulation of a conceptual model.  
The need for a questionnaire as the primary research tool suitable for further understanding within the area of the investigation is identified
- stage 3**      To acquire respondents input through the questionnaire which will be used to establish how design research knowledge is currently communicated, as well as to identify what methods, systems and networks for communication are currently employed or needed. These results along with literature review will be used to make a comparison of the conceptual model identified in stage 2 against the perceived real world and to suggest feasible changes in the form of a new rich picture and a refined version of a root definition. These findings along with the literature review and the conceptual model are used to propose a new theoretical communication and information model concerned with how design research results can be more effectively efficiently communicated between its peers
- stage 4**      To further analyse the questionnaire along with stages 2 and 3 findings and Human Computer Interaction (HCI) literature based considerations in order to produce a specification framework. Structured interviews will be performed to evaluate the initial specification framework prior to the formulation of the prototype which will stand as the manifestation of the proposed theoretical communication and information model which will be tested in stage 5 to determine the model's validity



**stage 5**      **To perform evaluation studies employing Formative and Summative exercises in order to test the working prototype, and thereby, the validity of the proposed theoretical communication and information model in terms of its effectiveness and efficiency**

**This five step methodology as described above is illustrated in the following figure 1:**



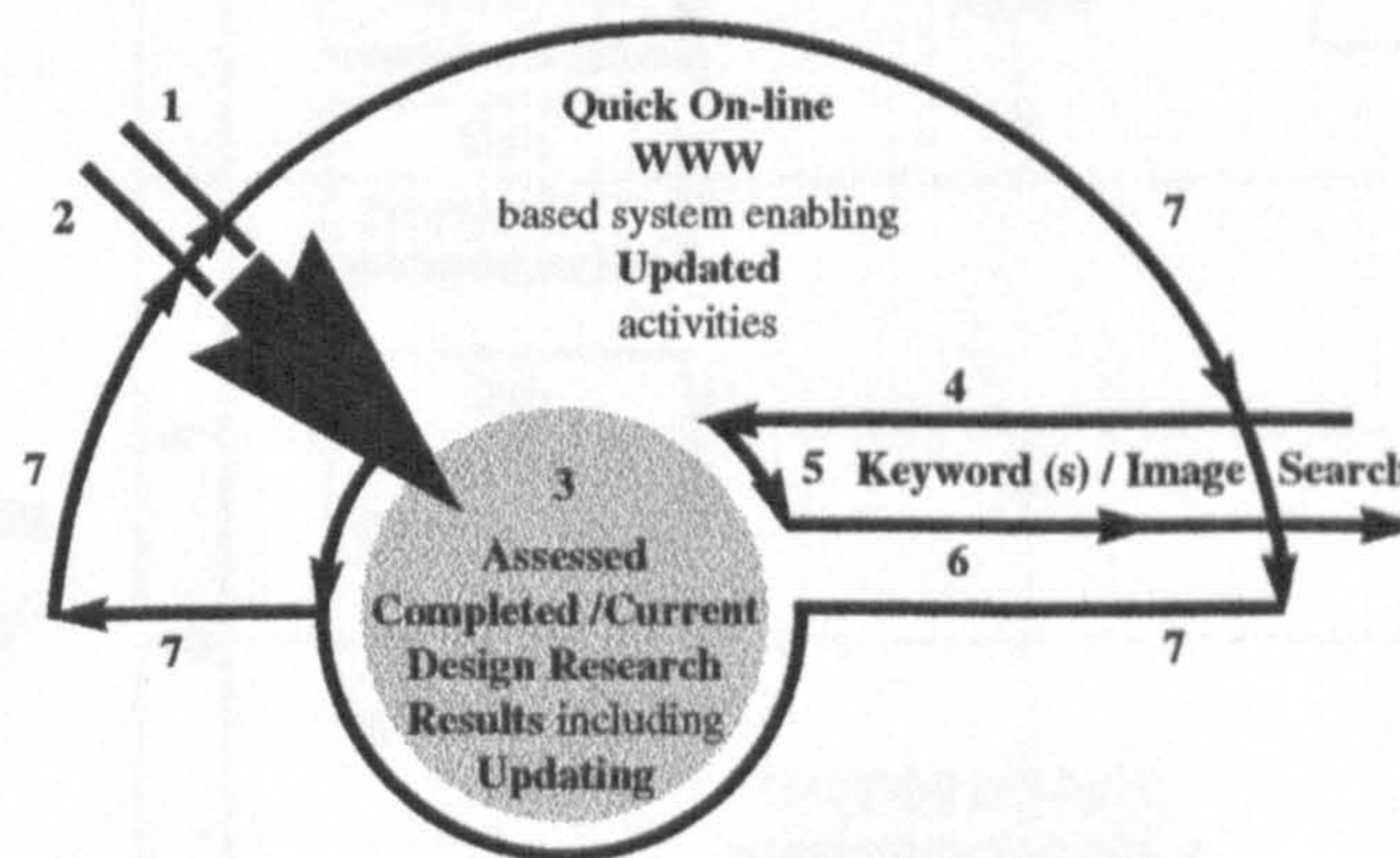




Based on the Soft Systems Methodology approach as described in the first three stages of the five step methodology, the following theoretical model has been formulated:

- **An on-line WWW based communication and information system owned, managed and operated by design researchers in which, they should be able to act, react and / or interact, and communicate with each other their completed / current design research results with speed. In particular, a system in which design researchers should be able to contribute on-line, and to assess on-line completed / current design research results. The system should hold these assessed works, in order for others to express and perform on-line an enquiry in relation to them (assessed works) by using an on-line keyword(s) search system (for retrieving part or the whole of research work itself in either a textual or audio-visual form or both) and allow on-line delivery and updates. Based on these principles, the system should further allow design researchers to communicate on-line with each other in order to act, react and / or interact on-line to provide criticism and feedback on completed / current design research results**

The following figure 2 provides the schematic representation of the theoretical model:



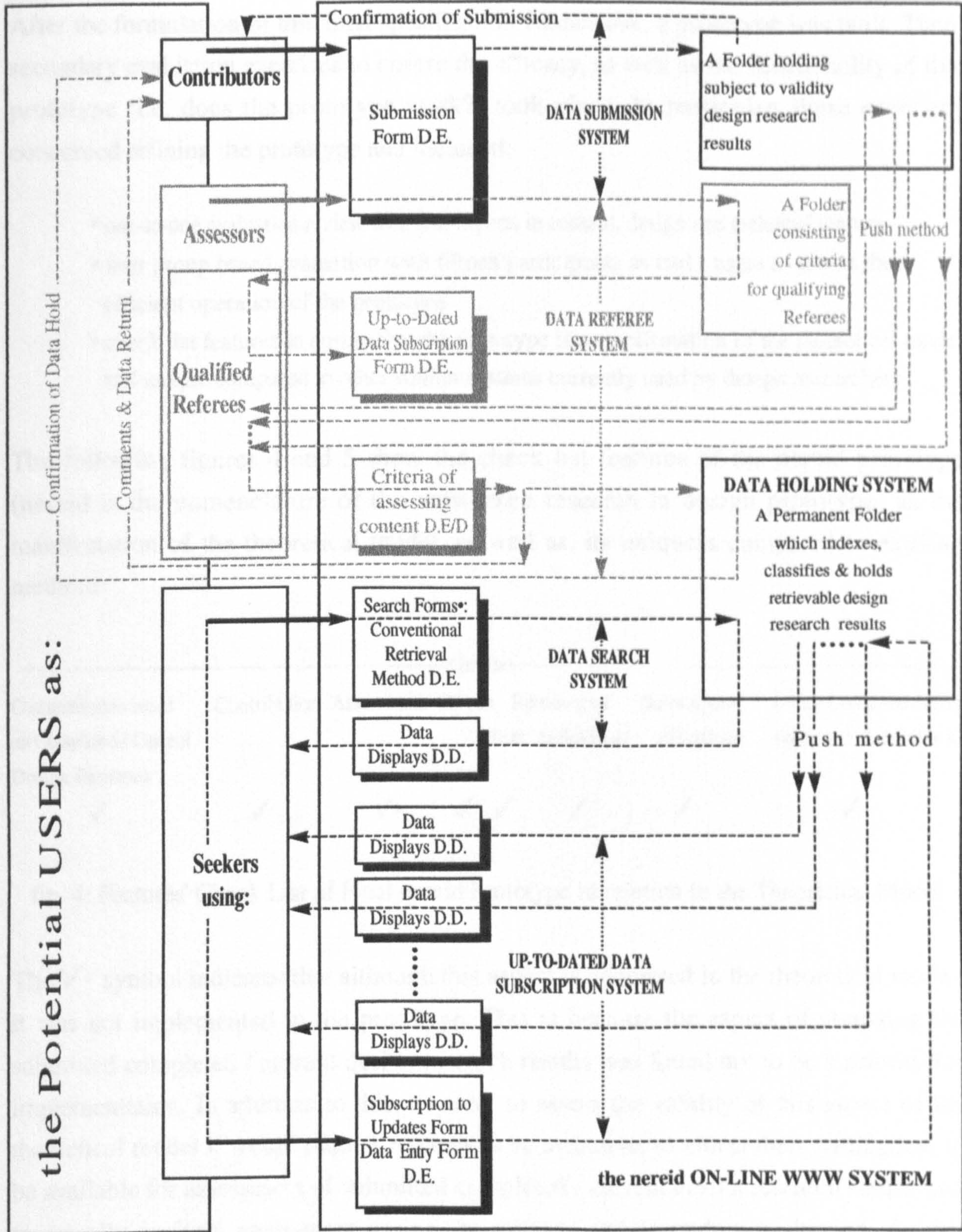
**Key:**

1. obtaining completed / current design research results from contributors / providers
2. assessing contributed completed / current design research results by their assessors
3. holding assessed completed / current design research results in a storage system
4. allowing seekers to express their interest in relation to stored assessed and completed / current design research results
5. performing & determining to whom stored assessed completed / current design research results will be communicated
6. delivering stored and assessed design research results to the appropriate seeker based on 4 and 5
7. allowing a communication facility for design researchers either as contributors, assessors or seekers to act, react and / or interact with each other based on activities 1, 2, 3, 4, 5, 6 and 7 for feedback & content criticism

figure 2: The schematic representation of the theoretical model

Based on this theoretical model, a specification framework and ultimately a prototype has been developed. The following figure 3 shows this final formulated specification framework that has been refined after one to one structured interviews with five experts in the field. The aim of this exercise was to evaluate the initial specification framework prior to the development of the prototype:





key points:

D.E.: Data Entry  
D.D.: Data Display

Search Forms\*: for search either design research results or authors' details and their e-mail in order to enable design researchers to communicate with each other

Types, Boxes and Lines in Grey indicate the refereeing process which is however not implemented on prototype but will be simulated for testing

fig. 3 The final version of the Specification Framework in the form of an Operational Structure (where Data refers to either Completed / Current Design Research Results or Authors' Profiles)



After the formulation of this final specification framework, a prototype was built. Then, secondary evaluation exercises to ensure the efficacy, as well as the functionality of this prototype (i.e. does the prototype work?) took place. In particular, these exercises concerned refining the prototype and included:

- one-to-one evaluation review with five experts in content, design and technical matters
- user group based evaluation with fifteen participants as end - users to assess the efficient operation of the prototype
- check list features to ensure that the prototype is a manifestation of the theoretical model and unique compared to other similar systems currently used by design researchers

The following figures 4 and 5 show the check list features of the nereid prototype (nereid is the nomenclature of the networked research in design prototype) as the manifestation of the theoretical model, as well as, its uniqueness compared to existing methods:

-----On-line-----						
Communication based on Completed / Current Design Research	Contribution	Assessment	Search	Retrieval of Text AudioVisuals	Subscription of Updates	2-way Communication (criticism & feedback)
✓	✓	✓•	✓	✓	✓	✓

fig. 4: Features' Check List of Final nereid Prototype in relation to the Theoretical Model

The '✓•' symbol indicates that although this aspect is addressed in the theoretical model, it was not implemented in the prototype. This is because the aspect of assessing the submitted completed / current design research results was found not to be a priority for implementation. In addition to this, in order to assess the validity of this aspect of the theoretical model it would require referees to be available, to affirm their willingness to be available for assessment of submitted completed / current design research results and to actually perform assessment during the primary and secondary evaluation. As this was not considered feasible the author decided that in order to perform the primary evaluation the final prototype would have to simulate this aspect of the model.

	OPAC	Telnet	CD ROM	E-mail	Mailbase	Newsgroups	FTP	WWW	ARIAD CD	ARIAD WWW	nereid
Communication of Completed Design Research	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Current Design Research	X	X	X	✓	✓	✓	✓	✓	X	X	✓



	OPAC	Telnet	CDROM	E-mail	Mailbase	Newsgroups	FTP	WWW	ARIADCD	ARIADWWW	nercid
On-line Contribution	X	X	X	✓	✓	✓	✓	✓	X	✓.	✓
On-line Assessment	X	X	X	X	X	X	X	X	X	X	✓.
On-line Search	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓
On-line retrieval of:											
text	✓	✓	X	X	X	✓	✓	✓	✓	✓	✓
image	X	X	X	X	X	X	X	X	X	✓	✓
On-line Subscription of Updates	X	X	X	X	X	X	X	X	X	X	✓
2-way Communication (criticism & feedback)	X	X	X	✓	✓	✓	✓	✓	X	X	✓

fig. 5: Features' Check List Compared with other Existing Methods Currently used

Although there is the capability of communicating completed and current design research using the above systems, to the best of the author's knowledge there are no findings to support the idea that there are systems utilising this ability (excluding the proposed nereid). In relation to the ARIAD WWW version, on-line contribution was scheduled for June 2000, however as of August 2000 this function still does not work. Finally, in relation to the nereid prototype, on-line assessment was not implemented as described on the previous page.

The results of these secondary exercises indicated that the final prototype did not adversely affect users' productivity in relation to the aspects of the theoretical model. Also the prototype had no major functionality or usability problems. In addition to this, the check list tables demonstrate that this prototype is an accurate manifestation of the theoretical model and thus a suitable vehicle for testing the model's validity which is the primary aim of this research. Based on these principles, this final prototype will be used as the tool through which the theoretical model will be validated. The following section describes this process.

## **Primary Evaluation Exercise**

### **(One-to-One Expert Summative Evaluation Review as a Primary Exercise)**

The aim of the primary evaluation exercise is to validate the theoretical model (as described earlier and seen in figure 2) formulated within the framework of a PhD



research study at De Montfort University, Faculty of Art & Design, Leicester. This exercise is the one-to-one expert evaluation with nine participants experts in the field. The experts are all active design researchers, supervisors or examiners, experts in design research issues, fellow members of the Design Research Society and the European Academy of Designers and recognised world wide as are either editors, co-editors or associate editors in international refereed design research journals. They include:

Prof. N. Cross, The Open University

Prof. B. Jerrard, The University of Central England

Prof. P. Isherwood, Brunel University

Dr M. Bruce / Miss R. Spudd, UMIST

Dr G. Bunce, Nottingham Trent University

Dr K. Wells, De Montfort University

Mr J. Wood, Goldsmith University

Mr M. Tovey, Coventry University

Mr A. Robertson, De Montfort University

### **Criteria through which the theoretical model will be validated**

The criteria used to validate the proposed theoretical model in terms of whether it provides a more effective and efficient means for communication of design research results between design researchers is concerned with the degree of satisfaction and improvement with this proposal for communicating design research work between design researchers. This clearly involves the degree, speed and convenience which design researchers are made aware of what is available in relation to assessed completed and current design research work. It also involves the degree and the speed with which world-wide accessibility and availability, relevance and accuracy of communicating design research can be achieved. In addition to this, it involves the degree and the speed with which world-wide accessibility and availability, relevance and accuracy of communicating with each other regarding design research can be achieved. In conclusion, the evaluation will validate the aspects of the proposed theoretical model based on the assumption that design researchers wish to share their work by evaluating the following criteria:

- the degree of satisfaction with the way completed and current design research is communicated
- the quality with which completed and current design research work is communicated
- the speed with which all the aspects of the proposed theoretical model can be achieved



- the degree to which the completed and current design research work is available and accessible
- the degree to which communication of completed and current design research work is relevant and accurate
- the degree to which design researchers are able to communicate with each other

The following figure 6 summarises the criteria through which the proposed theoretical communication and information model will be validated in terms of satisfaction with its efficiency and effectiveness:

<b>EFFECTIVENESS</b>				
<b>Availability of</b>	<b>Accuracy of</b>	<b>Relevance of</b>	<b>Quality of</b>	<b>Convenience of</b>
<ul style="list-style-type: none"> <li>• what research has been done</li> <li>• what research is currently going on</li> <li>• what work is done subsequently</li> <li>• communication with each other</li> </ul>				
<b>EFFICIENCY</b>				
<b>Speed of</b>				
<ul style="list-style-type: none"> <li>• communicating what research has been done</li> <li>• communicating what research is currently going on</li> <li>• communicating what work is done subsequently</li> <li>• communicating with each other</li> </ul>				

figure 6: The Criteria through which the theoretical model will be validated

However, it should be made clear that the aim of this exercise is not to compare the nereid prototype and its theoretical basis with existing specific systems but to determine whether overall it represents an improvement. In order to achieve this, the administrator will through the nereid prototype demonstrate each aspect of the theoretical model as listed below and participants will be asked to assess its validity through the questions provided. The aspects of the theoretical model to be validated are listed as follows:

1. Searching and retrieving submitted and assessed\* research work itself in textual and audio-visual form in part and/or whole
2. Retrieving Updates of available subsequent research work in a particular field of interest
3. Contributing research work in textual and audio-visual form in part and/or whole, as well as, the contributing author's details



4. Communicating with each other as an action, interaction and/or reaction
5. Assessing submitted design research work\*

\* As the aspect of assessing submitted design research work has not been implemented in the nereid prototype, the information content used in the prototype is already refereed as it consists of either completed MA / MScs / PhDs or registered PhDs. In order to evaluate this aspect of the theoretical model in particular, the administrator will describe this process of assessing submitted work through the specification framework diagram as seen in figure 3.

The following sections describe the tasks which the author, as the administrator of this exercise, will use to demonstrate the aspects of the theoretical model to the participants. After this the participants will assess and validate the proposed theoretical model through the questions provided.



**Questions:**

- Q1.1 When you conduct research in design, how often do you search for previous and / or current research relevant to your area of enquiry?
- Q1.2 What are the main sources for searching for research relevant to your enquiry?
- Q1.3 Do you currently use the WWW for searching information relevant to your area of enquiry and if so which?
- Q1.4 Please indicate if you are actively involved in research and if so to what extent
- Q1.5 Please indicate your computer literacy

Following this, all subjects had a demonstration of the following tasks for the purposes as also described next, and then they asked to answer the corresponding questions:

**Section 1, Searching**

Participants are shown the following steps in order to demonstrate the degree of speed, availability, accuracy, relevance, quality and convenience of searching and retrieving completed / current design research results using the nereid prototype as the manifestation of the proposed theoretical model. In particular, this task examines whether the aspect of retrieving on-line design research work can provide a satisfactory, effective and efficient means of communication. It also examines whether communicating part or the whole of design research work in a both textual and audio-visual form can provide a greater degree of understanding, completeness and detail of what has been done, what is going on currently and is available in the field of particular interest. This task includes the following steps:

- A. Load the URL: <http://westworld.dmu.ac.uk:591/nereid/welcome.htm>
- B. Navigate throughout the system and reach the Search page
- C. Search with the following criteria:   Graphics / Multimedia  
  Medical  
  Image  
  And   (match logic)
- D. Check relevance of matches
- E. Get details of the research work
- F. Get the audio-visual representation
- G. Get the whole design research work
- H. Repeat steps C - E by replacing the search values with the use of the following:  
  Completed  
  Management  
  Or   (match logic)



I. Repeat steps C - E by replacing the search values with the use of the following:

Completed

Management, And (match logic)

J. Circle / fill in questions in relation to this task which are as follows:

**Q2. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with searching and retrieving on-line completed / current design research work world-wide as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Finding what research has been done	-2	-1	0	1	2
Finding what research is currently going on	-2	-1	0	1	2
Speed	-2	-1	0	1	2
Clarity	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
Availability	-2	-1	0	1	2
Accuracy	-2	-1	0	1	2
Relevance	-2	-1	0	1	2
Quality	-2	-1	0	1	2
Convenience	-2	-1	0	1	2
Overall efficiency (see figure 6)	-2	-1	0	1	2
Overall effectiveness (see figure 6)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

## **Section 2, Subscription to Updates**

This task along with the steps that will be undertaken in section 4 (complementary task) will demonstrate to the participants the degree of speed, availability, accuracy, relevance, quality and convenience of world-wide communicating what subsequent research is available in relation to what has been done, what research is currently going on and is available using the nereid prototype as the manifestation of the proposed theoretical model. In particular, this task examines whether the aspect of subscribing to updates can provide a satisfactory, effective and efficient means of communication. This task involves the following steps:



- A. Load the URL: <http://westworld.dmu.ac.uk:591/neroid/welcome.htm>
  - B. Navigate throughout the system and reach the Search page
  - C. Search with the following criteria:    Current  
  Graphics / Multimedia  
  Soft Systems Methodology, And(match )
  - D. Check whether there are relevant matches
  - E. Navigate throughout the system and reach the Subscription to Updates page
  - F. Subscribe with the criteria entered in step C
- (questions in relation to this task are presented on section 4)

**Section 3, Contributing**

Participants were shown the following steps in order to demonstrate the degree of speed, availability, accuracy, relevance and convenience of world-wide contributing on-line design research results using the nereid prototype as the manifestation of the proposed theoretical model. This task examines whether this aspect of the theoretical model is a a quick and easy way and therefore, a satisfactory and efficient means for the world-wide contribution of completed / current design research work. It also examines whether it can provide a satisfactory and effective means for communication of what research has been done and what research is currently going on. This task involved the following steps:

- A. Load the URL: <http://westworld.dmu.ac.uk:591/neroid/welcome.htm>
- B. Navigate throughout the system and reach the Contributions page
- C. Provision of design research work details
- D. When you have finished, please click on the Submit button and then follow the instructions to submit the audiovisual and the whole of research
- E. Navigate throughout the system and reach the Search Form
- F. Search to retrieve the contribution just submitted
- G. Check throughout the submission
- H. Circle / fill in questions in relation to this task which are as follows:

**Q3. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with contributing on-line completed / current design research work world-wide as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	ncither	satisfactory	very satisfactory
Speed of:					
Contributing	-2	-1	0	1	2



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Making work available	-2	-1	0	1	2
Communicating work	-2	-1	0	1	2
<b>Ease of:</b>					
Contributing	-2	-1	0	1	2
Making work available	-2	-1	0	1	2
Communicating work	-2	-1	0	1	2
<b>Availability of options to represent:</b>					
Scope of contributors	-2	-1	0	1	2
Range of media	-2	-1	0	1	2
Amount of work	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
<b>Accuracy of options to represent:</b>					
Scope of contributors	-2	-1	0	1	2
Range of media	-2	-1	0	1	2
Amount of work	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
<b>Relevance of options to represent:</b>					
Scope of contributors	-2	-1	0	1	2
Range of media	-2	-1	0	1	2
Amount of work	-2	-1	0	1	2
Completeness	-2	-1	0	1	2
Detail	-2	-1	0	1	2
<b>Convenience of:</b>					
Contributing	-2	-1	0	1	2
Making work available	-2	-1	0	1	2
Communicating work	-2	-1	0	1	2
Overall efficiency (see figure 6)	-2	-1	0	1	2
Overall effectiveness (see figure 6)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**



#### Section 4, Subscription to Updates

Participants are shown the following steps which along with the steps undertaken in section 2 will demonstrate the degree of speed, availability, accuracy, relevance, quality and convenience of world-wide communicating what subsequent research is available in relation to what has been done, what research is currently going on and is available using the nereid prototype as the manifestation of the proposed theoretical model. In particular, this task examines whether the aspect of subscribing to updates can provide a satisfactory, effective and efficient means of communication. This task involves the following steps:

- A. Check the e-mail box and follow the given instructions
- B. Navigate throughout the system and reach the Search page and search for the ID provided in the e-mail
- D. Check the accuracy and relevance of this search with the criteria entered in step C of section 2
- E. Circle / fill in questions in relation to this task which are as follows:

**Q4. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with subscribing on-line to updates of completed / current design research results world-wide as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Awareness about subsequent research	-2	-1	0	1	2
Availability of subsequent research	-2	-1	0	1	2
Speed of informing about subsequent research	-2	-1	0	1	2
Accuracy of informing about subsequent research	-2	-1	0	1	2
Relevance of informing about subsequent research	-2	-1	0	1	2
Quality of informing about subsequent research	-2	-1	0	1	2
Convenience of informing about subsequent research	-2	-1	0	1	2
Provision of latest updates in the field of interest	-2	-1	0	1	2
Prevention of duplication of research	-2	-1	0	1	2
Saving repeated efforts in relation to a search	-2	-1	0	1	2
Overall efficiency (see figure 6)	-2	-1	0	1	2
Overall effectiveness (see figure 6)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**



**Section 5, Communicating with each other**

Participants are shown the following steps in order to demonstrate the degree of speed, availability, accuracy, relevance, quality and convenience of the two-way world-wide communication ability as either an action / interaction and / or reaction that can be achieved between design researchers regarding design research work. In particular, this task examines whether the aspect of communicating with each other can provide a satisfactory, effective and efficient means of communication. This task involves the following steps:

**Method I:**

- A. Click on the e-mail of the retrieved match from task 4 and send an enquiry in relation to this author's design research work
- B. Wait for up a short period of time and re-check your e-mail and then answer

**Method II:**

- A. Navigate throughout the system and reach the Search Users page
- B. Search using the following criteria: Current  
PhD, And (match logic)
- C. Check accuracy and relevance of matches
- D. Repeat steps A and B from method I
- C. Circle / fill in questions in relation to this section which are as follows:

**Q5. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with researchers communicating on-line with each other world-wide based on completed / current design research results as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Speed of communication	-2	-1	0	1	2
Ease of communication	-2	-1	0	1	2
Availability of communication	-2	-1	0	1	2
Accuracy of communication	-2	-1	0	1	2
Relevance of communication	-2	-1	0	1	2
Quality of communication	-2	-1	0	1	2
Convenience of communication	-2	-1	0	1	2
Encouragement of:					
dialogue between design researchers	-2	-1	0	1	2
criticism of design research work	-2	-1	0	1	2



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Overall efficiency (see figure 6)	-2	-1	0	1	2
Overall effectiveness (see figure 6)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

### **Section 6, Assessing (on simulation basis)**

Participants are informed of how the refereeing process will take place in the real world. In particular, it is explained that the refereeing method will be the same as those currently used in assessing articles and papers in refereed journals and conferences. It is also explained that although assessing work may be at the same speed when compared to existing methods that also use electronic mediums, fixed publication dates on both journals and conferences (including conference proceedings) extend the time required before refereed work is available for communication. In addition to this, it is explained that the refereeing action will assess only research that has been submitted in whole and not as descriptions. It also explained that refereeing will not take place when submitted research work has been already assessed by an examination / referee board as with completed MA / MSc / MPhils / PhDs or refereed published articles and papers. Finally, it is explained how a researcher can apply to become a referee, to qualify and assess relevant design research work according to their experience and expertise by using a similar form to subscription to updates form.

Based on these principles, participants are asked whether this aspect of the theoretical model would provide a more effective way of communicating refereed design research results and whether this would be a quicker means of assessing and thereafter communicating refereed design research work. They are asked whether this aspect would provide a more reliable and valid source for research in relation to what research is currently available in terms of what has been done and what is currently going on. In particular, participants were asked:

**Q6. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with assessing on-line completed / current design research results world-wide as demonstrated literally and with this diagram in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Speed:					
Of assessing design research work	-2	-1	0	1	2



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
In which refereed work is available	-2	-1	0	1	2
In which refereed work is communicated	-2	-1	0	1	2
Accuracy of what is subsequently communicated	-2	-1	0	1	2
Relevance of what is subsequently communicated	-2	-1	0	1	2
Quality of what is subsequently communicated	-2	-1	0	1	2
Convenience of what is subsequently communicated	-2	-1	0	1	2
Clarity of what is subsequently communicated	-2	-1	0	1	2
Validity of what is subsequently communicated	-2	-1	0	1	2
Reliability of what is subsequently communicated	-2	-1	0	1	2
Confidence in what is subsequently communicated	-2	-1	0	1	2
Overall efficiency (see figure 6)	-2	-1	0	1	2
Overall effectiveness (see figure 6)	-2	-1	0	1	2

**Please feel free to express overall comments in relation to this task**

### **Section 7, Overall Effectiveness and Efficiency of the Proposed Theoretical Model**

Finally, based on the experience of the demonstrations of all the tasks described above participants are asked to answer the following questions in relation to the communication of design research between design researchers based on the proposed theoretical model as a whole:

**Q7. To what extent does the proposed theoretical model taken as a whole as demonstrated in this prototype represent an improvement in communicating design research work in terms of:**

	much worse	worse	neither	better	much better
• Availability of:					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
• Accuracy of:					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2



	<b>much worse</b>	<b>worse</b>	<b>neither</b>	<b>better</b>	<b>much better</b>
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
<b>• Relevance of:</b>					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
<b>• Quality (in terms of clarity, validity, reliability and confidence in the source) of:</b>					
What research has been done	-2	-1	0	1	2
What research is currently going on	-2	-1	0	1	2
What research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
<b>• Convenience of:</b>					
Communicating what research has been done	-2	-1	0	1	2
Communicating what research is currently going on	-2	-1	0	1	2
Communicating what research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
<b>• Speed of:</b>					
Communicating what research has been done	-2	-1	0	1	2
Communicating what research is currently going on	-2	-1	0	1	2
Communicating what research is done subsequently	-2	-1	0	1	2
Communication with each other	-2	-1	0	1	2
Overall efficiency (see figure 6)	-2	-1	0	1	2
Overall effectiveness (see figure 6)	-2	-1	0	1	2

### **7. Please feel free to express overall comments**

Participant's Name.....

Many Thanks for participating in this exercise,  
 Nikolaos Bessis  
 PhD Design and Manufacture Research  
 Faculty of Art and Design  
 De Montfort University, Leicester  
 November, 2000



**Numbering of Participants:**

1. A. Robertson, De Montfort University
2. N. Cross, The Open University
3. J. Wood, Goldsmiths College
4. K. Wells, De Montfort University
5. G. Bunce, Nottingham Trent University

**Participants Response**

Q1.1 When you conduct research in design, how often do you search for previous and / or current research relevant to your area of enquiry? (A=Always, F=Frequently, S=Seldom, N=Never)

Q1.2. What are the main sources used for research relevant to your enquiry? (PM=Printed Materials, WWW, CD ROMs, E-Mail, OPACs, Mailbase, Telnet, NGs=Newsgroups, FTP / please specify)

Q1.3 Please indicate if you are actively involved in research and if so to what extent (Y=Yes, N=No, FT=Full Time, PT=Part Time, S=Supervisor, E=Examiner, R=Researcher, O=Other)

Q1.4 Please indicate your computer literacy (VH=Very High, H=High, A=Average, L=Low)

No Participant	Q1.1	Q1.2	Q1.3	Q1.4
1	F	PM, WWW, E-Mail, OPACs, Mailbase, NGs	Y, FT (O)	A
2	A	PM, OPACs, Mailbase (Journals, Books, e-journals, DRS lists)	Y, PT (S, E, R)	A
3	F	PM, WWW, CDs, E-Mail, OPACs, Mailbase	Y, FT (S, E) PT (R)	H
4	S	PM, WWW, E-Mail, NGs	Y, PT (S, R)	A
5	F	PM, WWW, CDs, E-Mail, OPACs, Mailbase	Y, PT (S, E, R)	H

All numbering under the assigned numerical values are concerned with the identity number of each participant in relation to the response.

**Section 1, Searching**

**Q2. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with searching and retrieving on-line completed / current design research work world-wide as demonstrated in this prototype in terms of the following criteria:**



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
	-2	-1	0	1	2
Finding what research has been done			1	2	3,4,5
Finding what research is currently going on			1	2,3	4,5
Speed				3,4	1,2,5
Clarity				1,3,4,5	2
Completeness				1,2,4	3,5
Detail			3	1,2,4	5
Availability			1	2	3,4,5
Accuracy				5	1,2,3,4
Relevance				1,2,3,5	4
Quality				2,3	1,4,5
Convenience				2,3	1,4,5
Overall efficiency				1,3	2,4,5
Overall effectiveness				1,2,3,5	4

**Please feel free to express overall comments in relation to this task**

1. Finding what research has been done and what research is currently going on is not answerable as this is a prototype.
2. Hypothetical results because of limited database in prototype
5. Availability and finding what research has been done and what research is currently going on is dependant on the contribution. In addition to this, accuracy, relevance and overall effectiveness is dependant in keywords.

## **Section 2, Subscription of Updates**

see section 4.

## **Section 3, Contributing**

**Q3. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with contributing on-line completed / current design research work world-wide as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
	-2	-1	0	1	2
Speed of:					
Contributing					1,2,3,4,5
Making work available					1,2,3,4,5



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
Communicating work				1	2,3,4,5
Ease of:					
Contributing					1,2,3,4,5
Making work available				1	2,3,4,5
Communicating work				1	2,3,4,5
Availability of options to represent:					
Scope of contributors				1,2	3,4,5
Range of media				2,5	1,3,4
Amount of work			2	1	3,4,5
Completeness				1,3	2,4,5
Detail				1,3	2,4,5
Accuracy of options to represent:					
Scope of contributors				1,3	2,4,5
Range of media				1,2	3,4,5
Amount of work				1,2,4	3,5
Completeness				1,4	2,3,5
Detail				1,4	2,3,5
Relevance of options to represent:					
Scope of contributors				1,3,4	2,5
Range of media			2	1,4	3,5
Amount of work			2	1,4	3,5
Completeness				1,2,4	3,5
Detail				1,2,4	3,5
Convenience of:					
Contributing					1,2,3,4,5
Making work available					1,2,3,4,5
Communicating work					1,2,3,4,5
Overall efficiency				2	1,3,4,5
Overall effectiveness				1,2,4	3,5

**Please feel free to express overall comments in relation to this task**

3. Very promising. Rugged thinking and well deployed within a prototype. Could make a valuable contribution to design research as we know it.



### Section 4, Subscription to Updates

**Q4. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with subscribing on-line to updates of completed / current design research results world-wide as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
	-2	-1	0	1	2
Awareness about subsequent research				4	1,2,3,5
Availability of subsequent research				4	1,2,3,5
Speed of informing about subsequent research					1,2,3,4,5
Accuracy of informing about subsequent research				1,5	2,3,4
Relevance of informing about subsequent research				1,3,4,5	2
Quality of informing about subsequent research				1,3,4	2,5
Convenience of informing about subsequent research					1,2,3,4,5
Provision of latest updates in the field of interest					1,2,3,4,5
Prevention of duplication of research				1,2,4	3,5
Saving repeated efforts in relation to a search				1,4	2,3,5
Overall efficiency				4	1,2,3,5
Overall effectiveness				1,4	2,3,5

**Please feel free to express overall comments in relation to this task**

3. Good tools that will be helpful to many designers.

5. Availability of and awareness about subsequent research is dependant on the contribution. In addition to this, accuracy of informing about subsequent research is dependant on keywords.

### Section 5, Communicating with each other

**Q5. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with researchers communicating on-line with each other world-wide based on completed / current design research results as demonstrated in this prototype in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
	-2	-1	0	1	2
Speed of communication				4	1,2,3,5
Ease of communication				1,4	2,3,5
Availability of communication				1,4	2,3,5
Accuracy of communication				1,4	2,3,5
Relevance of communication				1,2,4	3,5



	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
	-2	-1	0	1	2
Quality of communication				1,2,4,5	3
Convenience of communication				1,4	2,3,5
Encouragement of: dialogue between design researchers					1,2,3,4,5
criticism of design research work				1	2,3,4,5
Overall efficiency				4	1,2,3,5
Overall effectiveness				1,4	2,3,5

**Please feel free to express overall comments in relation to this task**

3. Works very well for its purpose and for the culture of design research

**Section 6, Assessing (on simulation basis)**

**Q6. Please indicate your level of satisfaction with this aspect of the proposed theoretical model concerned with assessing on-line completed / current design research results world-wide as demonstrated literally and with this diagram in terms of the following criteria:**

	very unsatisfactory	unsatisfactory	neither	satisfactory	very satisfactory
	-2	-1	0	1	2
Speed:					
Of assessing design research work				1,2,4	3,5
In which refereed work is available				1,4	2,3,5
In which refereed work is communicated				1,4	2,3,5
Accuracy of what is subsequently communicated			2,5	1,4	3
Relevance of what is subsequently communicated			2,5	1,4	3
Quality of what is subsequently communicated			1,2,5	4	3
Convenience of what is subsequently communicated			2,5	4	1,3
Clarity of what is subsequently communicated			2	4,5	1,3
Validity of what is subsequently communicated			1,2	4,5	3
Reliability of what is subsequently communicated			2	1,4,5	3
Confidence in what is subsequently communicated			2	1,4,5	3
Overall efficiency				1,4	2,3,5
Overall effectiveness				1,2,4	3,5

**Please feel free to express overall comments in relation to this task**

3. Again a helpful tool



**Section 7, Overall Effectiveness and Efficiency of the Proposed Theoretical Model**

**Q7. To what extent does the proposed theoretical model taken as a whole as demonstrated in this prototype represent an improvement in communicating design research work in terms of:**

	much worse	worse	neither	better	much better
	-2	-1	0	1	2
<b>• Availability of:</b>					
What research has been done			1		2,3,4,5
What research is currently going on			1		2,3,4,5
What research is done subsequently					1,2,3,4,5
Communication with each other				2	1,3,4,5
<b>• Accuracy of:</b>					
What research has been done				1,2,3,4	5
What research is currently going on				1,2	3,4,5
What research is done subsequently				2	1,3,4,5
Communication with each other				1,2	3,4,5
<b>• Relevance of:</b>					
What research has been done			1	2,3,4	5
What research is currently going on			1	2,3,4	5
What research is done subsequently				1,2,4	3,5
Communication with each other				1,2	3,4,5
<b>• Quality (in terms of clarity, validity, reliability and confidence in the source) of:</b>					
What research has been done			1,2	4	3,5
What research is currently going on			2	1,4	3,5
What research is done subsequently			2	4	1,3,5
Communication with each other			2		1,3,4,5
<b>• Convenience of:</b>					
Communicating what research has been done					1,2,3,4,5
Communicating what research is currently going on				1	2,3,4,5
Communicating what research is done subsequently					1,2,3,4,5
Communication with each other				2	1,3,4,5
<b>• Speed of:</b>					
Communicating what research has been done				1,4	2,3,5
Communicating what research is currently going on				1,4	2,3,5
Communicating what research is done subsequently				4	1,2,3,5
Communication with each other			2		1,3,4,5
Overall efficiency				1,4	2,3,5
Overall effectiveness				2,3	1,4,5



**7. Please feel free to express overall comments**

1. The communication aspects are served well by the prototype quite well. The aspects of relevance, accuracy, quality less, since volume of data is lacking to make judgments.
3. A great concept if taken as a way to facilitate a learning and authoring culture. Will develop with richer material, suited to the user base, and may permit additional (perhaps semantic) tools that would add value to this fine proof of concept.
4. In the field of design it has been very difficult to find out about past or current research, traditionally searches did not work. This system would greatly improve the situation of communication between design researcher world wide.
5. Overall Efficiency, Effectiveness, Availability, Accuracy of what research has been done, currently going on, is done subsequent and communication with each other is dependant on contribution. In addition to this, Relevance of hat research has been done, currently going on, is done subsequent and communication with each other is dependant on keywords. Finally, this represents an extremely valuable contribution to the dissemination of design research, provided that enough contributors participate.



## Major Screens and Scripts Used on the Prototype

This appendix provides the tailored script for the subscription of updates function and the major screens of the final nereid prototype.

scriptcheck

Enter Browse Mode []

Perform Script [Sub-scripts, external: "imform.fp3"]

do search

Enter Browse Mode []

Go to Layout ["all fields']

Paste [Select, <Field Missing>]

Perform Script [Sub-scripts, external: "imform.fp3"]

do search 1

Enter Browse Mode []

Go to Layout ["all fields']

Enter Find Mode []

Paste [Select, "Other keyword"]

Perform Script [Sub-scripts, external: "imform.fp3"]

do search 2

Go to Layout ["all fields']

Paste [Select, "Subject of Research"]

Perform Script [Sub-scripts, external: "imform.fp3"]

do search 3

Go to Layout ["all fields']

Paste [Select, "Method of Research"]

Perform Script [Sub-scripts, external: "imform.fp3"]

do search 4

Go to Layout ["all fields']

Paste [Select, "Project Status"]

Perform Script [Sub-scripts, external: "imform.fp3"]

do search 5

Go to Layout ["all fields']

Paste [Select, "Year"]

Perform Script [Sub-scripts, external: "imform.fp3"]

do search 6

Go to Layout ["all fields']



```

Paste [Select, "Location"]
Perform Script [Sub-scripts, external: "imform.fp3"]
    do search 7
Go to Layout ["all fields']
Paste [Select, "Institution"]
Perform Script [Sub-scripts, external: "imform.fp3"]
    do search 8
Go to Layout ["all fields']
Paste [Select, "Deliverable"]
Perform Script [Sub-scripts, external: "imform.fp3"]
    do search 9
Go to Layout ["all fields']
Paste [Select, "Deliverable status"]
Perform Script [Sub-scripts, external: "imform.fp3"]
    do search 10
Go to Layout ["all fields']
Paste [Select, "Subscribe for up to"]
Perform Script [Sub-scripts, external: "imform.fp3"]
    do search 11
Set Error Capture [On]
Go to Layout ["all fields']
Paste [Select, "Visuals"]
Perform Find []
Sort [Restore, No dialog]
Perform Script [Sub-scripts, external: "collect ids"]
    collect ids
Enter Browse Mode []
if ["Status(CurrentFoundCount)0"]
Set Field ["g_allIDs", "*"]
Go to Layout ["all fields"]
Else
Set Field ["g_allIDs", ""]
Go to record/Request/Page [First]
Loop
Set Field["g_allIDs", "g_allIDs & Record ID & ¶"]
Go to Record/Request/Paste [exit after last, Next]
End Loop
End if
Copy [Select, "g_allIDs"]

```



```

Perform Script [Sub-scripts, external: "imform.fp3"]
    Send email
Enter Browse Mode []
Send Mail ["Your search on Nereid"]
Set Field ["was sent", "yes"]
    find unsent
Enter Browse Mode []
Set Field ["dosend", "false"]
Set Error Capture [On]
Go to Layout [Refresh window, "all fields"]
Enter Find Mode []
Set Field [<field missing>, "andmatch"]
Set Field ["was sent", "no"]
Set Field ["lastfound", "nereid/allcriteria:Record ID"]
Pause/Resume Script []
Perform find []
if [Status(currentfound)=0]
Find All
Else
Set Field ["dosent", "true"]
End if
Go to Layout [Refresh window, "informed"]
Enter Browse Mode []
    check matches final 1
Enter Browse Mode []
Go to Layout ["Layout#3"]
Set Field ["lastfound"]
Go to portalRow[select, <file missing>:<unknown>]
Loop
Go to portalRow[select, Exit after last, Next]
Set Field ["lastfound", "lastIDfound&<file missing>:<unknown>&""]
Request
    searcher
Enter Browse Mode []
Perform Script [Sub-scripts, external: "nereid.fp3"]
    compare
Set Field["g_difference", "newIDfound"]
Set Field["g-holder", "Right(g_difference Length(g_difference)-Lenght(lastIDfound)"]
End if

```



start search

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,<field missing>]

Enter Browse Mode []

Freeze window

Perform Script [Sub-scripts, external: "nereid.fp3"]

Enter Browse Mode []

kw1

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,"kw1"]

Perform Script [Sub-scripts, external: "nereid.fp3"]

subject

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,"subject"]

Perform Script [Sub-scripts, external: "nereid.fp3"]

method

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,"method"]

Perform Script [Sub-scripts, external: "nereid.fp3"]

projectstatus

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,"projectstatus"]

Perform Script [Sub-scripts, external: "nereid.fp3"]

Year

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,"year"]

Perform Script [Sub-scripts, external: "nereid.fp3"]

Location

Enter Browse Mode []

Go to Layout ["Layout#3"]

Clear[select,"location"]

Perform Script [Sub-scripts, external: "nereid.fp3"]

Institution



Enter Browse Mode []  
Go to Layout ["Layout#3"]  
Clear[select,"institution"]  
Perform Script [Sub-scripts, external: "nereid.fp3"]

Deliverable

Enter Browse Mode []  
Go to Layout ["Layout#3"]  
Clear[select,"deliverable"]  
Perform Script [Sub-scripts, external: "nereid.fp3"]

Deliverablestatus

Enter Browse Mode []  
Go to Layout ["Layout#3"]  
Clear[select,"Delstatus"]  
Perform Script [Sub-scripts, external: "nereid.fp3"]

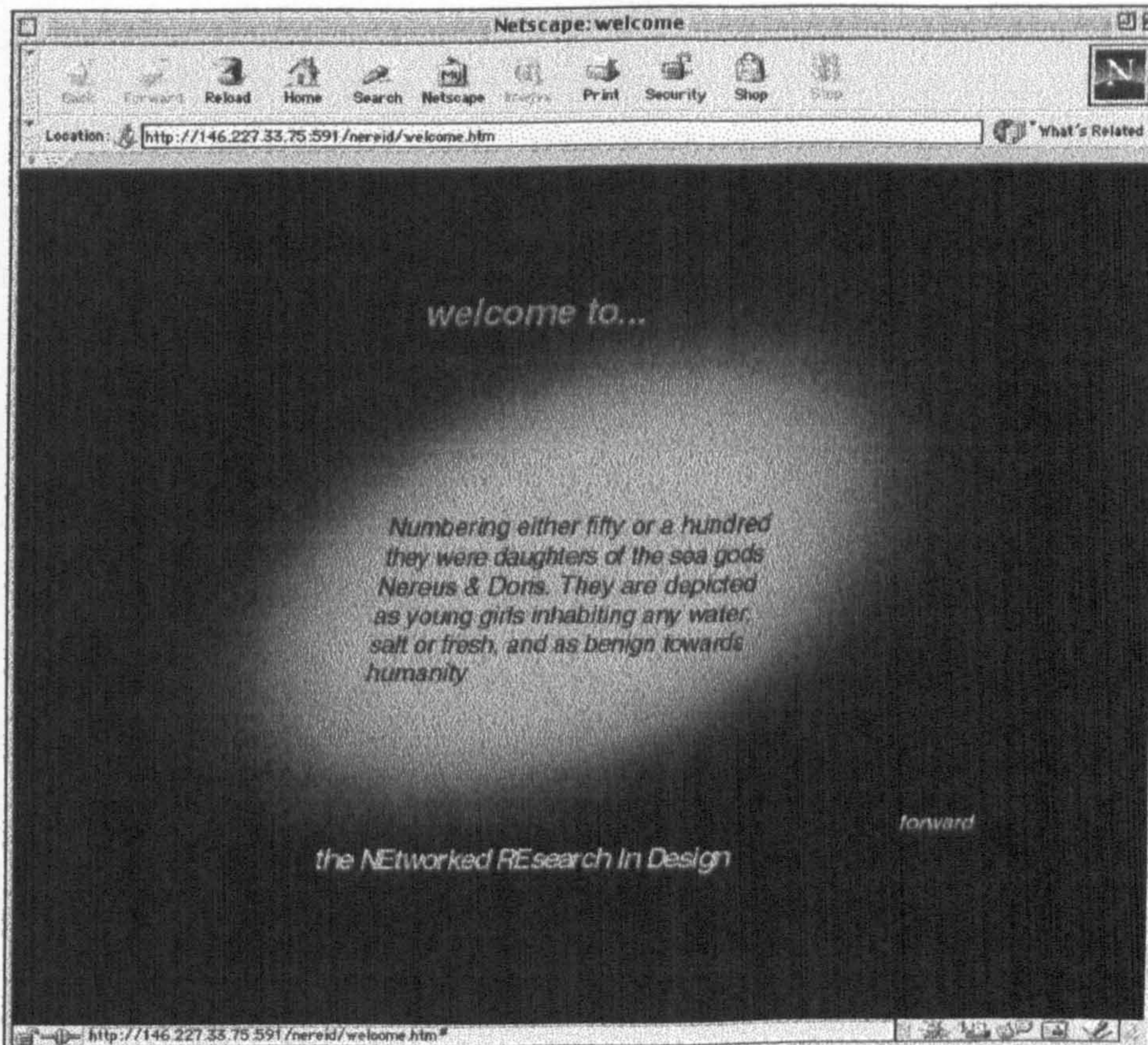
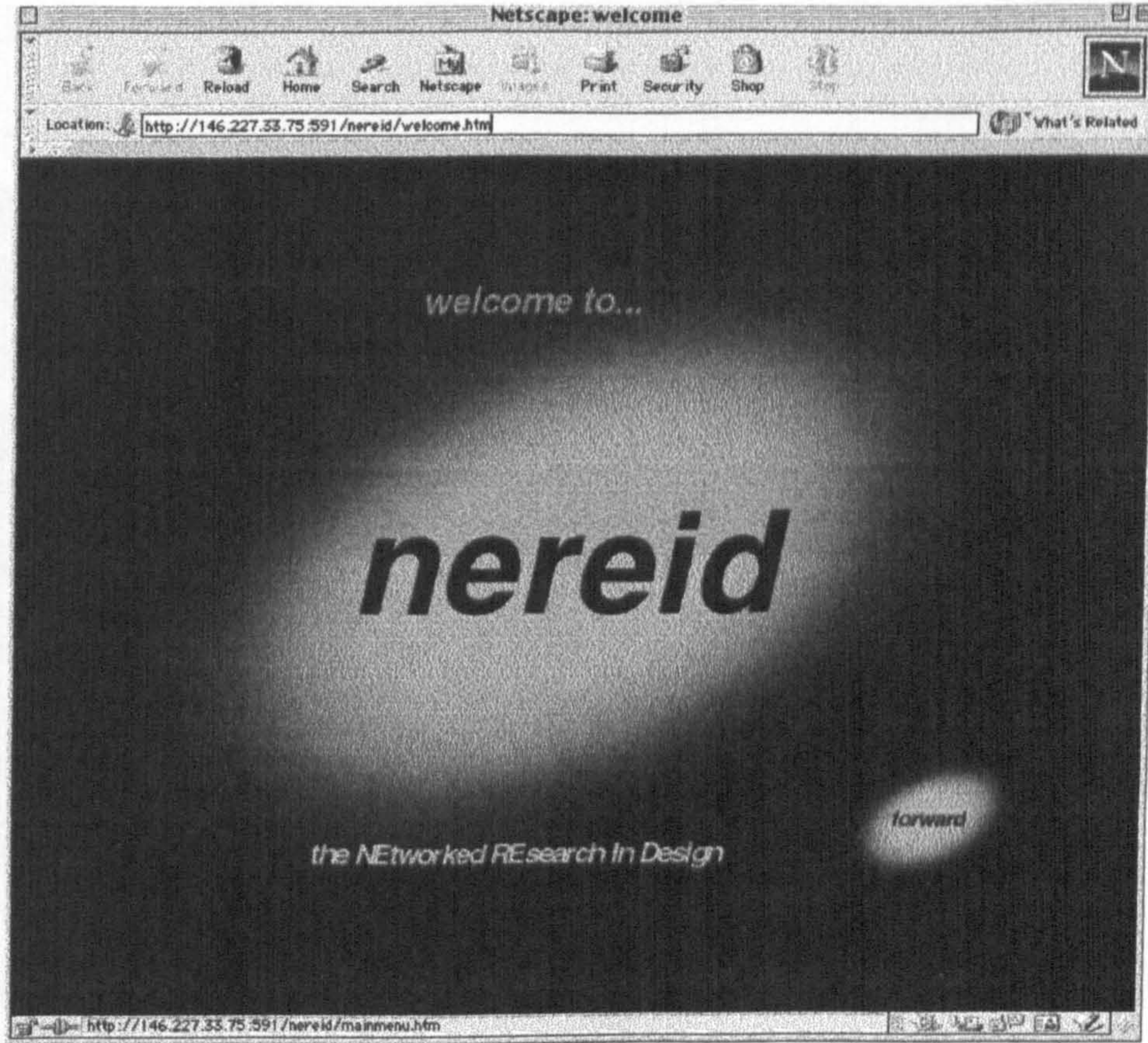
Visuals

Enter Browse Mode []  
Go to Layout ["Layout#3"]  
Clear[select,"visuals"]  
Perform Script [Sub-scripts, external: "nereid.fp3"]

Subscribe for up to

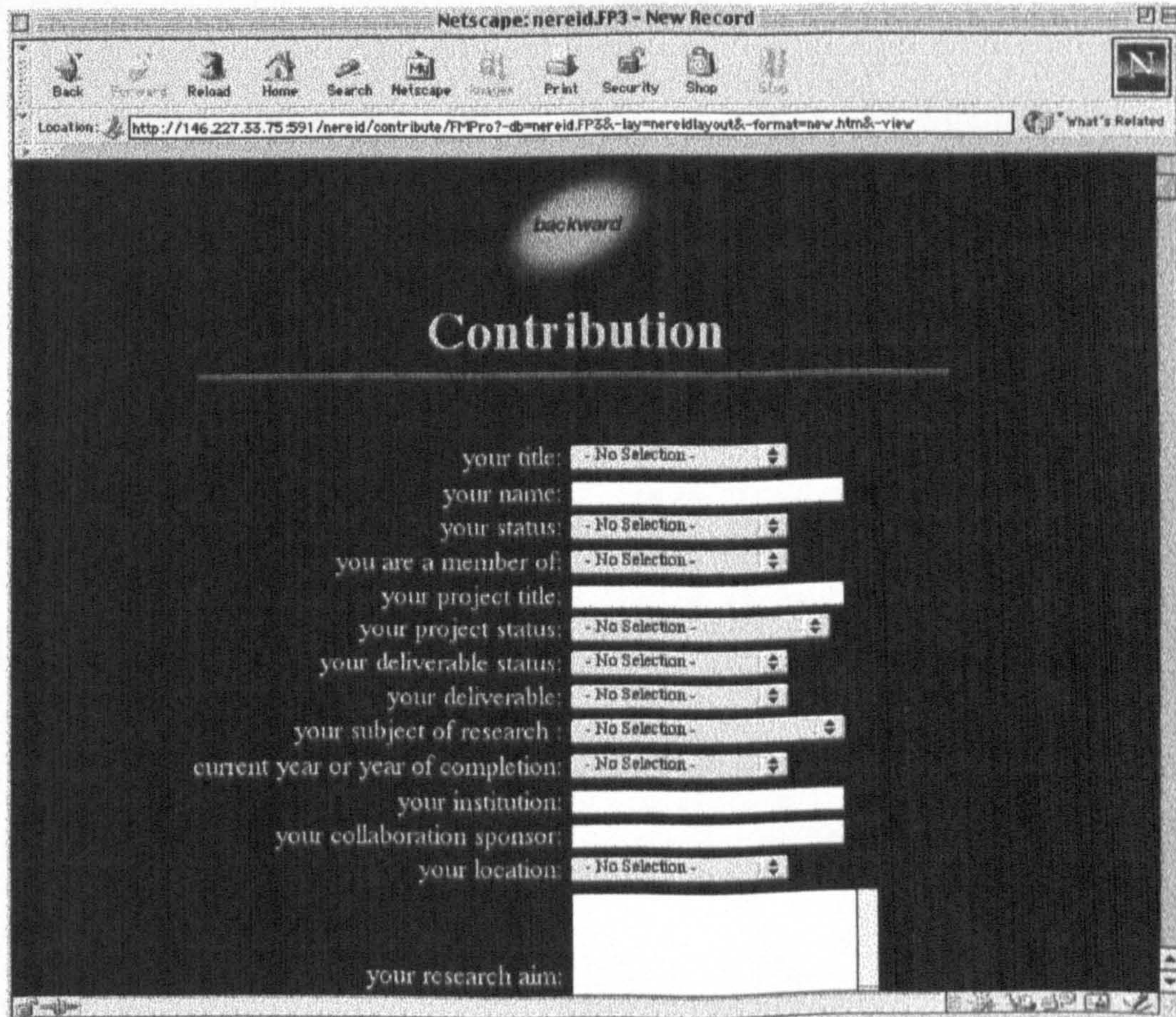
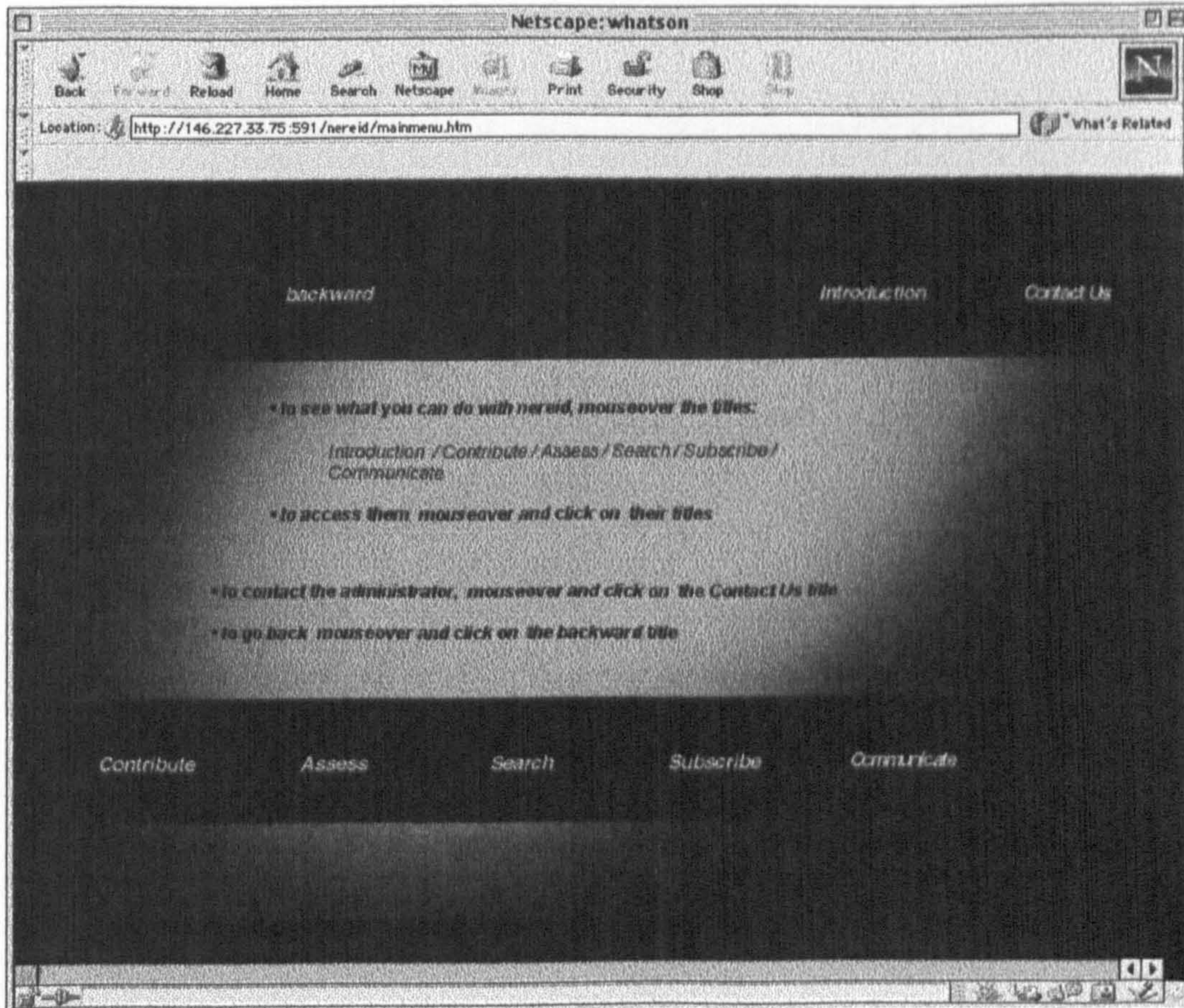
Enter Browse Mode []  
Go to Layout ["Layout#3"]  
Clear[select,"subscribe"]  
Perform Script [Sub-scripts, external: "nereid.fp3"]





The welcome screen of the nereid prototype which when nereid logo is mousecovered it reveals the meaning of the nereid nomenclature





The screens of the main menu and the contribution form



backward

## Search

record ID:

name:

title:

project status:

deliverable status:

deliverable:

subject of research:

year:

other keyword:

method of research:

institution:

collaboration sponsor:

location:

visuals:

When Searching:  Match all words between fields (AND)  
 Match any words between fields (OR)

## Results

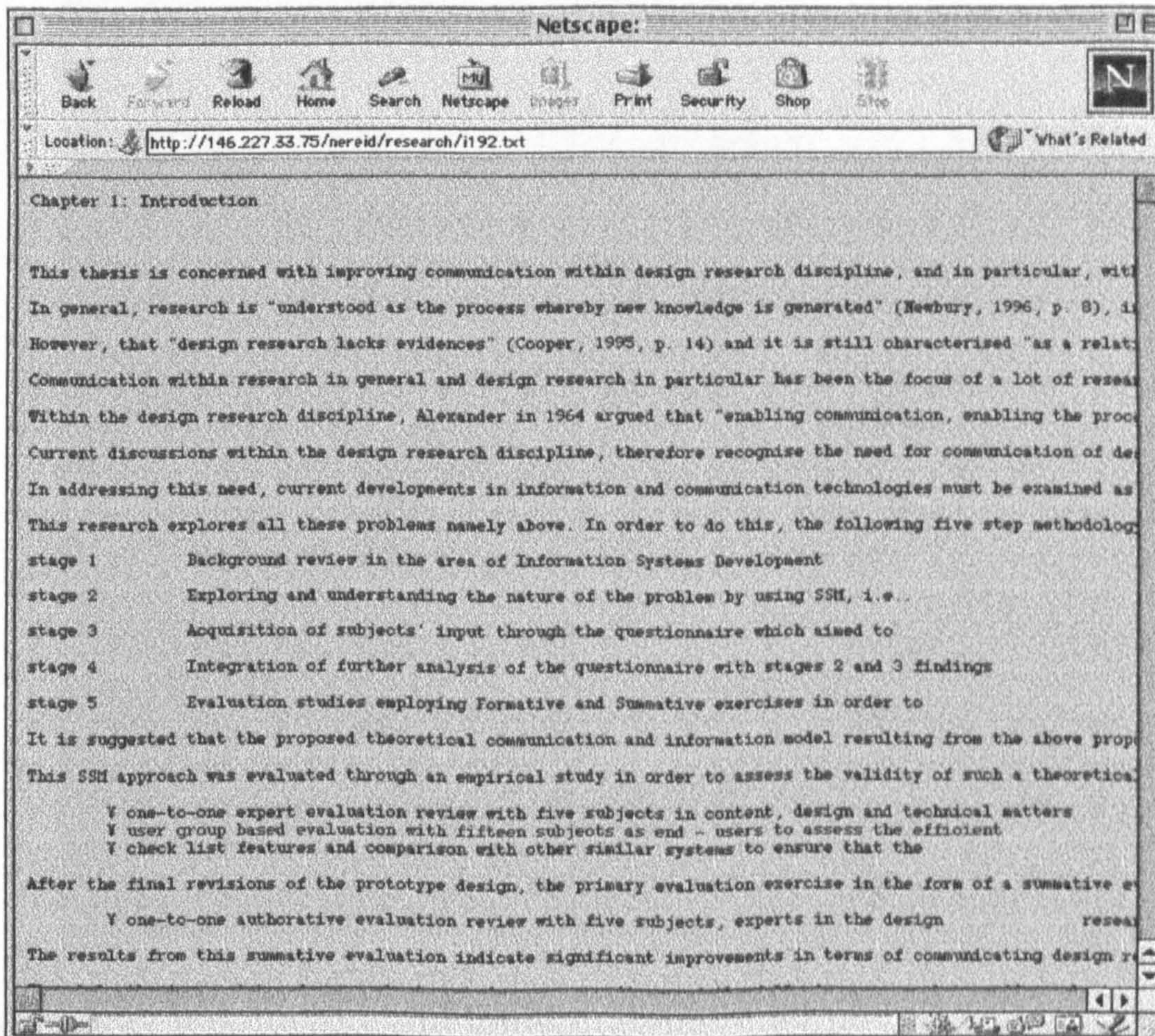
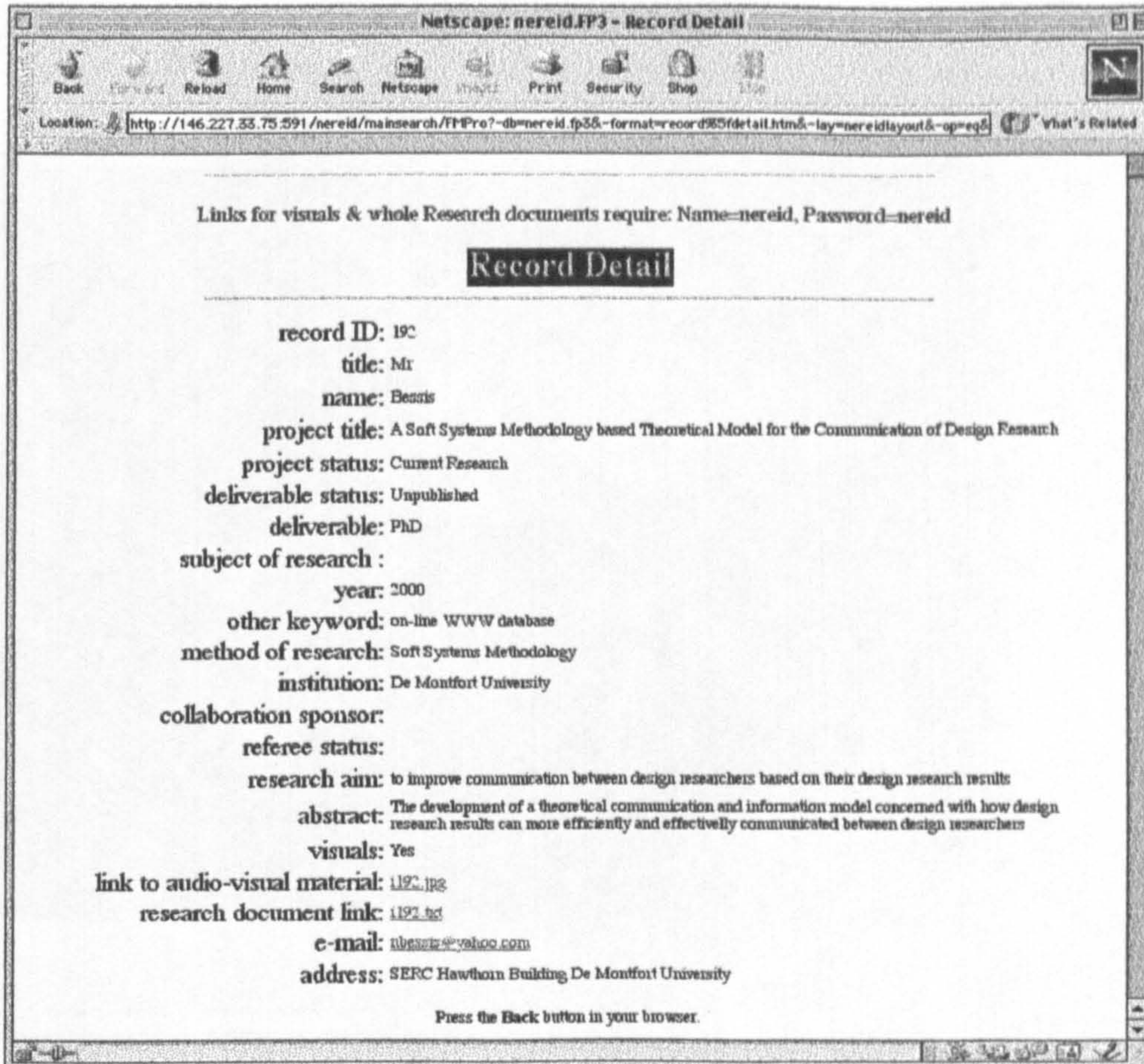
Displaying records 1 through 1 of 1 records found.

Links for visuals & whole Research documents require: Name=nerid, Password=nerid

Record ID	Name	Project Title	Project status	Deliverable status	Deliverable	Subject of Research	Year	Visuals	Link to Visuals	Link to Research itself
192	Basis	A Soft Systems Methodology based Theoretical Model for the Communication of Design Research	Current Research	Unpublished	PhD		2000	Yes	1192.jpg	1192.txt

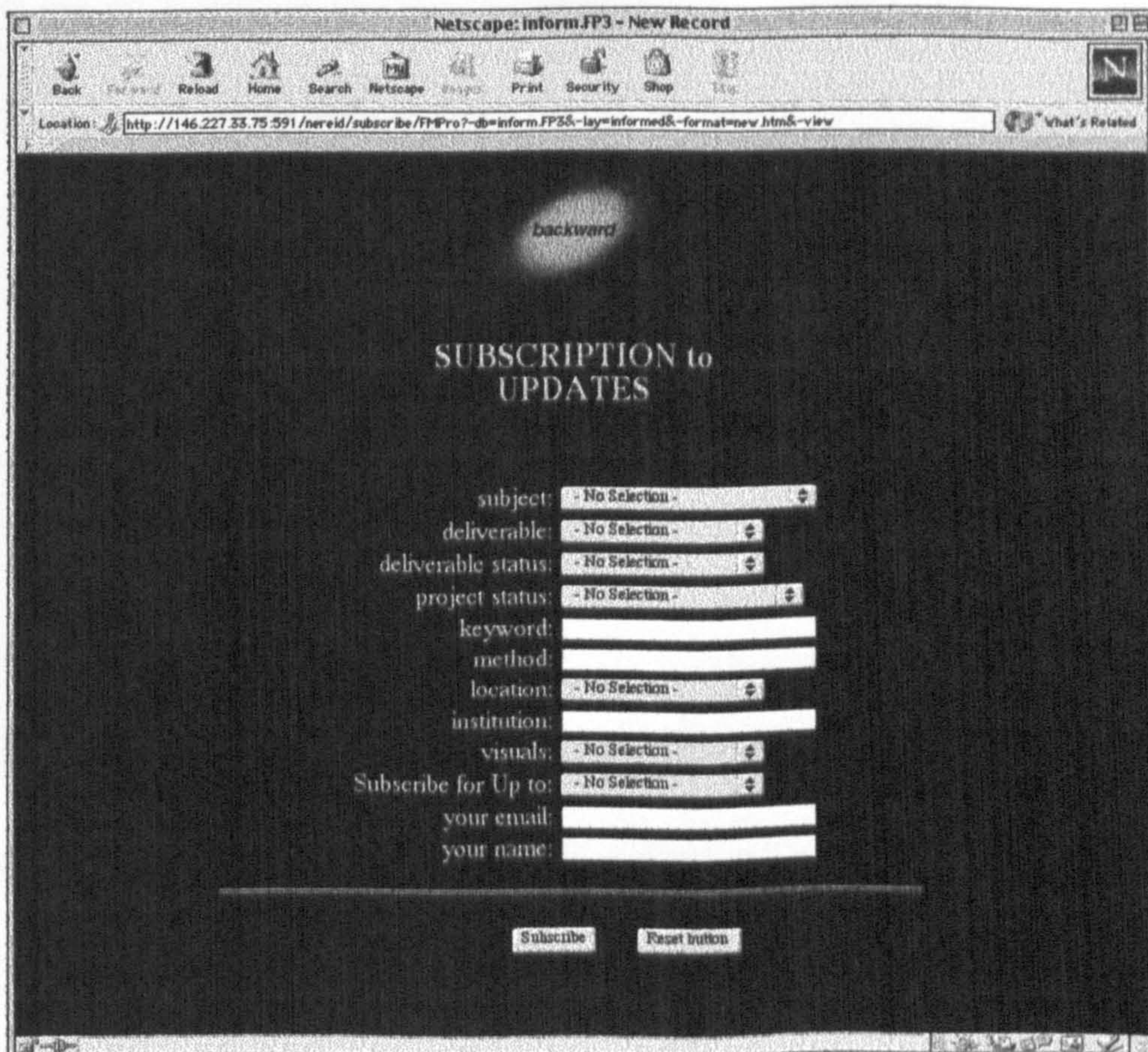
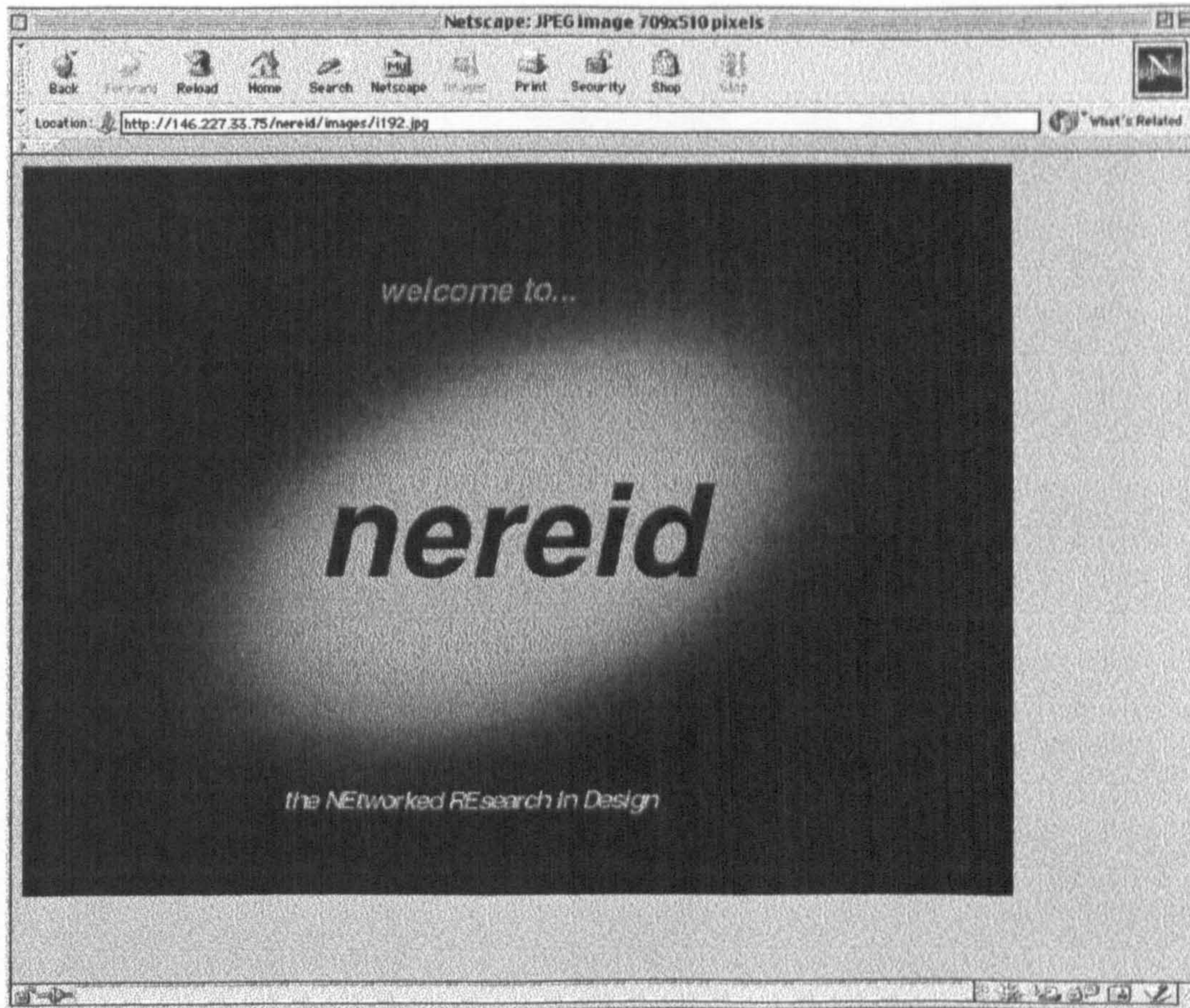
The screens of the search form and the relevant matches





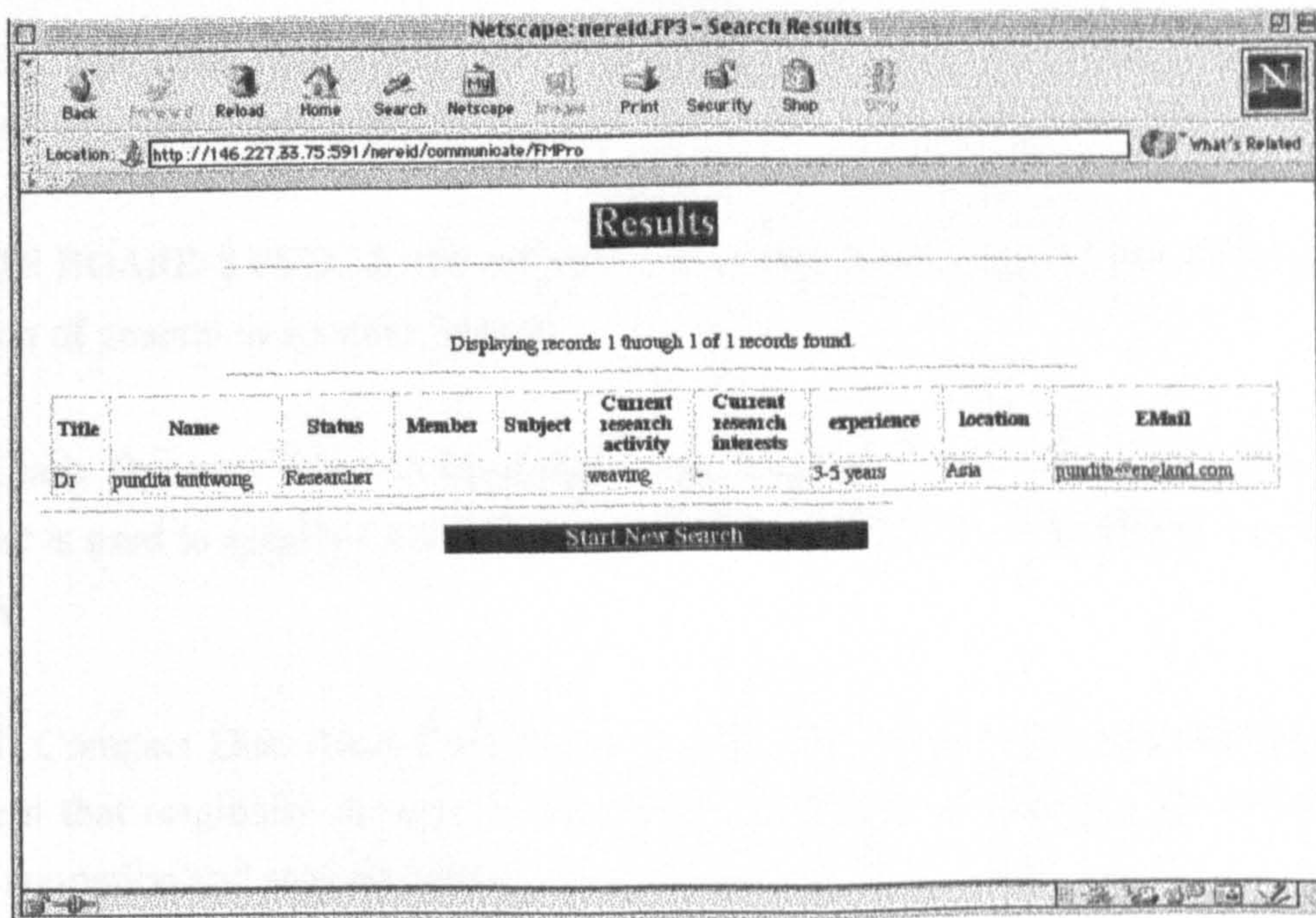
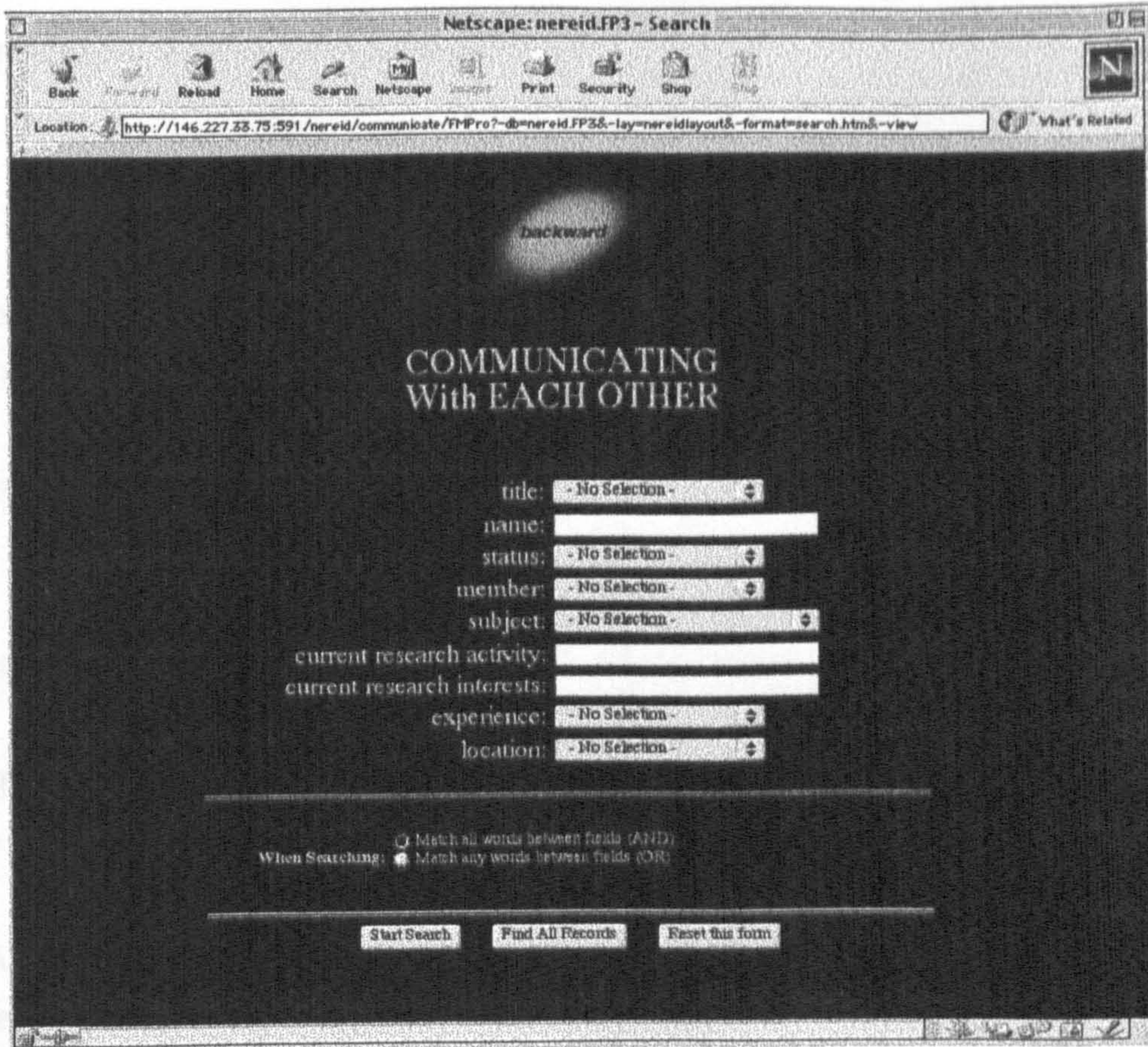
The screens of the research description and the research itself





The screens of the audio-visual material relevant to the research match and the subscription of updates enquiry form





The screens of searching others to communicate and the relevant match



## Computer based Glossary

This appendix provides a brief explanation of the computer based acronyms that are either used within this thesis, or used to describe them within this appendix:

**ACTIVE X:** Microsoft's method that allows a program to run inside a Web page.

**AGENT:** the mechanism that is used to act and / or conduct a task instead of someone else. When it refers to Autonomous it means self-governing, acting independently.

**BANDWIDTH:** the size of the pipeline. The more the bandwidth, the more data can flow at once over a net.

**BOOLEAN LOGIC:** is a form of expressions or operators such as 'and', 'or', 'not', to define the specific range of data being sought from a database.

**BROWSER:** a program that allows WWW documents (documents published on the WWW) to be displayed over the user's terminal.

**BULLETIN BOARD SYSTEM:** the noticeboards where users can post and find messages and information of general or specific interest.

**CDML:** Claris Dynamic Markup Language - the language based on Custom Web Publishing (CWP) that is used to specify formatting commands for publishing File Maker Pro databases on the WWW.

**CD ROM:** Compact Disc Read Only Memory - the non-erasable, prerecorded digital optical-disc system that originally devoted to store text and data, and latterly accommodates audio, graphics, animation and moving video.

**CD ROM DATABASE:** the database that is stored on a CD ROM form.

**CGI:** Common Gateway Interface - the standard WWW protocol for executing a program through a server and the return of its output to the browser.

**CHANNEL:** the stream of data pushed onto computer's desktop or browser window.



**CLIENT:** the standard term for the the computer on which the browser it runs. However, client as a term maybe refer to the browser itself, or to the user who is running the browser.

**DATABASE:** the collection of data that is organised for easy storage and retrieval.

**DYNAMIC:** the capability to alter content of a WWW document at load and run time.

**DHTML:** Dynamic HyperText Markup Language - the collection of scripts that allow dynamic capability into a WWW document.

**DVD:** Digital Video / Versatile Disc - the optical digital disc which can store moving video of up 4.7 GB that is equivalent of 133 minutes of full colour, full screen, and full motion video. It is the successor to CD ROM.

**E-MAIL:** Electronic Mail - the electronic messages that can be carried over a network.

**FTP:** File Transfer Protocol - the protocol that is used to transfer files from one computer to another computer across the Internet.

**GIF:** Graphics Interchange Format - the image file format suitable for publication on the Internet. GIFs image files are limited to 256 colours but does produce adequate compact files.

**GB:** Gigabyte - for now it is the highest unit which represents a staggering 1,073,741,824 bytes. Byte is made up of eight bits that allows information to be carried and stored by the computer. Bit stands as the abbreviation for Binary Digit and it can have only one of two values: 1 or 0 depending on whether it is switched on or off. Their combinations enable a computer to process, display and store information.

**GOPHER:** a menu driven information service that makes information across the internet available through a single application. It is similar to FTP facility.

**GUI:** Graphical User Interface - the approach to communications between humans and computer based systems which makes extensive use of visual and textual prompts in the form of icons, labels, pull-down menus rather than the codes and text of easier command - driven and menu - driven systems.

**HOSTNAME:** the name given to a computer.

**HTML:** HyperText Markup Language - the generic language that is used to create, design,



format and publish information content on the WWW.

**HTTP:** HyperText Transfer Protocol - the protocol that is used to transfer HTML documents on the WWW and to communicate between the browser and a WWW site.

**HYPERTEXT:** the method of presenting information that allows the user to jump between places in a document, typically by clicking on a highlighted word or an icon. Hypertext's concept was originally conceived in the 1940s by Vannevar Bush and it initially introduced by HyperCard, a software that is designed for Apple Macintosh computers.

**JAVA:** a programming language and runtime environment created by Sun Microsystems to promote cross platform compatibility and simplify application development.

**JAVASCRIPT:** Netscape's implementation of a scripting language that loosely based on Java's syntax.

**JPEG:** Joint Photographic Experts Group - the term usually refers to a graphic image format defined by the above mentioned group that has become an alternative to GIF for small, compact images. JPEG as the GIF files are also suitable to be published over the Internet.

**INTERNET:** the physical structure of the computer networks.

**LINK:** it is the pointer in a hypertext document that points to another location or another document.

**MAILBASE:** the discussion network that is based on e-mail.

**MARKUP:** the textual description of and formatting instructions for text content.

**MB:** MegaByte - it represents 1,048,576 bytes. For more information of what a Byte is, see the GB term.

**MOSAIC:** one of the most popular browser for the WWW. It is the first widely used graphical browser.

**NETWORK:** the packet-switching method that is used to fragment messages into sub-parts called packets, then routing them to their destinations, and reassembling them.

**NEWSGROUPS:** the service by providers which offers the exchange of information from



participating organisations and between individual subscribers.

**OPACs:** Online Public Access Catalogues - the catalogues that stores bibliographic and periodical references mainly located in Colleges', Universities' and communal libraries.

**PACKET:** the unit of data or in otherwords a part of a file that is prepared for transmission across a network.

**PLATFORM:** the computer operating system, such as MacOS, Windows, UNIX, Linux.

**PROTOCOL:** the protocol and formal (standard) description of the format of messages exchanged over the Internet.

**PUSH technology:** the mechanism that is used to describe the idea of WWW content that can be sent to a user automatically and regularly, compared to the common experience of finding and browsing information at will ('pull').

**RELATIONAL DATABASE:** the database that uses Structured Query Language. For instance, File Maker Pro is a relational database.

**ROBOT:** the program that automates network based tasks such as collating search engine databases.

**ROUTER:** the device that is used to examine packets of data and send them to their appropriate destination.

**SERVER:** the application program that supports client software. Servers do back-end processing and clients handle user interaction. By extension, server can refer to the computer on which the server application is running. In a simple sense it is a computer that makes services available on the net.

**SCRIPT:** the programming language that is used to execute orders on a predefined situation. Scripts maybe structured on different programming languages, such as, C, C++, Java, Fortran, Javascript, Visual Basic, Lingo, or other generic script. Scripts may also run other scripts.

**SGML:** Standard Generalised Markup Language - the markup language used for labelling electronic text so it can be exchanged between different users and systems without undue distortion and confusion. It is a broad language used to define specific markup languages. For instance, HTML is a particular application of SGML.



**SITE:** the registered location on the Internet.

**SQL:** Structured Query Language - the language that is used for performing database server queries.

**STRING:** the sequence of characters that is used for searching databases.

**TAG:** the start tag, the end tag, or an empty tag; that is generally used to delimit an element's content.

**TCP/IP:** Transfer (or Transmission) Control Protocol / Internet Protocol - the architecture based on protocol that is used basically to enable the networks of the Internet to send data back and forth.

**TELNET:** this is the internet standard protocol for remote terminal connection service.

**URL / URI:** Uniform Resource Locator / Identifier - the WWW standard for identifying the location (the address) of documents on the WWW.

**VISUALBASIC SCRIPT:** Microsoft's stripped down version of Visual Basic designed as a competitor to JavaScript.

**VR:** Virtual Reality - the supplement based on visual and aural effects to project the viewer into an imaginary environment beyond the screen.

**W3C:** World Wide Web Consortium - the consortium consisting of a group of industry developers and institutions formed to oversee standards development for the WWW.

**WYSIWYG:** what you see is what you get. What you type is the way it comes out.

**WWW:** World Wide Web - a hypertext based distributed information system, as well as, the collection of sites and the information contained on them that can be accessed over the Internet. It is just one of the many applications that run on the Internet.

**XML:** eXtensive Markup Language - a W3C standard for semantic and structural tagging of documents that also allows the creation of markup languages for particular documents and domains.



## Meanings to the Abbreviations

This appendix provides the meanings of the abbreviations presented throughout the thesis.

<b>ABM:</b>	<b>Art Bibliographies Modern</b>
<b>ADAM:</b>	<b>Art, Design and Architecture and Media Information Gateway</b>
<b>AI:</b>	<b>Artificial Intelligence</b>
<b>ARIAD:</b>	<b>Allison Research Index of Art and Design</b>
<b>BA / BSc / BEng:</b>	<b>Bachelor of Arts / Science / Engineering</b>
<b>BEI:</b>	<b>British Education Index</b>
<b>BIDS:</b>	<b>Bath Information and Data Services</b>
<b>BTEC:</b>	<b>Business and Technology Education Council</b>
<b>BUBL:</b>	<b>Bulletin Board for Libraries</b>
<b>CAD / CAM:</b>	<b>Computer Aided Design / Computer Aided Manufacturing</b>
<b>CATWOE:</b>	<b>Customers - Actors - Transformation - Weltanschauung - Owners - Environmental Constrains</b>
<b>CD:</b>	<b>Compact Disc</b>
<b>CD ROM:</b>	<b>Compact Disc Read Only Memory</b>
<b>CDML:</b>	<b>Claris Dynamic Markup Language</b>
<b>CERN:</b>	<b>European Centre for Particle Physics</b>
<b>CGI:</b>	<b>Common Gateway Interface</b>
<b>COPAC:</b>	<b>Consolidated On-line Public Access Catalogue</b>
<b>CRIB:</b>	<b>Current Research In Britain</b>
<b>CSD:</b>	<b>Chartered Society of Designers</b>
<b>CTAI:</b>	<b>the Clothing and Textiles Arts Index</b>
<b>CTI:</b>	<b>Current Technology Index</b>
<b>DAAI:</b>	<b>Design and Applied Arts Index</b>
<b>DHTML:</b>	<b>Dynamic HyperText Markup Language</b>
<b>DBA:</b>	<b>Design Business Association</b>
<b>D&amp;DA:</b>	<b>The Designers and Art Directors Association of the United Kingdom</b>
<b>DFD:</b>	<b>Data Flow Diagram</b>
<b>DIA:</b>	<b>Design and Industries Association</b>
<b>DMI:</b>	<b>Design Management Institute</b>
<b>DRS:</b>	<b>Design Research Society</b>
<b>DVD:</b>	<b>Digital Video or Versatile Disc</b>
<b>EAD:</b>	<b>European Academy of Design</b>
<b>E-Mail:</b>	<b>Electronic Mail</b>



<b>ERIC:</b>	<b>Educational Research Information Centre</b>
<b>FIRA:</b>	<b>Furniture Industry Research Association</b>
<b>FTP:</b>	<b>File Transfer Protocol</b>
<b>GB:</b>	<b>Gigabyte</b>
<b>GIF:</b>	<b>Graphics Interchange Format</b>
<b>GUI:</b>	<b>Graphical User Interface</b>
<b>HCI:</b>	<b>Human Computer Interaction / Interface</b>
<b>HND:</b>	<b>High National Diploma</b>
<b>HTML:</b>	<b>HyperText Markup Language</b>
<b>HTTP:</b>	<b>HyperText Transfer Protocol</b>
<b>IDDA:</b>	<b>Interior Decorators and Designers Association</b>
<b>IS:</b>	<b>Information Systems</b>
<b>ISDMs:</b>	<b>Information Systems Development Methodologies</b>
<b>JISC</b>	<b>Joint Information Systems Committee</b>
<b>JPEG:</b>	<b>Joint Photographic Experts Group</b>
<b>MA / MSc / MPhil:</b>	<b>Master of Arts / Science / Philosophy</b>
<b>MAID:</b>	<b>Multimedia Assets for Industrial Design</b>
<b>MB:</b>	<b>Megabyte</b>
<b>NSEAD:</b>	<b>National Society of Education in Art and Design</b>
<b>OPACs:</b>	<b>On-line Public Access Catalogues</b>
<b>PhD:</b>	<b>Doctor of Philosophy</b>
<b>RD:</b>	<b>Root Definition</b>
<b>RP:</b>	<b>Rich Picture</b>
<b>RAE:</b>	<b>Research Assessment Exercise</b>
<b>RSA:</b>	<b>Royal Society of Arts</b>
<b>SGML:</b>	<b>Standard Generalised Markup Language</b>
<b>SSM:</b>	<b>Soft Systems Methodology</b>
<b>STD:</b>	<b>The Society of Typographic Designers</b>
<b>SPSS:</b>	<b>Statistical Package for Social Sciences</b>
<b>SQL:</b>	<b>Structured Query Language</b>
<b>TCP/IP:</b>	<b>Transfer (or Transmission) Control Protocol / Internet Protocol</b>
<b>TI:</b>	<b>The Textiles Institute</b>
<b>TTD:</b>	<b>Textiles Technology Digest</b>
<b>URL / URI:</b>	<b>Uniform Resource Locator / Identifier</b>
<b>VR:</b>	<b>Virtual Reality</b>
<b>VRML:</b>	<b>Virtual Reality Markup Language</b>
<b>Weltanschauung:</b>	<b>Worldview</b>
<b>WWW:</b>	<b>World Wide Web</b>
<b>XML:</b>	<b>eXtensive Markup Language</b>



## **Analysis of RAE Outcome Relevant to Art and Design**

This appendix provides information relevant to the Art and Design UoA in the RAE's of 1992, 1996 and the most recent one in 2001. In particular, it provides some comparisons with other UoA's. Raw data are accessible through the RAE web site at <http://www.rae.ac.uk>. The appendix includes the following listings:

1. Listing of RAE's 1992 Units of Assessment (UoA)
2. Listing of RAE's 1996 Units of Assessment (UoA)
3. Listing of RAE's 2001 Units of Assessment (UoA)
4. Listing of RAE's 1992 Output
5. Listing of RAE's 1996 Output
6. Listing of RAE's 2001 Output
7. Listing of the RAE's (Sort by) Volume
8. Listing of the RAE's 1992 UoA Sorted by Top Rating
9. Listing of the RAE's 1996 UoA Sorted by Top Rating
10. Listing of the RAE's 2001 UoA Sorted by Top Rating
11. Listing of the RAE's UoA Sorted by Submission & Output
12. Listing of the RAE's 2001 and 1996 Ratings and Funds

It is worth noting that although there was an attempt to include the RAE 88 outcomes for this comparison this was not feasible since these results were not available at the time of writing for reasons explained within the main body of the thesis.

Listings 1, 2 and 3 present all the UoA's included in the RAE 92, 96 and the most recent RAE 2001. It includes the number of submissions made, the top ratings gained (5's for RAE 92 and 5\*'s and 5's for the RAE 96 and 2001), the output, (the sum of category A and A\* Research active Staff for all submissions made) the ratio of output to submissions and finally the calculation of the top ratings achieved.

Listings 4, 5 and 6 present the position of Art and Design as a UoA compared to other UoA's based on its ratio of output to submissions made. These results are based on the RAE outcomes in 1992, 1996 and 2001 respectively.

Listing 7 presents a graphical representation of the volume of Art and Design UoA compared to other UoA's in the RAE 92, 96 and 2001.



Listings 8, 9 and 10 present all the UoA's that participated in the RAE 92, 96 and 2001 based on the top ratings gained (5's for RAE 92 and 5\*'s and 5's for the RAE 96 and 2001).

Listing 11 presents the number of submissions made and output achieved by the Art and Design UoA in the RAE 92, 96 and 2001.

Finally, listing 12 presents the funding weight model for RAE 96. It then presents the funds that the Art and Design UoA attracted based on the RAE 96 ratings.

Finally, it estimates (if funding levels are the same as in RAE 96) the funds Art and Design UoA should attract based on the RAE 2001 ratings.



# 1. Listing of RAE's 1992 Units of Assessment (UoA)

Listing of RAE's 1992 Units of Assessment (UoA)		number of 5* achieved is	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5)
	number of Submissions	Not Applicable	number of 5 achieved			
1 Clinical Laboratory Sciences	34		3	1285	37.8	8.8
2 Community Based Clinical Subjects	33		4	1041.2	31.6	12.1
3 Hospital Based Clinical Subjects	33		7	2622.4	79.5	21.2
4 Clinical Dentistry	16		2	525.1	32.8	12.5
5 Pre-Clinical Studies	9		0	292.4	32.5	0.0
6 Anatomy	18		4	240.6	13.4	22.2
7 Physiology	19		3	316.5	16.7	15.8
8 Pharmacology	17		3	173.8	10.2	17.6
9 Pharmacy	18		3	332.4	18.5	16.7
10 Nursing	29		0	202.4	7.0	0.0
11 Other Studies and Professions Allied To Medicine	34		4	328.1	9.7	11.8
12 Biochemistry	27		4	526.6	19.5	14.8
13 Psychology	64		9	901.8	14.1	14.1
14 Biological Sciences	86		8	1819.7	21.2	9.3
15 Genetics	9		3	129.5	14.4	33.3
16 Microbiology	8		0	72.1	9.0	0.0
17 Agriculture	16		1	467.3	29.2	6.3
18 Food Science and Technology	11		1	97	8.8	9.1
19 Veterinary Science	6		1	327	54.5	16.7
20 Chemistry	70		7	1385.6	19.8	10.0
21 Physics	70		11	1553.2	22.2	15.7
22 Earth Sciences	34		8	573	16.9	23.5
23 Environmental Sciences/Studies	40		5	429	10.7	12.5
24 Pure Mathematics	44		5	506.4	11.5	11.4
25 Applied Mathematics	67		8	781.6	11.7	11.9
26 Statistics and Operational Research	50		7	407	8.1	14.0
27 Computer Science	113		10	1393.1	12.3	8.8
28 General Engineering	33		7	657.7	19.9	21.2
29 Chemical Engineering	24		4	359.6	15.0	16.7
30 Civil Engineering	45		9	710.5	15.8	20.0
31 Electrical and Electronic Engineering	69		7	1377.9	20.0	10.1
32 Mechanical, Aeronautical and Manufacturing Engineering	29		2	488.2	16.8	6.9
33 Mineral and Mining Engineering	5		1	85.9	17.2	20.0



<i>continued</i>	34 Metallurgy and Materials	53	7	482.1	9.1	13.2
	35 Built Environment	44	6	550.1	12.5	13.6
	36 Town and Country Planning	32	3	387.2	12.1	9.4
	37 Geography	60	6	852	14.2	10.0
	38 Law	55	6	1105.7	20.1	10.9
	39 Anthropology	17	6	199	11.7	35.3
	40 Economic & Social history	21	3	154.3	7.3	14.3
	41 Economics and Econometrics	60	10	1045.1	17.4	16.7
	42 Politics and International Studies	66	8	881.3	13.4	12.1
	43 Social Policy and Administration	40	5	520.1	13.0	12.5
	44 Social Work	34	2	294.7	8.7	5.9
	45 Sociology	67	6	826.6	12.3	9.0
	46 Business and Management Studies	85	7	2036.4	24.0	8.2
	47 Accountancy	31	2	286.4	9.2	6.5
	48 American Studies	12	2	81.8	6.8	16.7
	49 Middle Eastern and African Studies	11	2	115.5	10.5	18.2
	50 East and South Asian Studies	11	2	136.5	12.4	18.2
	51 European Studies	30	2	332.5	11.1	6.7
	52 Celtic Studies	15	2	63.9	4.3	13.3
	53 English Language and Literature	71	7	1138.5	16.0	9.9
	54 French	46	3	497.6	10.8	6.5
	55 German, (Related Languages)	46	8	295.7	6.4	17.4
	56 Italian	23	5	94.4	4.1	21.7
	57 Russian, Slavonic and East European Languages	23	3	115.9	5.0	13.0
	58 Spanish	33	4	191.4	5.8	12.1
	59 Linguistics	30	5	257.6	8.6	16.7
	60 Classics and Ancient History	26	7	281.1	10.8	26.9
	61 Archaeology	24	6	284.5	11.9	25.0
	62 History	83	5	1254	15.1	6.0
	63 History of Art, Architecture and Design	45	7	323.9	7.2	15.6
	64 Library and Information Management	19	2	133.9	7.0	10.5
	65 Philosophy	46	5	431.9	9.4	10.9
	66 Theology, Divinity and Religious Studies	33	8	285.1	8.6	24.2
	67 Art and Design	59	4	976.4	16.5	6.8
	68 Communication, Cultural and Media Studies	31	4	177.5	5.7	12.9
	69 Drama, Dance and Performing Arts	30	5	193.9	6.5	16.7
	70 Music	45	3	297	6.6	6.7
	71 Education	86	11	2310.1	26.9	12.8
	72 Physical Education & Sport Science	19	1	146.5	7.7	5.3



## 2. Listing of RAE's 1996 Units of Assessment (UoA)

Listing of RAE's 1996 Units of Assessment (UoA)		number of Submissions	number of 5* achieved	number of 5 achieved	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5*+5)
1	Clinical Laboratory Sciences	32	3	3	5	1097.1	34.3	25.0
2	Community Based Clinical Subjects	35	3	3	4	1212.8	34.7	20.0
3	Hospital Based Clinical Subjects	34	3	3	4	2814.2	82.8	20.6
4	Clinical Dentistry	15	1	1	2	456.2	30.4	20.0
5	Pre-Clinical Studies	10	0	0	1	360.2	36.0	10.0
6	Anatomy	11	3	3	3	180.2	16.4	54.5
7	Physiology	15	1	1	4	265.2	17.7	33.3
8	Pharmacology	15	3	3	4	212.5	14.2	46.7
9	Pharmacy	16	1	1	5	385.9	24.1	37.5
10	Nursing	36	0	0	1	396.5	11.0	2.8
11	Other Studies and Professions Allied To Medicine	68	3	3	3	672.5	9.9	8.8
12	Biochemistry	17	3	3	9	425.1	25.0	70.6
13	Psychology	75	4	4	7	1151.4	15.4	14.7
14	Biological Sciences	82	4	4	14	2075.9	25.3	22.0
15	Agriculture	21	1	1	4	577.2	27.5	23.8
16	Food Science and Technology	15	2	2	0	131.7	8.8	13.3
17	Veterinary Science	6	0	0	0	350.5	58.4	0.0
18	Chemistry	62	2	2	9	1369.1	22.1	17.7
19	Physics	56	2	2	11	1516.5	27.1	23.2
20	Earth Sciences	33	2	2	6	631.7	19.1	24.2
21	Environmental Sciences	38	2	2	2	484.1	12.7	10.5
22	Pure Mathematics	45	3	3	14	468	10.4	37.8
23	Applied Mathematics	65	2	2	13	721.5	11.1	23.1
24	Statistics and Operational Research	55	1	1	7	423.7	7.7	14.5
25	Computer Science	89	6	6	10	1550.8	17.4	18.0
26	General Engineering	37	3	3	4	816.8	22.1	18.9
27	Chemical Engineering	21	1	1	5	333.1	15.9	28.6
28	Civil Engineering	43	3	3	17	703.7	16.4	46.5
29	Electrical and Electronic Engineering	65	5	5	8	1203.5	18.5	20.0
30	Mechanical, Aeronautical and Manufacturing Engineering	57	5	5	7	1176.5	20.6	21.1
31	Mineral and Mining Engineering	5	1	1	1	80.1	16.0	40.0
32	Metallurgy and Materials	38	8	8	2	466.7	12.3	26.3







### 3. Listing of RAE's 2001 Units of Assessment (UoA)

Listing of RAE's 2001 Units of Assessment (UoA)	number of Submissions	number of 5* achieved	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5*+5)
1 Clinical Laboratory Sciences	57	21	22	1741.0	30.5	75.4
2 Community Based Clinical Subjects	78	13	20	1978.0	25.4	42.3
3 Hospital Based Clinical Subjects	82	26	24	3483.0	42.5	61.0
4 Clinical Dentistry	14	2	5	424.9	30.4	50.0
5 Pre-Clinical Studies	6	2	4	164.4	27.4	100.0
6 Anatomy	7	3	3	150.3	21.5	85.7
7 Physiology	11	1	4	249.6	22.7	45.5
8 Pharmacology	9	2	3	178.9	19.9	55.6
9 Pharmacy	12	2	6	418.0	34.8	66.7
10 Nursing	43	0	4	575.4	13.4	9.3
11 Other Studies and Professions Allied To Medicine	75	4	11	1016.0	13.5	20.0
12 Biochemistry (no results available)						
13 Psychology	73	12	17	1287.1	17.6	39.7
14 Biological Sciences	76	11	30	2416.7	31.8	53.9
15 Agriculture	19	0	6	508.8	26.8	31.6
16 Food Science and Technology	11	1	2	117.5	10.7	27.3
17 Veterinary Science	6	6	0	346.4	57.7	100.0
18 Chemistry	45	6	13	1300.2	28.9	42.2
19 Physics	50	5	23	1668.2	33.4	56.0
20 Earth Sciences	25	3	11	561.5	22.5	56.0
21 Environmental Sciences	34	2	2	541.4	15.9	11.8
22 Pure Mathematics	47	4	25	509.5	10.8	61.7
23 Applied Mathematics	58	6	25	734.7	12.7	53.4
24 Statistics and Operational Research	46	6	15	386.6	8.4	45.7
25 Computer Science	80	6	18	1560.1	19.5	30.0
26 General Engineering	48	3	10	1023.4	21.3	27.1
27 Chemical Engineering	17	3	4	293.6	17.3	41.2
28 Civil Engineering	31	5	11	518.0	16.7	51.6
29 Electrical and Electronic Engineering	45	6	15	862.8	19.2	46.7
30 Mechanical, Aeronautical and Manufacturing Engineering	47	6	13	1038.6	22.1	40.4
31 Mineral and Mining Engineering	3	2	0	81.6	27.2	66.7
32 Metallurgy and Materials	30	6	4	402.4	13.4	33.3
33 Built Environment	37	2	5	600.6	16.2	18.9



<i>continued</i>	34 Town and Country Planning	28	2	6	361.4	12.9	28.6
	35 Geography	62	6	10	1188.4	19.2	25.8
	36 Law	60	8	30	1352.9	22.5	63.3
	37 Anthropology	20	2	11	285.5	14.3	65.0
	38 Economics and Econometrics	41	4	9	838.2	20.4	31.7
	39 Politics and International Studies	69	5	19	1115.5	16.2	34.8
	40 Social Policy and Administration	47	2	8	957.7	20.4	21.3
	41 Social Work	30	1	7	383.0	12.8	26.7
	42 Sociology	48	6	12	858.8	17.9	37.5
	43 Business and Management Studies	97	3	13	2554.7	26.3	16.5
	44 Accountancy	20	2	12	218.2	10.9	70.0
	45 American Studies	13	2	3	113.4	8.7	38.5
	46 Middle Eastern and African Studies	11	2	5	128.9	11.7	63.6
	47 Asian Studies	13	2	5	129.4	10.0	53.8
	48 European Studies	41	4	13	558.6	13.6	41.5
	49 Celtic Studies	15	4	6	92.2	6.1	66.7
	50 English Language and Literature	89	14	27	1519.4	17.1	46.1
	51 French	43	6	14	446.0	10.4	46.5
	52 German, Dutch and Scandinavian Languages	42	10	9	255.0	6.1	45.2
	53 Italian	19	6	3	103.4	5.4	47.4
	54 Russian, Slavonic and East European Languages	17	3	6	77.3	4.5	52.9
	55 Iberian and Latin American Languages	32	7	7	207.6	6.5	43.8
	56 Linguistics	24	4	8	210.3	8.8	50.0
	57 Classics and Ancient History	26	6	9	346.5	13.3	57.7
	58 Archaeology	26	3	10	482.6	18.6	50.0
	59 History	95	8	31	1719.8	18.1	41.1
	60 History of Art, Architecture and Design	39	1	14	346.6	8.9	38.5
	61 Library and Information Management	23	2	3	302.1	13.1	21.7
	62 Philosophy	44	6	16	459.9	10.5	50.0
	63 Theology, Divinity and Religious Studies	43	4	16	438.8	10.2	46.5
	64 Art and Design	75	0	12	1668.7	22.2	16.0
	65 Communication, Cultural and Media Studies	38	2	6	358.6	9.4	21.1
	66 Drama, Dance and Performing Arts	40	2	6	395.8	9.9	20.0
	67 Music	59	9	12	487.5	8.3	35.6
	68 Education	83	2	12	2045.1	24.6	16.9
	69 Sports-Related Subjects	34	5	2	319.2	9.4	20.6



## 4. Listing of RAE's 1992 Output

	Listing of RAE's 1992 Units of Assessment (UoA)	number of Submissions	number of 5* achieved is Not Applicable	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5)
1	3 Hospital Based Clinical Subjects	33		7	2622.4	79.5	21.2
2	19 Veterinary Science	6		1	327	54.5	16.7
3	1 Clinical Laboratory Sciences	34		3	1285	37.8	8.8
4	4 Clinical Dentistry	16		2	525.1	32.8	12.5
5	5 Pre-Clinical Studies	9		0	292.4	32.5	0.0
6	2 Community Based Clinical Subjects	33		4	1041.2	31.6	12.1
7	17 Agriculture	16		1	467.3	29.2	6.3
8	71 Education	86		11	2310.1	26.9	12.8
9	46 Business and Management Studies	85		7	2036.4	24.0	8.2
10	21 Physics	70		11	1553.2	22.2	15.7
11	14 Biological Sciences	86		8	1819.7	21.2	9.3
12	38 Law	55		6	1105.7	20.1	10.9
13	31 Electrical and Electronic Engineering	69		7	1377.9	20.0	10.1
14	28 General Engineering	33		7	657.7	19.9	21.2
15	20 Chemistry	70		7	1385.6	19.8	10.0
16	12 Biochemistry	27		4	526.6	19.5	14.8
17	9 Pharmacy	18		3	332.4	18.5	16.7
18	41 Economics and Econometrics	60		10	1045.1	17.4	16.7
19	33 Mineral and Mining Engineering	5		1	85.9	17.2	20.0
20	22 Earth Sciences	34		8	573	16.9	23.5
21	32 Mechanical, Aeronautical and Manufacturing Engineering	29		2	488.2	16.8	6.9
22	7 Physiology	19		3	316.5	16.7	15.8
23	67 Art and Design	59		4	976.4	16.5	6.8
24	53 English Language and Literature	71		7	1138.5	16.0	9.9
25	30 Civil Engineering	45		9	710.5	15.8	20.0
26	62 History	83		5	1254	15.1	6.0
27	29 Chemical Engineering	24		4	359.6	15.0	16.7
28	15 Genetics	9		3	129.5	14.4	33.3
29	37 Geography	60		6	852	14.2	10.0
30	13 Psychology	64		9	901.8	14.1	14.1
31	6 Anatomy	18		4	240.6	13.4	22.2
32	42 Politics and International Studies	66		8	881.3	13.4	12.1
33	43 Social Policy and Administration	40		5	520.1	13.0	12.5



<b>34</b>	<b>35 Built Environment</b>	<b>44</b>	<b>6</b>	<b>550.1</b>	<b>12.5</b>	<b>13.6</b>
<b>35</b>	<b>50 East and South Asian Studies</b>	<b>11</b>	<b>2</b>	<b>136.5</b>	<b>12.4</b>	<b>18.2</b>
<b>36</b>	<b>45 Sociology</b>	<b>67</b>	<b>6</b>	<b>826.6</b>	<b>12.3</b>	<b>9.0</b>
<b>37</b>	<b>27 Computer Science</b>	<b>113</b>	<b>10</b>	<b>1393.1</b>	<b>12.3</b>	<b>8.8</b>
<b>38</b>	<b>36 Town and Country Planning</b>	<b>32</b>	<b>3</b>	<b>387.2</b>	<b>12.1</b>	<b>9.4</b>
<b>39</b>	<b>61 Archaeology</b>	<b>24</b>	<b>6</b>	<b>284.5</b>	<b>11.9</b>	<b>25.0</b>
<b>40</b>	<b>39 Anthropology</b>	<b>17</b>	<b>6</b>	<b>199</b>	<b>11.7</b>	<b>35.3</b>
<b>41</b>	<b>25 Applied Mathematics</b>	<b>67</b>	<b>8</b>	<b>781.6</b>	<b>11.7</b>	<b>11.9</b>
<b>42</b>	<b>24 Pure Mathematics</b>	<b>44</b>	<b>5</b>	<b>506.4</b>	<b>11.5</b>	<b>11.4</b>
<b>43</b>	<b>51 European Studies</b>	<b>30</b>	<b>2</b>	<b>332.5</b>	<b>11.1</b>	<b>6.7</b>
<b>44</b>	<b>54 French</b>	<b>46</b>	<b>3</b>	<b>497.6</b>	<b>10.8</b>	<b>6.5</b>
<b>45</b>	<b>60 Classics and Ancient History</b>	<b>26</b>	<b>7</b>	<b>281.1</b>	<b>10.8</b>	<b>26.9</b>
<b>46</b>	<b>23 Environmental Sciences/Studies</b>	<b>40</b>	<b>5</b>	<b>429</b>	<b>10.7</b>	<b>12.5</b>
<b>47</b>	<b>49 Middle Eastern and African Studies</b>	<b>11</b>	<b>2</b>	<b>115.5</b>	<b>10.5</b>	<b>18.2</b>
<b>48</b>	<b>8 Pharmacology</b>	<b>17</b>	<b>3</b>	<b>173.8</b>	<b>10.2</b>	<b>17.6</b>
<b>49</b>	<b>11 Other Studies and Professions Allied To Medicine</b>	<b>34</b>	<b>4</b>	<b>328.1</b>	<b>9.7</b>	<b>11.8</b>
<b>50</b>	<b>65 Philosophy</b>	<b>46</b>	<b>5</b>	<b>431.9</b>	<b>9.4</b>	<b>10.9</b>
<b>51</b>	<b>47 Accountancy</b>	<b>31</b>	<b>2</b>	<b>286.4</b>	<b>9.2</b>	<b>6.5</b>
<b>52</b>	<b>34 Metallurgy and Materials</b>	<b>53</b>	<b>7</b>	<b>482.1</b>	<b>9.1</b>	<b>13.2</b>
<b>53</b>	<b>16 Microbiology</b>	<b>8</b>	<b>0</b>	<b>72.1</b>	<b>9.0</b>	<b>0.0</b>
<b>54</b>	<b>18 Food Science and Technology</b>	<b>11</b>	<b>1</b>	<b>97</b>	<b>8.8</b>	<b>9.1</b>
<b>55</b>	<b>44 Social Work</b>	<b>34</b>	<b>2</b>	<b>294.7</b>	<b>8.7</b>	<b>5.9</b>
<b>56</b>	<b>66 Theology, Divinity and Religious Studies</b>	<b>33</b>	<b>8</b>	<b>285.1</b>	<b>8.6</b>	<b>24.2</b>
<b>57</b>	<b>59 Linguistics</b>	<b>30</b>	<b>5</b>	<b>257.6</b>	<b>8.6</b>	<b>16.7</b>
<b>58</b>	<b>26 Statistics and Operational Research</b>	<b>50</b>	<b>7</b>	<b>407</b>	<b>8.1</b>	<b>14.0</b>
<b>59</b>	<b>72 Physical Education &amp; Sport Science</b>	<b>19</b>	<b>1</b>	<b>146.5</b>	<b>7.7</b>	<b>5.3</b>
<b>60</b>	<b>40 Economic &amp; Social history</b>	<b>21</b>	<b>3</b>	<b>154.3</b>	<b>7.3</b>	<b>14.3</b>
<b>61</b>	<b>63 History of Art, Architecture and Design</b>	<b>45</b>	<b>7</b>	<b>323.9</b>	<b>7.2</b>	<b>15.6</b>
<b>62</b>	<b>64 Library and Information Management</b>	<b>19</b>	<b>2</b>	<b>133.9</b>	<b>7.0</b>	<b>10.5</b>
<b>63</b>	<b>10 Nursing</b>	<b>29</b>	<b>0</b>	<b>202.4</b>	<b>7.0</b>	<b>0.0</b>
<b>64</b>	<b>48 American Studies</b>	<b>12</b>	<b>2</b>	<b>81.8</b>	<b>6.8</b>	<b>16.7</b>
<b>65</b>	<b>70 Music</b>	<b>45</b>	<b>3</b>	<b>297</b>	<b>6.6</b>	<b>6.7</b>
<b>66</b>	<b>69 Drama, Dance and Performing Arts</b>	<b>30</b>	<b>5</b>	<b>193.9</b>	<b>6.5</b>	<b>16.7</b>
<b>67</b>	<b>55 German, (Related Languages)</b>	<b>46</b>	<b>8</b>	<b>295.7</b>	<b>6.4</b>	<b>17.4</b>
<b>68</b>	<b>58 Spanish</b>	<b>33</b>	<b>4</b>	<b>191.4</b>	<b>5.8</b>	<b>12.1</b>
<b>69</b>	<b>68 Communication, Cultural and Media Studies</b>	<b>31</b>	<b>4</b>	<b>177.5</b>	<b>5.7</b>	<b>12.9</b>
<b>70</b>	<b>57 Russian, Slavonic and East European Languages</b>	<b>23</b>	<b>3</b>	<b>115.9</b>	<b>5.0</b>	<b>13.0</b>
<b>71</b>	<b>52 Celtic Studies</b>	<b>15</b>	<b>2</b>	<b>63.9</b>	<b>4.3</b>	<b>13.3</b>
<b>72</b>	<b>56 Italian</b>	<b>23</b>	<b>5</b>	<b>94.4</b>	<b>4.1</b>	<b>21.7</b>

continued



## 5. Listing of RAE's 1996 Output

	Listing of RAE's 1996 Units of Assessment (UoA)	number of Submissions	number of 5* achieved	number of 5 achieved	number of 5* achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5*+5)
1	3 Hospital Based Clinical Subjects	34	3	4	2814.2	82.8	20.6	
2	17 Veterinary Science	6	0	0	350.5	58.4	0.0	
3	5 Pre-Clinical Studies	10	0	1	360.2	36.0	10.0	
4	2 Community Based Clinical Subjects	35	3	4	1212.8	34.7	20.0	
5	1 Clinical Laboratory Sciences	32	3	5	1097.1	34.3	25.0	
6	4 Clinical Dentistry	15	1	2	456.2	30.4	20.0	
7	15 Agriculture	21	1	4	577.2	27.5	23.8	
8	19 Physics	56	2	11	1516.5	27.1	23.2	
9	68 Education	104	2	11	2800.8	26.9	12.5	
10	14 Biological Sciences	82	4	14	2075.9	25.3	22.0	
11	12 Biochemistry	17	3	9	425.1	25.0	70.6	
12	9 Pharmacy	16	1	5	385.9	24.1	37.5	
13	43 Business and Management Studies	100	3	8	2259	22.6	11.0	
14	18 Chemistry	62	2	9	1369.1	22.1	17.7	
15	26 General Engineering	37	3	4	816.8	22.1	18.9	
16	30 Mechanical, Aeronautical and Manufacturing Engineering	57	5	7	1176.5	20.6	21.1	
17	36 Law	64	2	11	1294.6	20.2	20.3	
18	20 Earth Sciences	33	2	6	631.7	19.1	24.2	
19	29 Electrical and Electronic Engineering	65	5	8	1203.5	18.5	20.0	
20	59 History	110	7	19	2000.9	18.2	23.6	
21	38 Economics and Econometrics	50	3	10	888.1	17.8	26.0	
22	64 Art and Design	89	3	4	1578	17.7	7.9	
23	7 Physiology	15	1	4	265.2	17.7	33.3	
24	25 Computer Science	89	6	10	1550.8	17.4	18.0	
25	6 Anatomy	11	3	3	180.2	16.4	54.5	
26	28 Civil Engineering	43	3	17	703.7	16.4	46.5	
27	31 Mineral and Mining Engineering	5	1	1	80.1	16.0	40.0	
28	27 Chemical Engineering	21	1	5	333.1	15.9	28.6	
29	35 Geography	69	5	5	1083.5	15.7	14.5	
30	50 English Language and Literature	91	4	5	1418.5	15.6	9.9	
31	13 Psychology	75	4	7	1151.4	15.4	14.7	
32	39 Politics and International Studies	66	4	6	1004.3	15.2	15.2	



<i>continued</i>	33	34 Town and Country Planning	30	3	1	456	15.2	13.3
	34	42 Sociology	61	2	7	892.8	14.6	14.8
	35	40 Social Policy and Administration	44	1	4	641.7	14.6	11.4
	36	58 Archaeology	26	3	7	371	14.3	38.5
	37	8 Pharmacology	15	3	4	212.5	14.2	46.7
	38	37 Anthropology	19	1	6	262.3	13.8	36.8
	39	33 Built Environment	55	2	5	727.8	13.2	12.7
	40	21 Environmental Sciences	38	2	2	484.1	12.7	10.5
	41	48 European Studies	38	1	6	474.3	12.5	18.4
	42	32 Metallurgy and Materials	38	8	2	466.7	12.3	26.3
	43	23 Applied Mathematics	65	2	13	721.5	11.1	23.1
	44	41 Social Work	32	1	4	353.6	11.1	15.6
	45	10 Nursing	36	0	1	396.5	11.0	2.8
	46	57 Classics and Ancient History	28	5	6	307.7	11.0	39.3
	47	46 Middle Eastern and African Studies	12	1	3	124.9	10.4	33.3
	48	22 Pure Mathematics	45	3	14	468	10.4	37.8
	49	47 Asian Studies	12	1	2	123.9	10.3	25.0
	50	62 Philosophy	46	2	6	456	9.9	17.4
	51	11 Other Studies and Professions Allied To Medicine	68	3	3	672.5	9.9	8.8
	52	51 French	47	4	7	450.5	9.6	23.4
	53	61 Library and Information Management	23	2	1	214.2	9.3	13.0
	54	65 Communication, Cultural and Media Studies	35	0	6	315.6	9.0	17.1
	55	56 Linguistics	27	0	6	242	9.0	22.2
	56	44 Accountancy	23	1	4	205.8	8.9	21.7
	57	16 Food Science and Technology	15	2	0	131.7	8.8	13.3
	58	63 Theology, Divinity and Religious Studies	50	3	10	413.7	8.3	26.0
	59	66 Drama, Dance and Performing Arts	42	1	1	343.1	8.2	4.8
	60	60 History of Art, Architecture and Design	48	3	5	389.4	8.1	16.7
	61	24 Statistics and Operational Research	55	1	7	423.7	7.7	14.5
	62	67 Music	57	6	15	421.4	7.4	36.8
	63	69 Sports-Related Subjects	34	0	3	239.4	7.0	8.8
	64	45 American Studies	18	1	3	117.9	6.6	22.2
	65	55 Iberian and Latin American Languages	31	1	8	191.9	6.2	29.0
	66	52 German, Dutch and Scandinavian Languages	46	6	5	282.1	6.1	23.9
	67	49 Celtic Studies	15	0	4	88.7	5.9	26.7
	68	54 Russian, Slavonic and East European Languages	22	2	5	115.3	5.2	31.8
	69	53 Italian	22	3	3	104.3	4.7	27.3



## 6. Listing of RAE's 2001 Output

Listing of RAE's 2001 Units of Assessment (UoA)		number of Submissions	number of 5* achieved	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5*+5)
1	17 Veterinary Science	6	6	0	346.4	57.7	100.0
2	3 Hospital Based Clinical Subjects	82	26	24	3483.0	42.5	61.0
3	9 Pharmacy	12	2	6	418.0	34.8	66.7
4	19 Physics	50	5	23	1668.2	33.4	56.0
5	14 Biological Sciences	76	11	30	2416.7	31.8	53.9
6	1 Clinical Laboratory Sciences	57	21	22	1741.0	30.5	75.4
7	4 Clinical Dentistry	14	2	5	424.9	30.4	50.0
8	18 Chemistry	45	6	13	1300.2	28.9	42.2
9	5 Pre-Clinical Studies	6	2	4	164.4	27.4	100.0
10	31 Mineral and Mining Engineering	3	2	0	81.6	27.2	66.7
11	15 Agriculture	19	0	6	508.8	26.8	31.6
12	43 Business and Management Studies	97	3	13	2554.7	26.3	16.5
13	2 Community Based Clinical Subjects	78	13	20	1978.0	25.4	42.3
14	68 Education	83	2	12	2045.1	24.6	16.9
15	7 Physiology	11	1	4	249.6	22.7	45.5
16	36 Law	60	8	30	1352.9	22.5	63.3
17	20 Earth Sciences	25	3	11	561.5	22.5	56.0
18	64 Art and Design	75	0	12	1668.7	22.2	16.0
19	30 Mechanical, Aeronautical and Manufacturing Engineering	47	6	13	1038.6	22.1	40.4
20	6 Anatomy	7	3	3	150.3	21.5	85.7
21	26 General Engineering	48	3	10	1023.4	21.3	27.1
22	38 Economics and Econometrics	41	4	9	838.2	20.4	31.7
23	40 Social Policy and Administration	47	2	8	957.7	20.4	21.3
24	8 Pharmacology	9	2	3	178.9	19.9	55.6
25	25 Computer Science	80	6	18	1560.1	19.5	30.0
26	29 Electrical and Electronic Engineering	45	6	15	862.8	19.2	46.7
27	35 Geography	62	6	10	1188.4	19.2	25.8
28	58 Archaeology	26	3	10	482.6	18.6	50.0
29	59 History	95	8	31	1719.8	18.1	41.1
30	42 Sociology	48	6	12	858.8	17.9	37.5
31	13 Psychology	73	12	17	1287.1	17.6	39.7
32	27 Chemical Engineering	17	3	4	293.6	17.3	41.2
33	50 English Language and Literature	89	14	27	1519.4	17.1	46.1



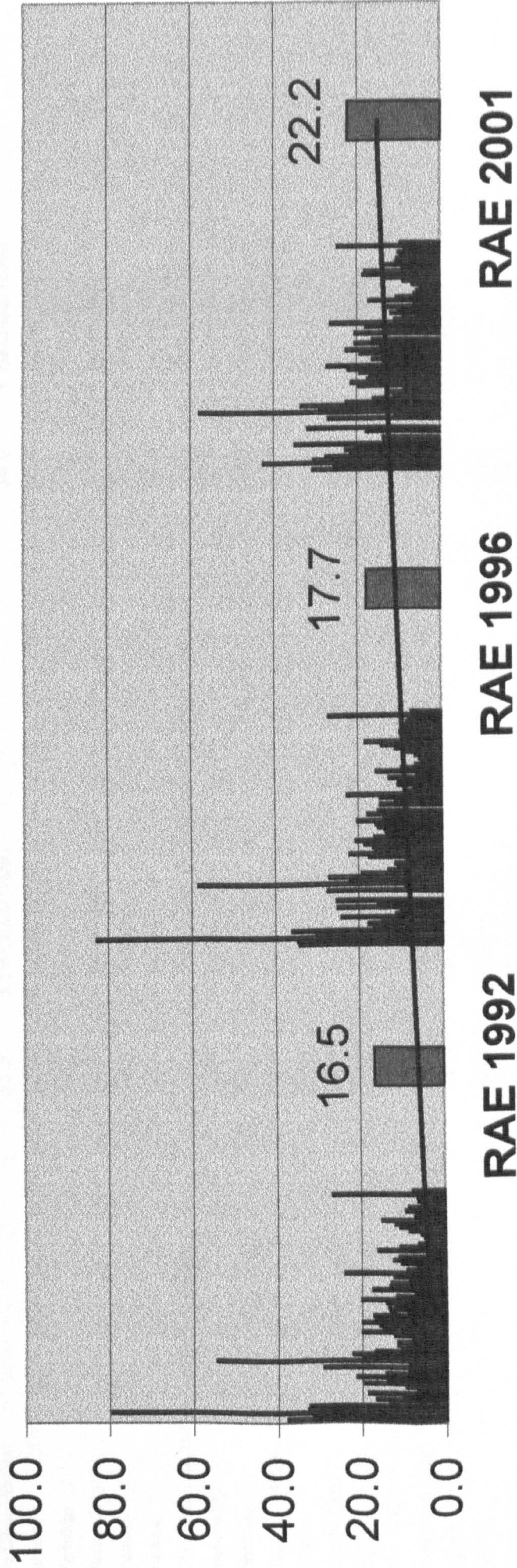
34	28 Civil Engineering	31	5	11	518.0	16.7	51.6
35	33 Built Environment	37	2	5	600.6	16.2	18.9
36	39 Politics and International Studies	69	5	19	1115.5	16.2	34.8
37	21 Environmental Sciences	34	2	2	541.4	15.9	11.8
38	37 Anthropology	20	2	11	285.5	14.3	65.0
39	48 European Studies	41	4	13	558.6	13.6	41.5
40	11 Other Studies and Professions Allied To Medicine	75	4	11	1016.0	13.5	20.0
41	32 Metallurgy and Materials	30	6	4	402.4	13.4	33.3
42	10 Nursing	43	0	4	575.4	13.4	9.3
43	57 Classics and Ancient History	26	6	9	346.5	13.3	57.7
44	61 Library and Information Management	23	2	3	302.1	13.1	21.7
45	34 Town and Country Planning	28	2	6	361.4	12.9	28.6
46	41 Social Work	30	1	7	383.0	12.8	26.7
47	23 Applied Mathematics	58	6	25	734.7	12.7	53.4
48	46 Middle Eastern and African Studies	11	2	5	128.9	11.7	63.6
49	44 Accountancy	20	2	12	218.2	10.9	70.0
50	22 Pure Mathematics	47	4	25	509.5	10.8	61.7
51	16 Food Science and Technology	11	1	2	117.5	10.7	27.3
52	62 Philosophy	44	6	16	459.9	10.5	50.0
53	51 French	43	6	14	446.0	10.4	46.5
54	63 Theology, Divinity and Religious Studies	43	4	16	438.8	10.2	46.5
55	47 Asian Studies	13	2	5	129.4	10.0	53.8
56	66 Drama, Dance and Performing Arts	40	2	6	395.8	9.9	20.0
57	65 Communication, Cultural and Media Studies	38	2	6	358.6	9.4	21.1
58	69 Sports-Related Subjects	34	5	2	319.2	9.4	20.6
59	60 History of Art, Architecture and Design	39	1	14	346.6	8.9	38.5
60	56 Linguistics	24	4	8	210.3	8.8	50.0
61	45 American Studies	13	2	3	113.4	8.7	38.5
62	24 Statistics and Operational Research	46	6	15	386.6	8.4	45.7
63	67 Music	59	9	12	487.5	8.3	35.6
64	55 Iberian and Latin American Languages	32	7	7	207.6	6.5	43.8
65	49 Celtic Studies	15	4	6	92.2	6.1	66.7
66	52 German, Dutch and Scandinavian Languages	42	10	9	255.0	6.1	45.2
67	53 Italian	19	6	3	103.4	5.4	47.4
68	54 Russian, Slavonic and East European Languages	17	3	6	77.3	4.5	52.9
69	12 Biochemistry (no results available)						

*continued*



## 7. Listing of the RAE's: Sort by Volume

**% Volume of Art & Design compared to other UoA based on RAE 92, 96, 2001**





## 7. Listing of the RAE's: Sort by Volume

Listing of RAE's 1992 Units of Assessment (UoA)	output to submissions	Listing of RAE's 1996 Units of Assessment (UoA)	output to submissions	Listing of RAE's 2001 Units of Assessment (UoA)	output to submissions
1 Clinical Laboratory Sciences	37.8	1 Clinical Laboratory Sciences	34.3	1 Clinical Laboratory Sciences	30.5
2 Community Based Clinical Subjects	31.6	2 Community Based Clinical Subjects	34.7	2 Community Based Clinical Subjects	25.4
3 Hospital Based Clinical Subjects	79.5	3 Hospital Based Clinical Subjects	82.8	3 Hospital Based Clinical Subjects	42.5
4 Clinical Dentistry	32.8	4 Clinical Dentistry	30.4	4 Clinical Dentistry	30.4
5 Pre-Clinical Studies	32.5	5 Pre-Clinical Studies	36.0	5 Pre-Clinical Studies	27.4
6 Anatomy	13.4	6 Anatomy	16.4	6 Anatomy	21.5
7 Physiology	16.7	7 Physiology	17.7	7 Physiology	22.7
8 Pharmacology	10.2	8 Pharmacology	14.2	8 Pharmacology	19.9
9 Pharmacy	18.5	9 Pharmacy	24.1	9 Pharmacy	34.8
10 Nursing	7.0	10 Nursing	11.0	10 Nursing	13.4
11 Other Studies and Professions Allied To Medicine	9.7	11 Other Studies and Professions Allied To Medicine	9.9	11 Other Studies and Professions Allied To Medicine	13.5
12 Biochemistry	19.5	12 Biochemistry	25.0	12 Biochemistry (no results available)	0.0
13 Psychology	14.1	13 Psychology	15.4	13 Psychology	17.6
14 Biological Sciences	21.2	14 Biological Sciences	25.3	14 Biological Sciences	31.8
15 Genetics	14.4				
16 Microbiology	9.0				
17 Agriculture	29.2	15 Agriculture	27.5	15 Agriculture	26.8
18 Food Science and Technology	8.8	16 Food Science and Technology	8.8	16 Food Science and Technology	10.7
19 Veterinary Science	54.5	17 Veterinary Science	58.4	17 Veterinary Science	57.7
20 Chemistry	19.8	18 Chemistry	22.1	18 Chemistry	28.9
21 Physics	22.2	19 Physics	27.1	19 Physics	33.4
22 Earth Sciences	16.9	20 Earth Sciences	19.1	20 Earth Sciences	22.5
23 Environmental Sciences/Studies	10.7	21 Environmental Sciences	12.7	21 Environmental Sciences	15.9
24 Pure Mathematics	11.5	22 Pure Mathematics	10.4	22 Pure Mathematics	10.8
25 Applied Mathematics	11.7	23 Applied Mathematics	11.1	23 Applied Mathematics	12.7
26 Statistics and Operational Research	8.1	24 Statistics and Operational Research	7.7	24 Statistics and Operational Research	8.4
27 Computer Science	12.3	25 Computer Science	17.4	25 Computer Science	19.5
28 General Engineering	19.9	26 General Engineering	22.1	26 General Engineering	21.3
29 Chemical Engineering	15.0	27 Chemical Engineering	15.9	27 Chemical Engineering	17.3
30 Civil Engineering	15.8	28 Civil Engineering	16.4	28 Civil Engineering	16.7
31 Electrical and Electronic Engineering	20.0	29 Electrical and Electronic Engineering	18.5	29 Electrical and Electronic Engineering	19.2
32 Mechanical, Aeronautical and Manufacturing Engineering	16.8	30 Mechanical, Aeronautical and Manufacturing Engineering	20.6	30 Mechanical, Aeronautical and Manufacturing Engineering	22.1
33 Mineral and Mining Engineering	17.2	31 Mineral and Mining Engineering	16.0	31 Mineral and Mining Engineering	27.2
34 Metallurgy and Materials	9.1	32 Metallurgy and Materials	12.3	32 Metallurgy and Materials	13.4
35 Built Environment	12.5	33 Built Environment	13.2	33 Built Environment	16.2



36 Town and Country Planning	12.1	34 Town and Country Planning	15.2	34 Town and Country Planning	12.9
37 Geography	14.2	35 Geography	15.7	35 Geography	19.2
38 Law	20.1	36 Law	20.2	36 Law	22.5
39 Anthropology	11.7	37 Anthropology	13.8	37 Anthropology	14.3
40 Economic & Social history	7.3	38 Economics and Econometrics	17.8	38 Economics and Econometrics	20.4
41 Economics and Econometrics	17.4	39 Politics and International Studies	15.2	39 Politics and International Studies	16.2
42 Politics and International Studies	13.4				
43 Social Policy and Administration	13.0	40 Social Policy and Administration	14.6	40 Social Policy and Administration	20.4
44 Social Work	8.7	41 Social Work	11.1	41 Social Work	12.8
45 Sociology	12.3	42 Sociology	14.6	42 Sociology	17.9
46 Business and Management Studies	24.0	43 Business and Management Studies	22.6	43 Business and Management Studies	26.3
47 Accountancy	9.2	44 Accountancy	8.9	44 Accountancy	10.9
48 American Studies	6.8	45 American Studies	6.6	45 American Studies	8.7
49 Middle Eastern and African Studies	10.5	46 Middle Eastern and African Studies	10.4	46 Middle Eastern and African Studies	11.7
50 East and South Asian Studies	12.4	47 Asian Studies	10.3	47 Asian Studies	10.0
51 European Studies	11.1	48 European Studies	12.5	48 European Studies	13.6
52 Celtic Studies	4.3	49 Celtic Studies	5.9	49 Celtic Studies	6.1
53 English Language and Literature	16.0	50 English Language and Literature	15.6	50 English Language and Literature	17.1
54 French	10.8	51 French	9.6	51 French	10.4
55 German, (Related Languages)	6.4	52 German, Dutch and Scandinavian Languages	6.1	52 German, Dutch and Scandinavian Languages	6.1
56 Italian	4.1	53 Italian	4.7	53 Italian	5.4
57 Russian, Slavonic and East European Languages	5.0	54 Russian, Slavonic and East European Languages	5.2	54 Russian, Slavonic and East European Languages	4.5
58 Spanish	5.8	55 Iberian and Latin American Languages	6.2	55 Iberian and Latin American Languages	6.5
59 Linguistics	8.6	56 Linguistics	9.0	56 Linguistics	8.8
60 Classics and Ancient History	10.8	57 Classics and Ancient History	11.0	57 Classics and Ancient History	13.3
61 Archaeology	11.9	58 Archaeology	14.3	58 Archaeology	18.6
62 History	15.1	59 History	18.2	59 History	18.1
63 History of Art, Architecture and Design	7.2	60 History of Art, Architecture and Design	8.1	60 History of Art, Architecture and Design	8.9
64 Library and Information Management	7.0	61 Library and Information Management	9.3	61 Library and Information Management	13.1
65 Philosophy	9.4	62 Philosophy	9.9	62 Philosophy	10.5
66 Theology, Divinity and Religious Studies	8.6	63 Theology, Divinity and Religious Studies	8.3	63 Theology, Divinity and Religious Studies	10.2
67 Art and Design	16.5	64 Art and Design	17.7	64 Art and Design	22.2
68 Communication, Cultural and Media Studies	5.7	65 Communication, Cultural and Media Studies	9.0	65 Communication, Cultural and Media Studies	9.4
69 Drama, Dance and Performing Arts	6.5	66 Drama, Dance and Performing Arts	8.2	66 Drama, Dance and Performing Arts	9.9
70 Music	6.6	67 Music	7.4	67 Music	8.3
71 Education	26.9	68 Education	26.9	68 Education	24.6
72 Physical Education & Sport Science	7.7	69 Sports-Related Subjects	7.0	69 Sports-Related Subjects	9.4

A graphical representation of this table can be seen on the next page



## 8. Listing of RAE's 1992 UoA Sorted by Top Rating

ranking	Listing of RAE's 1992 Units of Assessment (UoA)	number of Submissions	number of 5* achieved is Not Applicable	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5)
1	15 Genetics	9		3	129.5	14.4	33.3
2	19 Veterinary Science	6		1	327	54.5	16.7
3	39 Anthropology	17		6	199	11.7	35.3
4	8 Pharmacology	17		3	173.8	10.2	17.6
5	60 Classics and Ancient History	26		7	281.1	10.8	26.9
6	49 Middle Eastern and African Studies	11		2	115.5	10.5	18.2
7	50 East and South Asian Studies	11		2	136.5	12.4	18.2
8	16 Microbiology	8		0	72.1	9.0	0.0
9	57 Russian, Slavonic and East European Languages	23		3	115.9	5.0	13.0
10	22 Earth Sciences	34		8	573	16.9	23.5
11	30 Civil Engineering	45		9	710.5	15.8	20.0
12	34 Metallurgy and Materials	53		7	482.1	9.1	13.2
13	40 Economic & Social history	21		3	154.3	7.3	14.3
14	66 Theology, Divinity and Religious Studies	33		8	285.1	8.6	24.2
15	63 History of Art, Architecture and Design	45		7	323.9	7.2	15.6
16	7 Physiology	19		3	316.5	16.7	15.8
17	26 Statistics and Operational Research	50		7	407	8.1	14.0
18	12 Biochemistry	27		4	526.6	19.5	14.8
19	33 Mineral and Mining Engineering	5		1	85.9	17.2	20.0
20	3 Hospital Based Clinical Subjects	33		7	2622.4	79.5	21.2
21	58 Spanish	33		4	191.4	5.8	12.1
22	56 Italian	23		5	94.4	4.1	21.7
23	9 Pharmacy	18		3	332.4	18.5	16.7
24	24 Pure Mathematics	44		5	506.4	11.5	11.4
25	21 Physics	70		11	1553.2	22.2	15.7
26	41 Economics and Econometrics	60		10	1045.1	17.4	16.7
27	17 Agriculture	16		1	467.3	29.2	6.3
28	29 Chemical Engineering	24		4	359.6	15.0	16.7
29	61 Archaeology	24		6	284.5	11.9	25.0
30	65 Philosophy	46		5	431.9	9.4	10.9
31	59 Linguistics	30		5	257.6	8.6	16.7
32	62 History	83		5	1254	15.1	6.0







## 9. Listing of RAE's 1996 UoA Sorted by Top Rating

ranking	Listing of RAE's 1996 Units of Assessment (UoA)	number of Submissions	number of 5* achieved	number of 5 achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5*+5)
1	12 Biochemistry	17	3	9	425.1	25.0	70.6
2	6 Anatomy	11	3	3	180.2	16.4	54.5
3	8 Pharmacology	15	3	4	212.5	14.2	46.7
4	28 Civil Engineering	43	3	17	703.7	16.4	46.5
5	31 Mineral and Mining Engineering	5	1	1	80.1	16.0	40.0
6	57 Classics and Ancient History	28	5	6	307.7	11.0	39.3
7	58 Archaeology	26	3	7	371	14.3	38.5
8	22 Pure Mathematics	45	3	14	468	10.4	37.8
9	9 Pharmacy	16	1	5	385.9	24.1	37.5
10	37 Anthropology	19	1	6	262.3	13.8	36.8
11	67 Music	57	6	15	421.4	7.4	36.8
12	7 Physiology	15	1	4	265.2	17.7	33.3
13	46 Middle Eastern and African Studies	12	1	3	124.9	10.4	33.3
14	54 Russian, Slavonic and East European Languages	22	2	5	115.3	5.2	31.8
15	55 Iberian and Latin American Languages	31	1	8	191.9	6.2	29.0
16	27 Chemical Engineering	21	1	5	333.1	15.9	28.6
17	53 Italian	22	3	3	104.3	4.7	27.3
18	49 Celtic Studies	15	0	4	88.7	5.9	26.7
19	32 Metallurgy and Materials	38	8	2	466.7	12.3	26.3
20	38 Economics and Econometrics	50	3	10	888.1	17.8	26.0
21	63 Theology, Divinity and Religious Studies	50	3	10	413.7	8.3	26.0
22	1 Clinical Laboratory Sciences	32	3	5	1097.1	34.3	25.0
23	47 Asian Studies	12	1	2	123.9	10.3	25.0
24	20 Earth Sciences	33	2	6	631.7	19.1	24.2
25	52 German, Dutch and Scandinavian Languages	46	6	5	282.1	6.1	23.9
26	15 Agriculture	21	1	4	577.2	27.5	23.8
27	59 History	110	7	19	2000.9	18.2	23.6
28	51 French	47	4	7	450.5	9.6	23.4
29	19 Physics	56	2	11	1516.5	27.1	23.2
30	23 Applied Mathematics	65	2	13	721.5	11.1	23.1
31	45 American Studies	18	1	3	117.9	6.6	22.2
32	56 Linguistics	27	0	6	242	9.0	22.2
33	14 Biological Sciences	82	4	14	2075.9	25.3	22.0







## 10. Listing of RAE's 2001 UoA Sorted by Top Rating

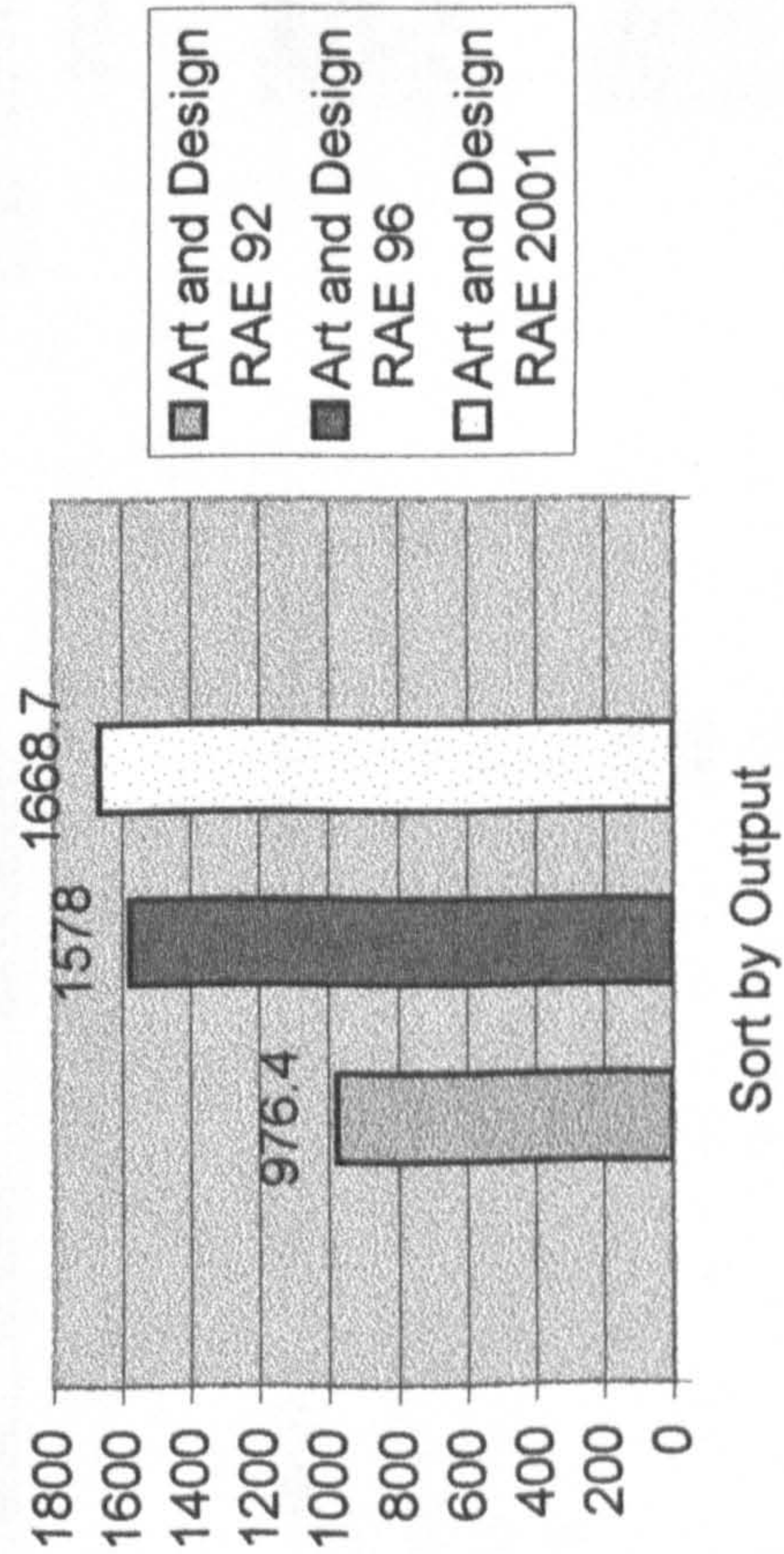
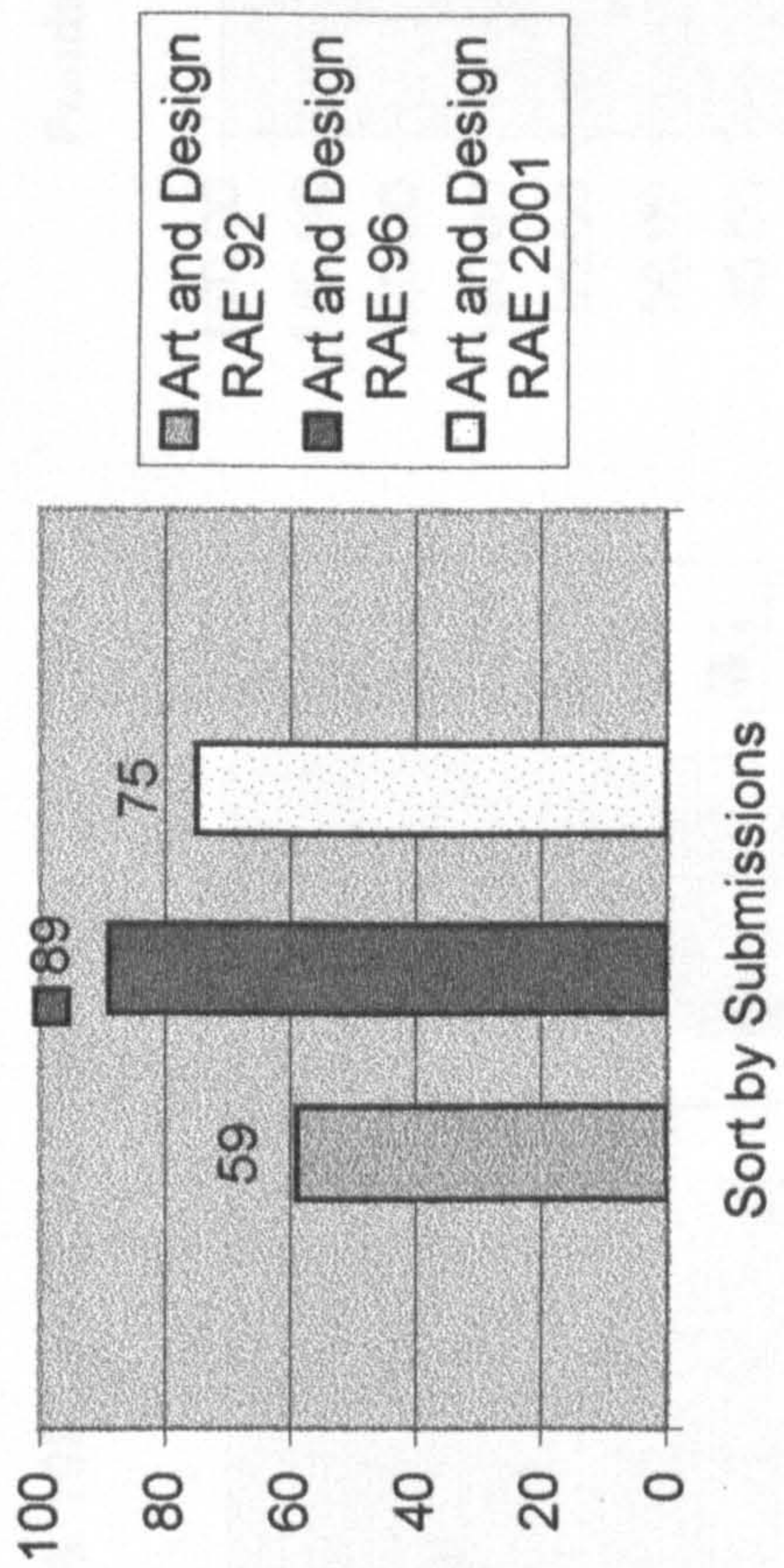
ranking	Listing of RAE's 2001 Units of Assessment (UoA)	number of Submissions	number of 5* achieved	number of 5 achieved	number of 5* achieved	Output based on Category A & A* Research Active Staff (FTE)	output to submissions	top rating achieved score (5*+5)
1	5 Pre-Clinical Studies	6	2	4	164.4	27.4	100.0	
2	17 Veterinary Science	6	6	0	346.4	57.7	100.0	
3	6 Anatomy	7	3	3	150.3	21.5	85.7	
4	1 Clinical Laboratory Sciences	57	21	22	1741.0	30.5	75.4	
5	44 Accountancy	20	2	12	218.2	10.9	70.0	
6	9 Pharmacy	12	2	6	418.0	34.8	66.7	
7	31 Mineral and Mining Engineering	3	2	0	81.6	27.2	66.7	
8	49 Celtic Studies	15	4	6	92.2	6.1	66.7	
9	37 Anthropology	20	2	11	285.5	14.3	65.0	
10	46 Middle Eastern and African Studies	11	2	5	128.9	11.7	63.6	
11	36 Law	60	8	30	1352.9	22.5	63.3	
12	22 Pure Mathematics	47	4	25	509.5	10.8	61.7	
13	3 Hospital Based Clinical Subjects	82	26	24	3483.0	42.5	61.0	
14	57 Classics and Ancient History	26	6	9	346.5	13.3	57.7	
15	19 Physics	50	5	23	1668.2	33.4	56.0	
16	20 Earth Sciences	25	3	11	561.5	22.5	56.0	
17	8 Pharmacology	9	2	3	178.9	19.9	55.6	
18	14 Biological Sciences	76	11	30	2416.7	31.8	53.9	
19	47 Asian Studies	13	2	5	129.4	10.0	53.8	
20	23 Applied Mathematics	58	6	25	734.7	12.7	53.4	
21	54 Russian, Slavonic and East European Languages	17	3	6	77.3	4.5	52.9	
22	28 Civil Engineering	31	5	11	518.0	16.7	51.6	
23	56 Linguistics	24	4	8	210.3	8.8	50.0	
24	58 Archaeology	26	3	10	482.6	18.6	50.0	
25	62 Philosophy	44	6	16	459.9	10.5	50.0	
26	4 Clinical Dentistry	14	2	5	424.9	30.4	50.0	
27	53 Italian	19	6	3	103.4	5.4	47.4	
28	29 Electrical and Electronic Engineering	45	6	15	862.8	19.2	46.7	
29	51 French	43	6	14	446.0	10.4	46.5	
30	63 Theology, Divinity and Religious Studies	43	4	16	438.8	10.2	46.5	
31	50 English Language and Literature	89	14	27	1519.4	17.1	46.1	
32	24 Statistics and Operational Research	46	6	15	386.6	8.4	45.7	
33	7 Physiology	11	1	4	249.6	22.7	45.5	







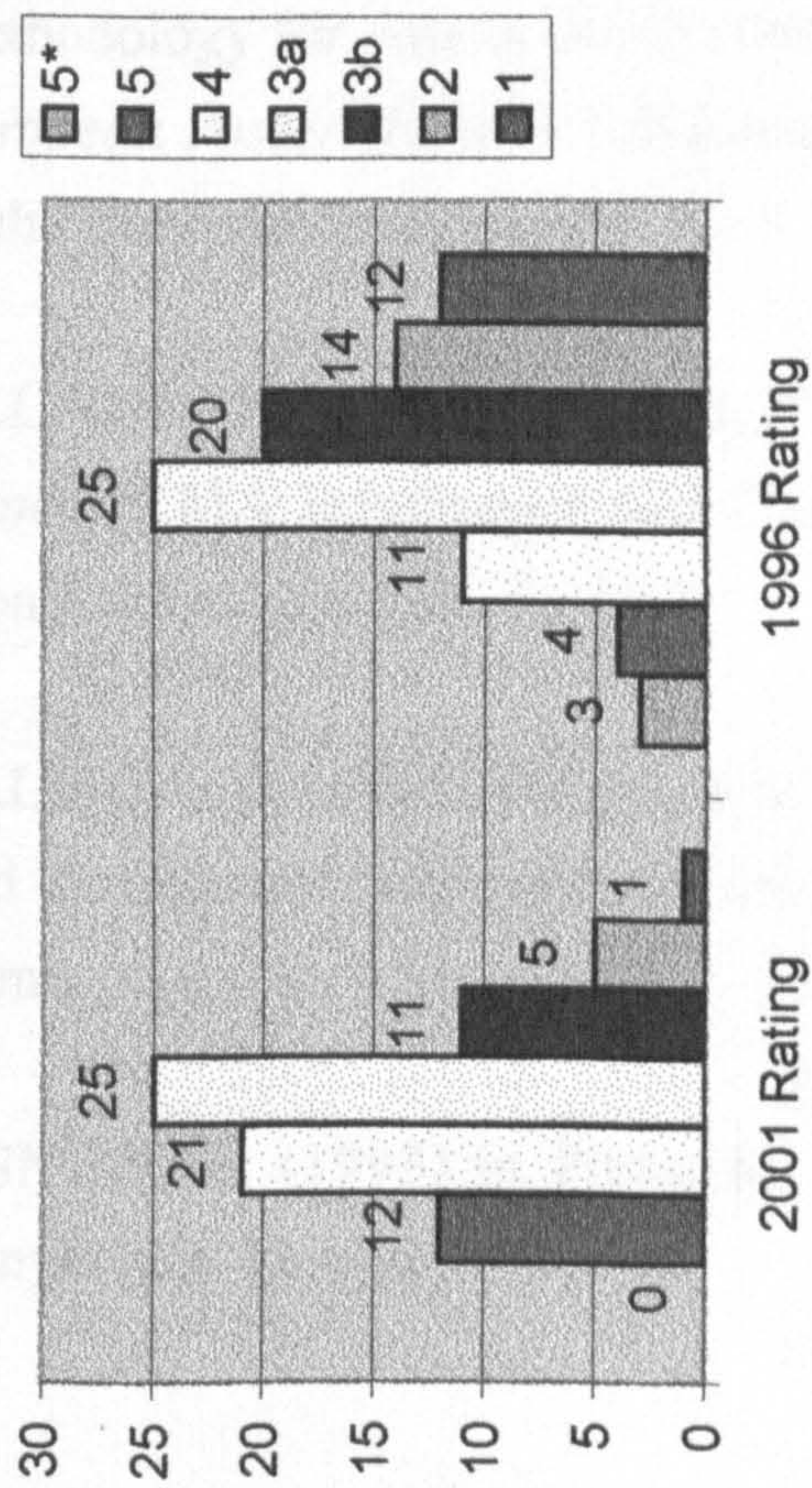
# 11. Listing of RAE's UoA Sorted by Submission & Output



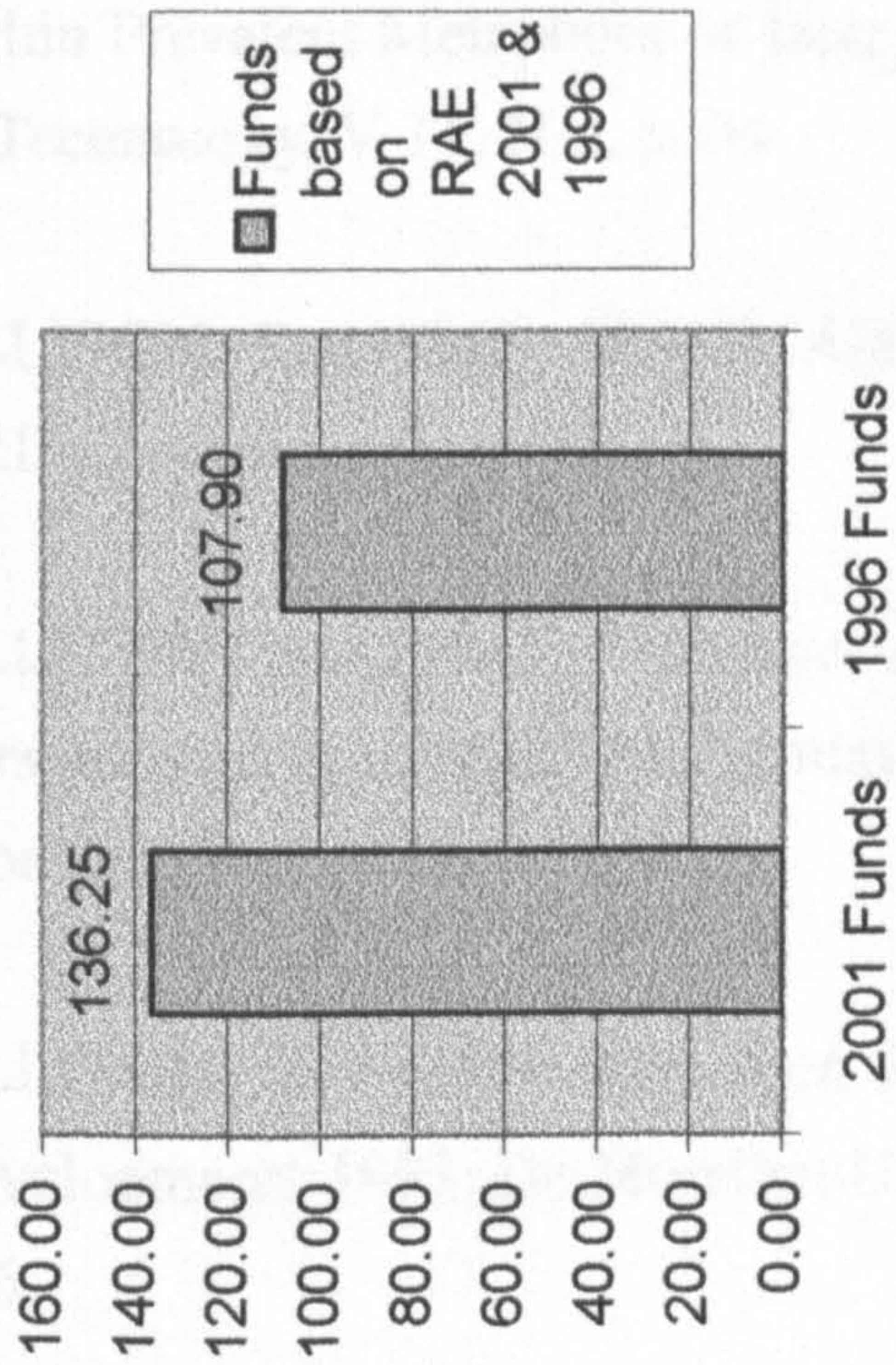


# 12. Listing of RAE's 2001 & 1996 Ratings & Funds

2001 & 1996 RAE Ratings



Funds based on RAE 2001 & 1996



RAE rating	funding weight	2001 Rating	1996 Rating
5*	4.05	0	3
5	3.375	12	4
4	2.25	21	11
3a	1.5	25	25
3b	1	11	20
2	0	5	14
1	0	1	12

2001 Funds	1996 Funds
136.25	107.90

Comparison of 2001 & 1996
26.27%



## References

- AIKEN, P. H. (1996). *Data Reverse Engineering: Slaying the Legacy Dragon, USA: Computing McGraw-Hill*, p. 35
- ALEXANDER, C. (1964) in Coyne, R. and Snodgrass, A. (1995). Problem Setting within Prevalent Metaphors of Design, *Design Issues*, MA: The Massachusetts Institute of Technology, V 11, N 2, p. 34
- ALLISON, B. (1996). *ARIAD, Allison Research Index of Art and Design*, Leicester: ARIAD Associates, unpagged
- ALLISON, B. (1994). *Professional Attitudes and Data Sources: An International Perspective*, National Art Education Association, Baltimore: unpublished paper, unpagged, April 1994
- ALLISON, B. (1993). *Research Methods*, Leicester: Student Learning Resources Developments 1993, De Montfort University Library and Enterprise Learning Initiative, p. 6
- ALLISON, B. (1992) in Gray, C. and Malins, J. (1993). *Research Procedures / Methodology for Artists and Designers, Principles and Definitions, Five Papers by the European Postgraduate Art & Design Group*, UK: Winchester School of Art on behalf of the European Postgraduate Art & Design Group, p.30
- ALLISON, B. (1991) in Bessis, N. (1995). *Documentation in Design: A Cause for Concern*, MA Information and Graphic Design Report, (unpublished), Leicester: De Montfort University, p. 1
- ALLISON, B. (1990). *Research in Art and Design: Research Problems, Programmes and Databases*, *International Journal of Technology and Design Education*, UK: Trentham Books, spring 1990
- AGNEW, K. (1993) in Press, M. (1995). *Its Research, Jim..., Co-Design*, Milton Kenyes: Co- Design, N 2, p. 34



- ARCHER, B. (1995). The Nature of Research, *Co-Design*, Milton Kenyes: Co-Design, N 2, p. 5-7, 10
- ARCHER, B. (1986) in Cross, N. (1986). Understanding Design: The Lessons of Design Methodology, *Design Methods and Theories, Journal of the DMG*, CA: Design Methods Group, V 20, N 2, p. 413
- ARCHER, B. (1983). *Systematic Method for Designers*, London: Royal College of Art, reprinted from *Design. (1963 / 1964)*, p. 5-6
- ARCHER, B. (1983) in Cross, N. (1996). *Engineering Design Methods: Strategies for Product Design*, 2nd ed., Chichester: John Wiley & Sons, p. 25
- ART, DESIGN, ARCHITECTURE AND MEDIA INFORMATION GATEWAY - ADAM. (1996). *The ADAM Project: An Information Gateway to Quality - Assured Resources on the Internet in Art, Design, Architecture*, 'http://www.adam.ac.uk'
- AVISON and FITZGERALD (1995) in Checkland, P. and Holwell, S. (1998). *Information, Systems and Information Systems - making sense of the field*, Chichester: John Wiley & Sons, p. 95
- AYRE, CALLAGHAN, HOFFOS (1996) in Brown, M. and Honeycutt, J. (1997). *Special Edition Using HTML 3.2*, 3rd ed., IN: Que Corporation, p. 592
- BACON, F. (1597) in Raivio, K. (1996). Est Potestas Ipsa Scientia, *Form Function Filand*, Filand: Nurminen and Gardberg, April (4), N 64, p. 6
- BACON, F. in Copp, N. and Zanella, A. (1993). *Discovery, Innovation and Risk: Case Studies in Science & Technology*, USA: Massachusetts Institute of Technology, p. 378
- BALL, C. (1993). Modern Miracles by the Sort Rule, *The Times Higher Educational Supplement*, UK: Times, N 1079, July 9th
- BALL-ROKEACH, S. and DEFLEUR, M. L. (1976) in McQuail, D. and Windahl, S. (1981) *Communication Models, for the study of mass communication*, NY: Longman Inc., p. 65-67



- BANATHY, B. H. (1994) in Trappl, R. (ed). *Building a Design Culture, Cybernetics and System 94*, Publ: World Scientific, p. 423 - 428
- BATES, M. (1986) in Marchionini, G. (1995). *Information Seeking in Electronic Environment, Cambridge Series on Human-Computer Interaction*; Cambridge: University of Cambridge, p. 87
- BATH INFORMATION AND DATA SERVICES - BIDS. (1995). *User Guide, Inside Information*, GB: British Library, unpagged
- BAYA and LEIFER (1996) in Cross, N., Christiaans, H. & Dorst, K. (eds) (1996). *Analysing Design Activity*, Chichester: John Wiley & Sons Ltd, p. 151-152
- BEHESHTI, J. (1992) in Marchionini, G. (1995). *Information Seeking in Electronic Environment, Cambridge Series on Human-Computer Interaction*; Cambridge: University of Cambridge, p. 121
- BELKIN, N. J. (1978). Information Concepts for Information Science, *Journal of Documentation*, V 34, N 10, p. 55-85
- BELKIN, N. J. (1980). Anomalous States of Knowledge as a Basis for Information Retrieval, *Canadian Journal of Information Science*, N 5, p. 133-144
- BENYON, D. (1997). *Information and Data Modelling*, 2nd ed., London: McGraw-Hill Companies, p. 2-3, 6-7, 52
- BESSIS, N. and ROBERTSON, A. (1995). Connecting Value Through Documentation of the Design Process, *Connecting Value, Symposium Proceedings, 7th International Forum on Design Management Research and Education, July 9-12, 1995*, Stanford: The Design Management Institute, unpagged
- BHI (1996). *Guide to British Humanities Index Database*, Leicester: De Montfort University Library, unpagged
- BOORSTIN, D. (1985). *The Discoverers*, New York: Random House, p. 394
- BORGMAN, C. L. (1986) in Marchionini, G. (1995). *Information Seeking in Electronic*



- Environment, Cambridge Series on Human-Computer Interaction; Cambridge: University of Cambridge, p. 87*
- BRADBURY, D. (1998). Against the Tide of Data, *Information Week*, 4 November 1998, London: CMP Media (UK) Ltd, N 44, p. 28
- BRADDOCK, R. (1958) in McQuail, D. and Windahl, S. (1981) *Communication Models, for the study of mass communication*, NY: Longman Inc., p. 11
- BRINKLEY, M. and BURKE, M. (1995). Information Retrieval from the Internet: An Evaluation of the Tools, *Internet Research: Electronic Networking Applications and Policy*, UK: MCB, University Press, V 5, N 3, p. 4, 7
- BROWN, M. and HONEYCUTT, J. (1997). *Special Edition Using HTML 3.2*, 3rd ed., IN: Que Corporation, p.10-12, 496, 851
- BUCKLAND, M. (1991). *Information and Information Systems*, NY: Praeger
- BUI, T. and LEE, J. (1999). An Agent-based Framework for Building Decision Support Systems, *Decision Support Systems, The International Journal*, Amsterdam: North-Holland, Elsevier Science B. V., V 25 (April 1999), N 3, p. 226, 228
- BULOW, I., VON (1989) in Checkland, J. and Scholes, J. (1991). *Soft Systems Methodology in Action*, Chichester: John Wiley & Sons, p. 28
- CHECKLAND, P. (1995). Soft Systems Methodology and its Relevance to the Development of Information Systems, in Stowell, F. A. ed., (1995), *Information Systems Provision: The Contribution of Soft Systems Methodology*, London: McGraw-Hill Book Company, p. 6
- CHECKLAND, P. (1988) in Checkland, P. and Scholes, J. (1991). *Soft Systems Methodology in Action*, Chichester: John Wiley and Sons, p. 27-29
- CHECKLAND, P. (1981). *Systems Thinking, Systems Practice*, Chichester: John Wiley & Sons



- CHECKLAND, P. and HOLWELL, S. (1998). *Information, Systems and Information Systems - making sense of the field*, Chichester: John Wiley & Sons, p. 18, 48
- CHECKLAND, P. and SCHOLES, J. (1991). *Soft Systems Methodology in Action*, Chichester: John Wiley & Sons, p. 1, 18, 25, 27, 43, 49, 52, 74, 76, 138, 146, 170, 244
- CHECKLAND, P. and SCHOLES, J. (1999). *Soft Systems Methodology in Action, Includes a 30 - year Retrospective*, Chichester: John Wiley & Sons, p. 29, 43-44, 52, 74, 76, 138, 146, 170, 244
- CHECKLAND, P. and GRIFFIN, R. (1970) in Checkland, P. (1995). *Soft Systems Methodology and its Relevance to the Development of Information Systems*, in Stowell, F. A. ed., (1995), *Information Systems Provision: The Contribution of Soft Systems Methodology*, London: McGraw-Hill Book Company, p. 1-17
- CHRISTIE, B. (ed.), (1985). *Human Factors of the User-System Interface, A Report on an ESPRIT Preparation Study*, Amsterdam: North-Holland, Elsevier Science Publishers B. V., p. 1, 38
- CLARE and LOUCOPOULOS (1987) in Checkland, P. and Holwell, S. (1998). *Information, Systems and Information Systems - making sense of the field*, Chichester: John Wiley & Sons, p. 95
- CLARKE, N. (1995). On-Line and On-Song: CMC within Graphic Design, *Co-Design*, Milton Kenyes: Co- Design, N 4, p. 26-27, 29
- COMMITTEE of SCOTTISH UNIVERSITY PRINCIPALS (1992). *Teaching and Learning in an Expanding Higher Education System: Report of a Working Party of the Committee of Scottish University Principals*, Lasswade, Midlothian: Polton House Press, unpagged
- CONSOLIDATED ON-LINE PUBLIC ACCESS CATALOGUE - COPAC. (1998). *User Guide for the Web Interface*, September 1988, Manchester: The University of Manchester, unpagged
- COOPER, R. (1995). Setting a Research Framework, *Co-Design*, Milton Kenyes: Co-Design, N 2, p. 14, 17, 19



- COOPER, R. and PRESS, M. (1995). *The Design Agenda: A Guide to Successful Design Management*, Chichester: John Wiley & Sons Ltd, p. 7
- CROFT, W. B. and TURTLE, H. (1993) in in Tsinakos, A. A. and Margaritis, K. G. (1996). Mentor Internet Search Advisor and Information Retrieval System, *Proceedings of WebNet 96 - World Conference of the Web Society, Oct. 1996*, San Francisco USA: Association for the Advancement of Computing in Education, p. 583-584
- CROSS, N. (1996). *Engineering Design Methods: Strategies for Product Design*, 2nd ed., Chichester: John Wiley & Sons, p. 19-25
- CROSS, N., CHRISTIAANS, H. and DORST, K. (eds), (1996). *Analysing Design Activity*, Chichester: John Wiley & Sons Ltd, p. 255
- CRIB (1996). *Guide to Current Research In Britain Database*, Leicester: De Montfort University Library, unpagged
- CTI (1996). *Guide to Current Technology Index Database*, Leicester: De Montfort University Library, unpagged
- DANCE, F. E. X. (1969) A Helical Model of Communication in Dance, F. E. X. (ed.), *Human Communication Theory*, NY: Holt, Rinehart and Winston
- DEFLEUR, M. L. (1966) *Theories of Mass Communication*, NY: David McKay
- DERVIN, B. (1992) in Waldron, M. & Brooks, R., (1994). Analysing Inter and Intra Group Information Exchanges in Conceptual Collaborative Design, *Design Theory and Methodology - DTM '94, The 1994 ASME Design Technical Conferences - 6th International Conference on Design Theory and Methodology, Minneapolis, Minnesota, September 11-14, 1994* by Hight, T. K. and Mistree, F. (eds), NY: The American Society of Mechanical Engineers, DE - V 68, p. 242
- DIX, A. FINLAY, J. ABOWD G. and BEALE, R. (1993). *Human-Computer Interaction*, Cambridge: Prentice Hall International (UK) Limited, p. 375
- DOHOHEW, L. and TRIPTON, L. (1973) A Conceptual Model of Information Seeking,



Avoiding and Processing, in Clarke, P. (ed.), *New Models for Communication Research*, Beverly Hills: Sage Publications

DORST, K. and DIJKHUIS, J. (1996) in Cross, N., Christiaans, H. & Dorst, K. (eds) (1996). *Analysing Design Activity*, Chichester: John Wiley & Sons Ltd, p. 253, 255

DORST, K. and DIJKHUIS, J. (1995). Comparing Paradigms for Describing Design Activity, *Design Studies*, GB: Elsevier Science Ltd, V 16, N 2, p. 261

DOYLE (1992) in Slaughter, B. and Knupp, E. (1996). *Proceedings of WebNet 96 - World Conference of the Web Society, Oct. 1996*, San Francisco USA: Association for the Advancement of Computing in Education

DYCE, R. (2000). FileMaker Pro 5.0, *MacUser*, 26 May 2000, London: Dennis Publishing Ltd, Vol 16, No11, pp. 69 - 74

EDER, W. E. (1995). Engineering Design - Art, Science and Relationships, *Design Studies*, GB: Elsevier Science Ltd, V 16, N 1, p. 117

ENDINBURGH ENGINEERING VIRTUAL LIBRARY - EEVL. (1996). *The UK Gateway to Engineering Information on the Internet*, 'http://www.eevl.ac.uk/welcome.html'

EUROPEAN DESIGN CONGRESS (1992) in Mistry, B. (1994). Design Centres Pool Resources, *Design Week*, 2nd Sep, V 9, N 34, p. 2

EVANS, D. (1990). *People, Communication and Organisations*, 2nd ed., London: Financial Times Management, p. 25, 32-33

FEILER, J. (1999). *File Maker Pro and the World Wide Web*, CA: Academic Press, p. 14, 83

FISHER, P. (1999). *How to buy a PC*, London: PC Advisor / IDG Communications, p. 33-34

FORBES, P. and CHECKLAND, P. (1987) in Checkland, P. and Scholes, J. (1991). *Soft Systems Methodology in Action*, Chichester: John Wiley & Sons, p. 39



- FRAYLING, C. (1993/94). Research in Art and Design, *Royal College of Art Research Papers*, London: Royal College of Art, V 1, N1, p 1 - 5
- FRENCH (1985) in Cross, N. (1996). *Engineering Design Methods: Strategies for Product Design*, 2nd ed., Chichester: John Wiley & Sons, p. 21
- FRIEDMAN, K. (1997). Design Science and Design Education, *Norwegian School of Management Research Report Series*, Oslo: Norwegian School of Management, unpagged
- FRIGGENS, G. (1998). *Design and Applied Art Index on CD-ROM*, Leicester: ACES Team, Kimberlin Library, De Montfort University, unpagged
- FRISSE, M. E. and COUSINS, S. B. (1989) in Tsinakos, A. A. and Margaritis, K. G. (1996). Mentor Internet Search Advisor and Information Retrieval System, *Proceedings of WebNet 96 - World Conference of the Web Society, Oct. 1996*, San Francisco USA: Association for the Advancement of Computing in Education, p. 583-584
- G7 SUMMIT BRUSSEL, (1995). G7 Information Society Conference, Theme Paper, *Main Documents from the G7 Summit, 25-26.02.1995*, Brussel: European Commission, Directorate General XIII, p. 3
- GALLANT (1982) in Checkland, P. and Holwell, S. (1998). *Information, Systems and Information Systems - making sense of the field*, Chichester: John Wiley & Sons, p. 95
- GALLIERS, R. (1987). *Information Analysis: Selected Readings*, Sydney: Addison-Wesley, p. 4
- GERBNER, G. (1967) Mass Media and Human Communication Theory' in Dance, F.E.X. (ed.), *Human Communication Theory*, NY: Holt, Rinehart and Winston
- GRAY, C. (1993) in Gray, C. and Malins, J. (1993). Research Procedures / Methodology for Artists and Designers, *Principles and Definitions, Five Papers by the European Postgraduate Art & Design Group*, UK: Winchester School of Art on behalf of the European Postgraduate Art & Design Group, p. 30
- GRAY, C. and MALINS, J. (1993). Research Procedures / Methodology for Artists and



Designers, *Principles and Definitions, Five Papers by the European Postgraduate Art & Design Group*, UK: Winchester School of Art on behalf of the European Postgraduate Art & Design Group, p.29-30

GRONEMAN, N., MERONEY, J., and WOHL, A. (1991). *Information Systems Applications, Evaluation, and Selection*, California: Office Systems Research Association and South-Western Publishing CO, p. 74

GROSSMAN, W. (1999). Into the Fast Lane for Facts, Start Up the Engine and Get Motoring, *Financial Mail on Sunday*, GB: London, February 21, 1999, p.52

GROSS, ERVIN, ANDERSON and FLEISHER (1988) in Young, R. A. (1989), *A Refinement of the Design Process through an Investigation of the Factors which affected the Design of a Communications Console*, York: unpublished PhD Thesis, University of York, p. 315-316

GUILFORD and KRAYNAK, J. (1998). *Netscape Communicator 4, 6 in 1*, IN: Que Corporation, p. 189

GULBRANSEN, D. and RAWLINGS, K. (1997). *Special Edition Using Dynamic HTML*, IN: Que Corporation, p. 8, 14

HALASZ, F. (1988). Reflections on Notecards: Seven Issues for the Next Generation of Hypermedia Systems, *Communications of the ACM*, NY: Association for Computing Machinery, V 31, N 7, July 1988, p. 845 -846

HANCOCK-BEAULIER, M. (1992). Query Expansion: Advances in Research in On-line Catalogues, *Journal of Information Science*, V 18, p. 99-103

HAROLD, E. R. (1998). *XML: Extensive Markup Language*, USA: IDG Inc., p. 3-4, 8, 17-21, 399-407

HAUBEN, R. (1993) in Hardy, H. E. (1993). *The History of the Net*, MA Unpublished Thesis, Grand Valley State University: '<http://www.ocean.ic.net/ftp/doc/nethist.html>'

HAYER, REICH and DRUCKER (1998) in Reimoller, (1998). Knowledge Creation and Product Planning, Design Management as a Catalyst of Innovation, *Formdiskrs -*



*Journal of Design and Design Theory*, V 4, N I, 1998, Germany, p. 55

HEAPS, H. S. (1978). *Information Retrieval: Computational and Theoretical Aspects*, London: Academic Press, p. 263

HICKS (1993) in Checkland, P. and Holwell, S. (1998). *Information, Systems and Information Systems - making sense of the field*, Chichester: John Wiley & Sons, p. 95

HIRSCHHEIM, R. and KLEIN, H. (1989) in Mingers, J. (1995). Using Soft Systems Methodology in the Design of Information Systems, in Stowell, F. A. (ed), (1995). *Information Systems Provision: the Contribution of Soft Systems Methodology*, Berkshire: McGraw-Hill Book Company Europe, p. 20

HIROSE, A., CANNON, D. M., and LEIFER, L. J. (1994). Development of a Prototype Design Process Recorder based on Hypergraphs, *Design Theory and Methodology - DTM '94, The 1994 ASME Design Technical Conferences - 6th International Conference on Design Theory and Methodology, Minneapolis, Minnesota, September 11-14, 1994* by Hight, T. K. and Mistree, F. (eds), NY: The American Society of Mechanical Engineers, DE - V 68, p. 259

HIX and HARTSON (1993) in Newman, W. M. and Lamming, M. G. (1995). *Interactive System Design*, Cambridge: Addison-Wesley Publishing Company, p. 190

HORTON, J. F. (1999). *User-Centred Methods for Information Systems: Introduction to Soft Systems Methodology*, Newcastle: University of Northumbria, Dep. of Computing, p. 2, 7

HOUGHTON, C. R. (1986). Designing User Interfaces: A key to System Success, *Journal of Information Systems Management*, p. 57

HUMPREY, S. M. and MELLONI, B. J. (1986). *Databases: A Primer for Retrieving Information by Computer*, USA: Prentice-Hall, Inc.

JONES, C. J. (1963) in Cross, N. (1986). Understanding Design: The Lessons of Design Methodology, *Design Methods and Theories, Journal of the DMG*, CA: Design Methods Group, V 20, N 2, p. 411, 415

INGRAM, P. (1999). Your Mission, Should You Choose To Accept It..., *Knowledge*



- Management: The Magazine for Knowledge Professionals*, Oxford: Learned Information Europe Ltd, p.31
- INSPEC (1996). *Guide to INSPEC Database*, Leicester: De Montfort University Library, unpagged
- JUSTICE, L. (1995). On-line vs CD-ROM Technologies: The Shades of Gray in Between, *Design Management Journal*, Fall 1995, p. 65-66
- KALAKOTA, R. and WHINSTON, A. (1996). *The Frontiers of Electronic Commerce*, Addison-Wesley
- KATZ, W. A. (1987). *Introduction to Reference Work*, 5th ed., V 1: Basic Information Sources, V 2: Reference Services and References Processes, NY: McGraw-Hill
- KERR, E., B. and HILTZ, S. R. (1982). *Computer-Mediated Communication Systems: Status and Evaluation*, NY: Academic Press, pp. 162, 164, 168
- KIM and MAUBORGNE (1997) in Reimoller, (1998). Knowledge Creation and Product Planning, Design Management as a Catalyst of Innovation, *Formdiskrs - Journal of Design and Design Theory*, V 4, N I,1998, Germany, p. 67
- KORVENMAA, P. and JAMES, M. (1993). The Nature and Role of Research in Postgraduate Art and Design Education, *Principles and Definitions, Five Papers by the European Postgraduate Art & Design Group*, UK: Winchester School of Art on behalf of the European Postgraduate Art & Design Group, p.22-23, 28
- KUHN, S. T. (1970). *The Structure of Scientific Revolutions*, 2nd ed., Chicago: University of Chicago Press
- LANDER, E. S., LANGRIDGE, R. and SACCOCIO, D. M., (1991). Mapping and Interpreting biological Information, *Communications of the ACM*, NY: Association for Computing Machinery, V 34, N 11, p. 34
- LASSWELL, H. D. (1948) The Structure and Function of Communication in Society, in Bryson (ed.), *The Communication of Ideas*, NY: Harper and Brothers



- LAUDON and LAUDON (1991) in Checkland, P. and Holwell, S. (1998). *Information, Systems and Information Systems - making sense of the field*, Chichester: John Wiley & Sons, p. 95
- LUCAS, H. (1975). *Why Information Systems Fail*, NY: Columbia University Press
- LUCEY, T. (1991). *Management Information Systems*, 6th ed., UK: Guernsey Press Co Ltd, p. 13 - 23, 29, 160, 263-265
- MACDONALD (1986) in Anderson A. J. (1987). *Communication Research: Issues and Methods*, NY: McGraw-Hill Series
- MADDIX, F. (1990). *Human- Computer Interaction, Theory and Practice*, Chichester: Ellis Horwood, p. 82
- MAID. (1996). *Multimedia Assets for Industrial Design, Telematics Application Programme, Information Engineering, European Commission DGXIII*, London: Centre for International Technology and Education, The London Institute London College of Printing, '<http://www.lond-inst.ac.uk/cite>'
- MAILBASE (1999). '<http://www.mailbase.ac.uk/lists>'
- MARCHIONINI, G. (1995). *Information Seeking in Electronic Environment, Cambridge Series on Human-Computer Interaction*; Cambridge: University of Cambridge, p. 1, 4-6, 38, 49-50, 87, 140, 148, 162, 188
- MCQUAIL, D. and WINDAHL, S. (1981) *Communication Models, for the study of mass communication*, NY: Longman Inc., p. 2-3, 5
- MEADOWS, A. J. (1974). *Communication in Science*, London: Butterworth & Co Publishers Ltd, p. 91-93, 107
- MERRIAM-WEBSTER, INC. (1993). *Merriam-Webster's Collegiate Dictionary*, 10th ed, MA: Springfield, p. 647
- MILES, R. K. (1988) in Checkland, P. (1995). *Soft Systems Methodology and its Relevance to the Development of Information Systems*, in Stowell, F. A. (ed.), (1995),



- Information Systems Provision: The Contribution of Soft Systems Methodology*, London: McGraw-Hill Book Company, p. 1-17
- MINGERS, J. (1995). Using Soft Systems Methodology in the Design of Information Systems, in Stowell, F. A. (ed), (1995). *Information Systems Provision: the Contribution of Soft Systems Methodology*, Berkshire: McGraw-Hill Book Company Europe, p. 19, 20, 25, 27, 29-39, 42-43
- MIRABITO, M. (1994). *The New Communication Technologies*, 2nd ed., Newton, MA: Focal Press, p. 2, 59
- MOCKFORD, C. and TORRENS, G. (1997) in Smith, J. S. (ed), *IDATER 97, International Conference on Design and Technology Educational Research and Curriculum Development*, Loughborough: Department of Design and Technology, Loughborough University, p.161-162
- MORROW, V. (1999). Network If You Can Get It, Editorial, *Knowledge Management: The Magazine for Knowledge Professionals*, Oxford: Learned Information Europe Ltd, p. 3
- NEOU, V. and RECKER, M. (1996). *HTML CD, An Internet Publishing Toolkit for Windows*, NJ: Prentice Hall Inc., p. xv, 1, 4, 44, 50-55, 105, 285, 295-296
- NEWBURY, D. (1996). *Research Perspectives in Art and Design*, Birmingham: University of Central England, The Research Training Initiative, p. 8-10, 12
- NEWBURY, D. (1996). *Information Searching in Art and Design*, Birmingham: University of Central England, The Research Training Initiative, p. 10-14, 21-28
- NEWBURY, D. (1995). *Research Perspectives in Art and Design*, Birmingham: University of Central England, The Research Training Initiative, p. 45
- NEWMAN, W. M. and LAMMING, M. G. (1995). *Interactive System Design*, Cambridge: Addison-Wesley Publishing Company, p. 190
- NIELSEN, J. (1993). *Usability Engineering*, Boston: Academic Press, p. 18



- NOYAKA and TAKEUCHI (1998) in Reimoller, (1998) in Reimoller, (1998). Knowledge Creation and Product Planning, Design Management as a Catalyst of Innovation, *Formdiskrs - Journal of Design and Design Theory*, V 4, N 1, 1998, Germany, p. 55
- NORUSIS, M. J. (1994), *SPSS 6.1, Base System User's Guide, Part 2, Macintosh Version*, USA: SPSS Inc.
- OAKLEY, M. (ed), (1990). *Design Management: A Handbook of Issues and Methods*, Oxford: Basil Blackwell Ltd, p. 10 - 11
- O'REILLY, T. (1995) in Honeywill, P., Thorn, T., Vranich, A. & Philips, M., (1995), The Virtual Studio: Collaboration through Digital Networks, *Intelligent Tutoring Media*, UK: Intellect Ltd, V 6, N 2, p. 63
- OWEN, C. (1998). Design Research: Building the Knowledge Base, *Design Studies*, Great Britain: Elsevier Science Ltd, V 19, N 1, p. 9 - 11
- PAO, M. L. (1989) in Brinkley, M. and Burke, M. (1995). Information Retrieval from the Internet: An Evaluation of the Tools, *Internet Research: Electronic Networking Applications and Policy*, UK: MCB, University Press, V 5, N 3, p.4, 7
- PATCHING, D. (1995). *Practical Soft Systems Analysis*, London: Pitman Publ., p. 9
- PARNAS, D. L. and CLEMENTS, P. C. (1986). A Rational Design Process: How and Why to Fake it, *IEEE Transactions on Software Engineering*, UK: IEEE, V SE12, p. 251-257
- PASMAN, G. and MULLER, W. (1995). Using Precedents in the Form - Creation Phase of the Industrial Design Process: A Typological Approach, *Design Interfaces Proceedings, 11-13 April 1995*, Salford: The European Academy of Designers, V 1 (Product Design, Graphic Design), unpagged
- PECHURA, C. M. and MARTIN, J. B. (1991). *Mapping the Brain and its Functions: Integrating Enabling Technologies into Neuroscience Research*, Washington: National Academy Press, p. 84



- POPPER, K. (1983). *The Logic of Scientific Discovery*, 11th impression February 1983, London: Hutchinson & Co Publishers Ltd, p. 59
- PRESS, M. (1995). Its Research, Jim..., *Co-Design*, Milton Kenyes: Co- Design, N 2, p. 34, 38
- RAE (2002). *Research Assessment Exercise*, <http://www.rae.ac.uk>
- RAIVIO, K. (1996). Est Potestas Ipsa Scientia, *Form Function Filand*, Filand: Nurminen and Gardberg, April (4), N 64, p. 6
- RESEARCH DEGREE REGULATIONS (1998). *Research Degree Regulations and Associated Research Degree Procedures of De Montfort University*, Leicester: De Montfort University, p. 3
- ROBBIN, A. (1995). SIPP ACCESS, an Information System for Complex Data: a Case Study creating a Collaboratory for the Social Sciences, *Internet Research: Electronic Networking Applications and Policy*, UK: MCB, University Press, V 5, N 2, p. 38, 40, 42
- ROGERS, E. M. (1976) in McQuail, D. and Windahl, S. (1981) *Communication Models, for the study of mass communication*, NY: Longman Inc., p. 70
- ROSEN, R. (1986) in Crowe, M., Beeby, R. and Gammack, J. (1996). *Information Systems and Information: A Process View*, London: McGraw-Hill Companies, p. 34
- ROSS, D. S. (1969). The Role of Universities in Industrial Innovation, *Proceedings of the first International Conference on Product Development and Manufacturing Technology, University of Strathclyde*, September 1969, London: MacDonald, p. 11
- RZEVSKI, G. (1995). Views from an Helicopter, *Co-Design*, Milton Kenyes: Co-Design, N 4, p. 9-10
- SARNOFF, D. (1964) in Kerr, E. B. and Hiltz, S. R. (1982). *Computer-Mediated Communication Systems: Status and Evaluation*, NY: Academic Press, p. 89
- SAVAGE, A. and MINGERS, J. (1996). A Framework for Linking Soft Systems Methodology (SSM) and Jackson System Development (JSD), *Information Systems*



*Journal*, GB: Blackwell Science Ltd, p. 110, 112

SAVOY and DESBOIS (1991), in Tsinakos, A. A. and Margaritis, K. G. (1996). Mentor Internet Search Advisor and Information Retrieval System, *Proceedings of WebNet 96 - World Conference of the Web Society, Oct. 1996*, San Francisco USA: Association for the Advancement of Computing in Education, p. 583-584

SCHARTZ, B. R. (1992) in Robbin, A. (1995). SIPP ACCESS, an Information System for Complex Data: a Case Study creating a Collaboratory for the Social Sciences, *Internet Research: Electronic Networking Applications and Policy*, UK: MCB, University Press, V 5, N 2, p. 40

SHNEIDERMAN, B. (1992). *Designing the User Interface, Strategies for Effective Human-Computer Interaction*, 2nd ed., USA: Addison-Wesley Publishing Company, p. 54, 72, 478

SCHRAMM, W. (1954) *How Communication Works, The Process and Effects of Mass Communication*, Urbana: University of Illinois Press

SCRIVENER, S. (1999). Design Research as Reflection on Action and Practice, *Practice-based Research Seminar Paper*, Leicester: De Montfort University, p. 1

SEGAL, B. (1995). *A Short History of Internet Protocols at CERN*, April 1995, <http://wwwcn.cern.ch/pdp/ns/ben/TCPHIST.html>

SHANNON, C. and WEAVER, W. (1949) *The Mathematical Theory of Communication*, Urbana: University of Illinois Press

SHIMMIN, B. (1998) Beaming Apps to Desktops, *Information Week*, London: CMP Media (UK) Ltd, p. 57

SIMON, H. (1982). *The Sciences of the Artificial*, 2nd ed., Cambridge, Massachusetts: MIT Press, p. 129

SIRCOM, A. (1999). What id DVD? *Home Entertainment*, September 1999, London: Dennis Publishing Ltd, p. 4

SMYTH, D. S. and CHECKLAND, P. (1976) in Checkland, P. and Scholes, J. (1991).



*Soft Systems Methodology in Action*, Chichester: John Wiley and Sons, p. 35

SONNENWALD, D. H. (1996). Communication Roles that support Collaboration during the Design Process, *Design Studies*, Great Britain: Elsevier Science Ltd, V 17, N 3, p. 279

SPSS Inc. (1994), *SPSS 6.1, Base System User's Guide, Part 1, Macintosh Version*, USA: SPSS Inc.

STENROS, A. (1996). Knowledge - Makers, *Form Function Filand*, Filand: Nurminen and Gardberg, April (4), N 64, p. 4

STERLING, B. (1996). *A Short History of the Internet*, October 1996, [http://www.ecc.ksu.edu/~hazem/A\\_Short\\_History\\_of\\_the\\_Internet.html](http://www.ecc.ksu.edu/~hazem/A_Short_History_of_the_Internet.html)

STOWELL, F. A. (1985) in Mingers, J. (1995). Using Soft Systems Methodology in the Design of Information Systems, in Stowell, F. A. (ed), (1995). *Information Systems Provision: the Contribution of Soft Systems Methodology*, Berkshire: McGraw-Hill Book Company Europe, p. 18-50

TAYLOR, R. (1962) in Marchionini, G. (1995), *Information Seeking in Electronic Environment*, *Cambridge Series on Human-Computer Interaction*; Cambridge: University of Cambridge, p. 35

THEODORSON, S. A. and THEODORSON, A. G. (1969) *A Modern Dictionary of Sociology*, NY: Cassell

THIMBLEBY, H. (1995) in Tufnell, R. (1997). Designing Multimedia Resources for Design and Technology, *The Journal of Design and Technology Education, the Data Journal*, Autumn 1997, V 2, N 3, UK: DATA, The Design & Technology Assoc., p. 260

TSICHRITZIS and LOCHOVSKY (1982) in Benyon, D. (1997). *Information and Data Modelling*, 2nd ed., London: McGraw-Hill Companies, p. 3

TUBBY, M. and BEVAN, A. (1998). EDINA: Bibliographic Information for Art and Design, *Outline*, Issue 5, spring 1998, GB: CTI Art and Design, p. 44-45



- VAN DALLEN, D. B. (1979). *Understanding Educational Research: An Introduction*, 4th ed., NY: McGraw-Hill Book Company, pp. 130-131, 154-155, 158-159 and 225-281
- VAKKARI, P. (1996) in Olaisen, J., Munch-Pedersen, E., Wilson, P. (eds). *Library and Information Science: Content and Scope, Information Science: From the Development of the Discipline to Social Interaction*, Oslo: Scandinavian University Press, p. 169
- WAERN, Y. (1992) in Liu, Z. and Rada, R. (1995). *A Perspective of Human - Computer Communication based on Knowledge Separation, Intelligent Tutoring Media*, UK: ITM, Intellect, Ltd, V 6, N 1, p. 4
- WALDRON, M. B. and BROOKS, R. L. (1994). *Analysing Inter and Intra Group Information Exchanges in Conceptual Collaborative Design, Design Theory and Methodology - DTM '94, The 1994 ASME Design Technical Conferences - 6th International Conference on Design Theory and Methodology, Minneapolis, Minnesota, September 11-14, 1994* by Hight, T. K. and Mistree, F. (eds), NY: The American Society of Mechanical Engineers, DE - V 68, p. 242
- WALKER and DAGGER (1995). *Editorial Notes, Co-Design*, Milton Kenyes: Co-Design, N 2, p. 2
- WARD, A. (1998). *Seek and ye shall Find!*, *Computer Shopper*, June 1998, London: Dennis Publishing Ltd, p. 753
- WENHAM, M. (1998). *Art and science in Education: The Common Ground, Journal of Art and Design*, Great Britain: NSEAD and Blackwell Publishers, V 17, N 1, p. 63
- WILCOX, S. B. (1994). *A Usability Testing Primer, Innovation*, Spring 1994, Virginia: McLean, V 13, PT 1, p. 18
- WOOD, R. and DOYLE, K. (1989) in Savage, A. and Mingers, J. (1996). *A Framework for Linking Soft Systems Methodology (SSM) and Jackson System Development (JSD)*, *Information Systems Journal*, GB: Blackwell Science Ltd, p. 111
- WOOD-HARPER (1990) in Crowe, M., Beeby, R. and Gammack, J. (1996). *Information Systems and Information: A Process View*, London: McGraw-Hill Companies, p. 3



- WOODWARD, J. F. (1982). *Science in Industry - Science of Industry, An Introduction to the Management of Technology based Industry*, GB: Aberdeen University Press, p. 8, 180
- WRIGLEY, I. (1999). *The Web Now, The Essential Guide to Electronic Publishing and Multimedia on the Internet*, Berks: Macromedia, Inc., p. 82-98
- WU, Z., ZHAO, D., and RAMSDEN, A. (1994) From Automated Library to Electronic Library: Challenges for Information Retrieval, in Leon, R. (ed), *Information Retrieval, New Systems and Current Research, Proceedings of the 15th Research Colloquium of the British Computer Information Retrieval Specialist Group*, London: Taylor Graham Publishing, p. 25, 35
- WULF, W. (1989) in Robbin, A. (1995). SIPP ACCESS, an Information System for Complex Data: a Case Study creating a Collaboratory for the Social Sciences, *Internet Research: Electronic Networking Applications and Policy*, UK: MCB, University Press, V 5, N 2, p. 37
- WULF, W. (1993). in Robbin, A. (1995). SIPP ACCESS, an Information System for Complex Data: a Case Study creating a Collaboratory for the Social Sciences, *Internet Research: Electronic Networking Applications and Policy*, UK: MCB, University Press, V 5, N 2, p. 37
- YODER, E. AKSCYN, A. and McCRACKEN, D. (1989). Collaboration in KMS, A Shared Hypermedia System, CHI '89, *Wings for the Mind, Conference Proceedings*, by Bice, K. and Lewis, C. (eds.), Austin Texas, April 30 - May 4, 1989, NY: The Association for Computer Machinery, p. 39
- YOUNG, R. A. (1989). *A Refinement of the Design Process through an Investigation of the Factors which affected the Design of a Communications Console*, York: unpublished PhD Thesis, University of York, p. 316, 320, 394, 397-398
- ZIMAN, J. M. (1968) in MEADOWS, A. J. (1974). *Communication in Science*, London: Butterworth & Co Publishers Ltd, p. 37
- ZIMAN, J. M. (1968). *Public Knowledge: An Essay Concerning the Social Dimension of Science*, Cambridge: Cambridge University Press
- ZUBOFF, S. (1988). *In the Age of the Smart Machine*, NY: Basic Books, p. 395