# The Use of the SIR Database in Design and Technology

Steven Garner and Eddie Norman
*Loughborough University of Technology*

The availability of information within our society is an issue that has occupied much thought in recent years and has led to dramatic structural changes in the nature of work for a range of occupations from the medical to the City professions. Some of the most profound effects of this increased availability have been witnessed in the field of design where the manipulation of information has underpinned much of its activities. Various journals have sought to reflect this interest and to explore the role that information retrieval has to play in modern commercial practice,[1] but it is only in recent years that this debate has extended into the sphere of design education. The reduction in hardware costs has facilitated the introduction into schools of sophisticated information retrieval systems such as databases designed to run on microcomputers, and this paper seeks to explore the functioning of one such prototype system.

In the 1970's the information issue was focussed onto two concerns. Firstly that designers should exploit the growing volume of information then being made available and secondly the need for research into the relative success of each retrieval system. Phil Gray in 1979 illustrates the former concern in an article in the Design Council's journal DESIGN[2] when he outlines the Loughborough Consultants' model of exploiting University based expertise. In 1971, 1974 and 1977 the International Symposium on Information Systems for Designers held at the University of Southampton largely concerned itself with the education of engineers and designers in information retrieval with notable papers from Nordstrom,[3] Wall[4] and Benson.[5] With the stimulation of this interest there followed a diverse range of qualitative analysis, primarily through users trials which set out to open up the debate as to the relative success of the retrieval systems. Of interest here are the abilities and opinions of a number of leading designers recorded after exposure to Technotec and Dialtech and published in Design in 1977.[6] In general the verdict of this piece of research was that 'automatic design information systems will emerge as a powerful weapon in the designers' armoury over

the next decade'. Viewed from 1987 much of this prophecy has been realised but the potential of such systems within design education remains largely unexplored.

In November 1979 the British Library Research and Development Department brought together a number of educational practitioners, policy makers and advisers to discuss the potential of the use of computers in secondary schools. Computer based information retrieval systems will undoubtedly be regarded as commonplace by the next generation, and in order to help prepare the way the British Library awarded a number of grants between 1980 and 1982 to the Schools Information Retrieval (SIR) project which had been first discussed at the 1979 seminar. The intention of the project was to develop a microcomputer based information retrieval system and to assess its effectiveness. The resulting system — the SIR database — emulated the BLAISE-LINE on-line information retrieval system as closely as it was possible to get with the restrictions of a microcomputer. The keyword search can be constructed using AND, OR and NOT operators and the facilities include a search history review, term truncation and the ability to save searches and re-use them.

The original software was written to run on an RML380Z microcomputer and it was this version which was evaluated in six schools for various curriculum areas. The schools were provided with a specially prepared demonstration database on current world problems such as energy resources and pollution, and several schools developed their own databases during the project. A full report of these trials has been published.[7] In general the system proved very successful. The technology held few problems for pupils, even first and second years were able to explore its potential as well as sixth formers, but the project did reveal the need for teaching the broader aspects of information use and handling which has since been tackled by a number of projects supported by the British Library. One school did attempt to establish an Engineering database and abandoned a Design database, which led us to approach our study cautiously.

The version of SIR used for our trial was commissioned by the MEP to run on the BBC model B using a double-sided double disk drive. This version has been written building on the experience of the earlier work and incorporates a number of improvements. Supporting material in the form of wallcharts and a video will also soon be available to help explain the use of the system. The version we used was a preproduction version which still contained a few bugs, but nevertheless seemed to us to be the best available database for a number of reasons. Firstly, because a large number of schools are already committed to the BBC micros and money for classroom equipment is very short. Nevertheless, the school would be likely to have to invest in an adequate disk drive. Secondly, because the SIR project had approximately five years of development behind it, many successful trials in schools to its credit and supporting materials had already been commissioned. Thirdly, because the database structure enabled considerable flexibility — other databases could have been used but most have disadvantages which SIR has overcome, e.g. having to declare field lengths and having no facility to compact the information on the disk thus leaving a lot of 'empty space' or only being suitable for entering journal references. Any system likely to be of general use in Design and Technology must be able to cope with information of considerable variety. And finally, because a number of 'mini-databases' developed on floppy disks can be easily amalgamated on to a hard disk system using the many add-ons developed for the BBC micro by many companies. This had already been done by the MEP on a different application and in the long run provided us with a potentially straightforward method of developing a major Design and Technology database by combining the efforts of a number of schools, colleges and researchers.

Three conferences have been held at the University concerning 'Information Systems for Designers' in 1971, 1974 and 1977. A paper presented by K. Nordstrom at the 1974 conference[3] reviewed the designer's information problems and reported the results of a survey of fifty designers in twenty industries. A questionnaire was sent out

FIG.1    KEYWORD HIERARCHIES FOR AN ARTICLE ON WOODEN FURNITURE

A.    FURNITURE HIERARCHY
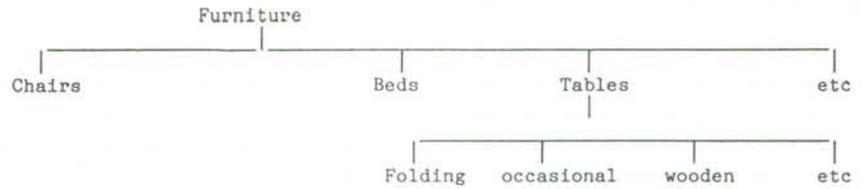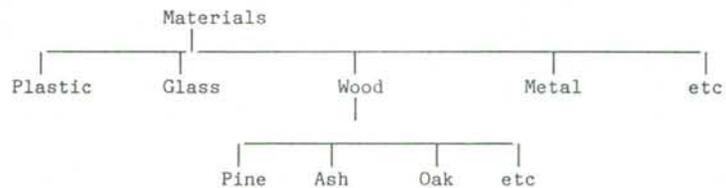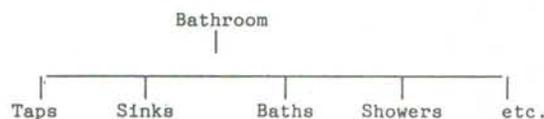


B.    MATERIALS HIERARCHY



FIG.2    THE KEYWORD HIERARCHIES CHOSEN FOR THE DESIGN DATABASE

A.    KEYWORD HIERARCHIES FOR THE DESIGN DATABASE

| | |
|---|---|
| Architecture | Interiors |
| Industrial | Kitchen/Bathroom |
| Product | Fashion/Textiles |
| Materials | Education |
| Furniture | Transport |
| Lighting | Jewellery/Silversmithing |

THE 'BATHROOM' HIERARCHY



in order to discover the sources of information used at various stages of the design process. Generally and not surprisingly the most common sources of information were the nearest ones, i.e. private files or company documents, but suppliers brochures and catalogues, exhibitions, courses of lectures, books and magazines, patent documents and standards were also used in varying degrees. Clearly any database which is to help with selecting materials and components, or locating suppliers, or checking conformity with British standards is going to need to be flexible, but it was felt that the SIR system was adequate.

The ultimate success of the system depends on the way the keywords which are used in searching for information are chosen by the database creator and user. Fig. 1 shows an example of the hierarchical structures of keywords for an article on wooden tables. It can be seen that 'wooden' or 'wood' appears in both the 'furniture' and 'materials' hierarchies. A rational choice of keywords would be 'materials, wood, furniture, tables'. The word 'wooden' is unnecessary since the word 'wood' is already a keyword and searching for wood can retrieve all occurrences of the words wood, wooden and woodwork. In general keywords need to be chosen to suit the people who will be using the system, their ability, age range and the type of questions they are likely to be asking. The supporting material must ensure that they are chosen and applied consistently. The use of truncation by the searcher will retrieve all singular, plural and variations on words, e.g. by using 'product*' as the searchword stem the searcher would retrieve all keywords entered as product, products or production, but the role of the supporting instructional material is evident.

As a database becomes very large computer storage space and search times can become critical and it may be essential to keep careful control of the keywords used. An authority list may be necessary indicating allowable keywords and this will eliminate all synonyms.

    i.e. chairs = seats
        leisure = recreation

Chairs and leisure would appear on the authority list. The keyword hierarchies chosen for our application

are shown in Fig.2 and it was expected that these would be used as the primary identifiers together with more specific keywords. This list is not exhaustive and there may be some overlap, e.g. 'interiors' and 'kitchen/bathroom' but it proved effective.

It was decided to use existing data on 'Design' magazine for the initial in-house trials because this had already been used 'manually' and hence a comparison was available. There were three fundamental objectives for this preliminary work:

— to evaluate the SIR database in relation to its ability to manipulate and present information.

— to explore its potential as a resource for undergraduate, postgraduate and in-service training.

— to examine its value as a resource for schools.

As part of their studies of the history of design, a group of third year undergraduate students produced an index of the major articles published in the Design Council's monthly 'Design'. Each student was responsible for researching one particular year and as part of that research produced a detailed index covering the contents of each month's edition. Eighteen students took part in the initial exercise which provided that number of individually chosen years between 1949 and 1985. This index takes the form of an A4 file, with each page referring to one month of a given year. It provides:

1. The year and month of the issue.
2. The author of the article.

FIG 3

EXTRACT FROM THE ORIGINAL FILE INDEX

DESIGN MAGAZINE INDEX                                    ISSUE APRIL 1986

Compiled by _____ A.N. OTHER

Year 3 1986

Author ...... KATZ SYLVIA .......................................... PAGE ...9...........
Title ...... "THE LOTUS. AND THE COFFIN" ..................................................
Summary ...... THE PLASTICS GALLERY AT THE SCIENCE MUSEUM SHOWS THE ..................................
           ADVANTAGES AND VERSATILITY OF PLASTICS
           .....................................................................
Keywords ...... MATERIALS  PLASTICS  SCIENCE   MUSEUM ............................

Author ...... PIPES, ALAN .................................... PAGE .......11......
Title ...... SHAPING AND SIGNING WHAT WOMEN WEAR ..........................................
Summary ...... BOOK REVIEW OF THE GREAT FASHION DESIGNERS BY CAROLINE REYNOLDS ..................
Keywords ...... FASHION REVIEW RENNOLDS ..................................................

Author ...... VINCENT JO .................................... PAGE .......13......
Title ...... MANUFACTURERS AND DESIGNERS REFLECT ON GLASS ..................................
Summary ...... IMAGINATIVE USE OF GLASS BY ARCHITECTS ..........................................
Keywords ...... MATERIALS  GLASS  ARCHITECTURE ..............................................

3. The title and page number of the article.
4. A brief summary of the contents.
5. The keywords relating to the text.

In this form the index has been used by many students researching for project work or dissertations. The obvious drawback being the requirement to search through the index page by page. Fig. 3 shows part of a typical record.

The SIR database evaluation therefore provided an excellent opportunity to organise this information in an easily retrievable manner. It is worth mentioning here that Design magazine is already covered by the Abstracting and Indexing services available in major libraries under the Current Technology Index (500). However, its accessiility and scope are limited and the educational benefits to students of Design and Technology in researching and creating a database should not be overlooked.

In order to use the SIR system the information required to locate an article is divided into fields. These fields are then named so as to represent the data held within them, i.e. Author or Keywords. Some databases allow several fields to be searched but the SIR database is restricted to four involving the incorporation or omission of some information. However, the SIR package does offer variable length fields, limited only by the size of the whole record or by the number of records a disk can hold. This overcomes problems of running out of space for unusually long entries or alternatively wasting valuable capacity on shorter ones.

The four fields created for the Design database are Title, Author(s), Source Details and Keywords, which necessitated the amalgamation of some information. The summary was rejected in favour of a more comprehensive keyword field and this has not affected the function of the database. Some of these fields extend to twenty keywords for long or complex articles while others may have only four or five keywords. As an indication of the facilities available with the SIR database a few examples have been included but lack of space precludes a full breakdown of all its functions.

Fig. 4 pictorially describes the stages of a student researching, in this instance, the relationship of materials to

production processes. Having chosen the option to 'search' a database (screen 1), and then gained access to a particular year (screen 2), the command is given to 'Find material* and product*', thus making use of the truncated word facility (screen 3). The intention here is to find articles that contain both words and thus leave out articles that are irrelevant. This command has resulted in 7 records held in the temporary field S1 and these can be viewed by the command 'show' or 'show S1' if a number of such files have been built up. One of the records from this S1 file is displayed as Screen 4. If on the other hand the original command had been 'find material* or product*' the S2 file would contain 46 records and would reveal a much wider range of articles.

These commands have taken approximately 2 minutes to complete, including viewing of the 7 records. Unfortunately, only one year can be searched at any one time but the search commands can be saved and run for other years.

Finally one still has to have access to the magazines themselves but these can be specified and located from library archives with increased speed and accuracy.

The positive and negative conclusions of our initial study can be summarised as follows:

**Positive**
- The SIR package has good documentation and clear on-screen instructions.
- The inverted file index is relatively fast allowing the chosen year to be searched within seconds.
- The variable length fields with the ability to compact the database keep the space used to a minimum.
- The incorporation of a stop list prevents unnecessary words from being indexed.
- The provision of 'Not' logic as well as 'And/Or' logic is a considerable aid to searching.
- Facilities for truncated word search allow misspelling, plurals etc., to be easily overcome.
- The flexibility of the structure gives considerable potential for a wide range of resources.

**Negative**
- With the prototype software the disk can only hold three by one year entries per side with a total of 797 records per disk which was really too few.

- Only one year can be searched at any one time although the command can be saved and run for other years.
- Although retrieval speed is fast, the files are slow to create and invert. Because space is at a premium any 'Savesearch' commands created in a file have to be deleted regularly. This could be a problem in multi-user applications as is the case here for this 'Design' database.

The SIR database package has so far proved to be a limited but valuable in-house teaching and retrieval resource. It is hoped to further evaluate and refine the system during the coming months, eventually amalgamating a variety of databases generated by different research students onto a hard disk. The final version may well find application in schools and perhaps may even be made available via a telephone link, in much the same was as the Overture project developed by the Southern Science and Technology Forum at the University of Southampton with support from British Telecom has made available resources concerning Mathematics, Physics, Biology and Chemistry.[8] Any individuals or schools interested in helping to further this work should contact Steve Garner or Eddie Norman at the Department of Design and Technology, Loughborough University of Technology.

**References**
1. Woudhuysen J. (1977) Information bridges the invention/demand gap. Design No.343 July.
2. Gray. P. (1979) Design Information: It's not what you know, it's how you use the expert. Design No. 364 April.
3. Norstrom K. (1974) Designers information problems. Second International Symposium on information systems for designers. Southampton University.
4. Wall. Dr. R.A. (1974) The education of design engineers in information retrieval. IBID.
5. Benson J.P. (1971) Findings of the COID committee on information for engineering designers. First International Sumposium on inforamtion systems for designers. Southampton University.
6. Woudhuysen J. (1977) Design information systems: a user test. Design Nos. 347 and 348. Nov. and Dec.
7. Rowbottom M. Payne A. and Cronin B. (1983) The School Information Retrieval Project. British Library (LIR report 15).
8. Study of resources and overture. (1985) View 25 Autumn.

SCREEN 1

```
    1.    Search a database

    2.    Edit a database

    3.    Create a new database

    *     OS Command(s)


          Press key to select option
          Press Escape to end the program
```

SCREEN 2

```
    SIR          search a database


    Directory
                    DESIGN   82
                    DESIGN   83
                    DESIGN   84

    Database to be searched ....................


    press f0 to change disk
          Escape to Quit
```

SCREEN 3

```
    DATABASE  :  DESIGN     83          106 RECORDS


    Find Product* and Material*

    1       2 Title    =    product
    2       4 Keywords =    product
    3       1 Keywords =    production
    4       3 Title    =    products
    5      10 Keywords =    products
    6      24 Keywords =    materials
    S1      7  =  Product* and Material*
               Find Product* and Material*

    COMMAND . . . . . . . . . . . . . . . . . . . .

    . . . . . . . . . . . . . . . . . . . . . . .
```

SCREEN 4

```
    Record Number        33

TITLE:

    Adhesives, not to be sniffed at.

AUTHOR:

    PARKES, Leslie

SOURCE DETAILS

    Design Apr. 83    p.66

KEYWORDS

    Materials, Adhesives, Superglue, Welding alternatives
    Engineering glue, Industry, Product.


press shift to see next record,
    Escape to Quit
```