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The Use of the SIR Database in Design and Technology

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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 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 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, Wall and Benson. 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. In general the verdict of this piece of research was that 'automatic design information systems will emerge as a powerful weapon in the designers' armory 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 reuse them.

The original software was written to run on an RML 380Z 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. 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 reviewed the designer's information problems and reported the results of a survey of fifty designers in twenty industries. A questionnaire was sent out...
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.

Studies in Design Education Craft and Technology Volume 19 Number 3 Summer 1987
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 accessibility 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.

These commands have taken approximately 2 minutes to complete, including viewing of the 7 records. Unfortunately, only one year can be searched at any 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.
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- 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.

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