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exploiting the capabilities of
FileMaker Pro for designing
a novel interface

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31 May 1995
22 June 1995
Subject Access to OPACs:
Exploiting the Capabilities of FileMaker Pro for
designing a Novel Interface

by

SHABAHAT HUSAIN

A thesis submitted in partial fulfilment of the requirements for the award of
Master of Philosophy

1992

Supervisors:
Ms. Ann O'Brien
Mr. Alan Poulter

Director of Research:
Dr. Paul Sturgess

Department of Information and Library Studies
Loughborough University of Technology
Dedicated to ...... my family.
About subject access

"Knowledge is of two types. We know a subject ourselves, or we know where we can find information upon it".

(Dr. Samuel Johnson)
"Computer can provide a kind of intellectual partnership in assisting the user to think about his problem, help him to formulate his tentative decision alternatives, and assist him in modifying his solution space as he searches towards a reasonable conclusion. In the case of information retrieval, the computer can be of significant assistance in formulating the search query, rather than just responding to requests for information."

(David Thompson,
Journal of the American Society for Information Science, Nov-Dec 1971)
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ABSTRACT

Ever since the libraries came to being, subject access has had been a problem. More often than not, subject searches result either in 'no retrievals' or 'too many records', discouraging users to proceed further. Solutions to these problems were found in improving search methods, indexing techniques, developing 'user friendly novel interfaces' and other methods. The present work attempts to tackle the problems of subject access using an experimental online catalogue by designing a graphic front end user interface, wherein an enhanced indexing technique that is traditional classification system coupled with improved search method by providing end user thesaurus were incorporated by using Macintosh compatible software package called 'FileMaker Pro'. The system provides subject access by three methods i.e. Class Number Search (CNS), Subject Heading Search (SHS) and Keyword Search (KWS) to cater to the needs of two different levels of users i.e. naive or ordinary level and another for the experienced or advanced level users. A cross section of the searchers were invited to evaluate the interface. On the basis of their reactions, certain recommendations were made for the improvement of the system. In the process the capabilities and limitations of FileMaker Pro were assessed and suggestions were given for its further improvement. Certain points pertaining to the further research on the subject were also recommended.
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Chapter 1

INTRODUCTION AND LITERATURE REVIEW

0 Introduction

It has been man’s continual quest to be able to identify and have access to the recorded forms of knowledge, for which a library catalogue serves well. Of the various approaches that may be made to the catalogue, subject access has long been engaging the attentions of library professionals, perhaps as long as libraries themselves. It may be recalled that the catalogue developed by Callimachus (305 BC-240 BC) for the library of Alexandria basically served subject access to its collection (2). One simple reason for subject access being problematic is that librarians want to serve an approach of which not even the user himself is sure. Hence, difficulties arise in analysing and indexing the subject on the one hand and in searching on the other. However, the emergence of ‘Online public Access Catalogue’ (OPAC) in the 1980’s, promised to minimise these problems, while offering better subject access capabilities and the enormous potential of embracing other bibliographical databases and even full text search facilities.
Great and growing interest in OPACs in general and subject access in particular, has led librarians and information scientists to undertake interesting research studies and projects that have, in effect, produced much literature on the subject. Various recent studies have provided both an overview of general developments (3) and some detailed examination of the problems involved (4). This chapter, therefore, aims to review and evaluate evolving trends of research in subject access to OPACs with a view to assessing the present state of the art and its future prospects.

1. Development of OPACs

Since their emergence, OPACs have undergone large scale improvements but the basic contention remains its accessibility by library clientele without any formal training. In the light of their functional capabilities, OPACs, according to Hildreth (5), have developed through the following three generations:

1.1 First generation

These phrase searching OPACs, as they are generally called, were, in a way the machine readable forms of conventional catalogues providing such access points (as class mark, author, title, subject as phrase) and simple left to right phrase matching. Such systems
had certain obvious drawbacks, for the probability of exact matching between search phrases with indexing terms was rather small. Much of the computer capabilities were wasted as the system worked like a card catalogue. It was not user friendly as user/system interaction was quite limited.

1.2 Second generation

Most of the existing OPACs are still at this stage. Influenced by the commercial bibliographic databases, second generation OPACs have adopted many of their features like ‘online help messages’, ‘alphabetical index displays’ for selecting search terms and using ‘Boolean logic’ for their combination and effective retrieval.

Despite the improvements, the second generation OPACs have made over first generation, Hildreth (6) regards them as ‘deficient tools’ for effective subject searching, for the following reasons:

1.2.1 they offer little or no help in translation of entry query terms into the vocabulary used in the catalogue;

1.2.2 they provide no help to the user in making alternate search statements and techniques, when the initial approach fails;
1.2.3 they do not, in all cases, lead to a successful free text search (e.g. title words) to the corresponding subject headings or class numbers assigned to a broader range of related material;

1.2.4 the retrieved records are generally devoid of such information as tables of contents, abstracts and book reviews, that might help the user to judge the usefulness of the documents;

1.2.5 the retrieved bibliographical records are not ranked in decreasing order of relevance to the user;

1.2.6. exploratory browsing to retrieve materials related to those already found is not facilitated.

1.3 Third generation

The above listed deficiencies were investigated and some of the remedies that emerged, were incorporated into third generation OPACs to enhance their subject searching capability. These systems are enriched by the inclusion of additional controlled and uncontrolled access points. Queries are accepted as a natural language' statement eliminating the need for the user to know query formulation and search techniques. Some of the systems use partial match techniques instead of Boolean operators. The
retrieved sets are sometimes ranked according to the query relevance. These catalogues ensure vastly improved search system interaction at every level of the search process. Though most of the work is at the experimental stage, some elements of third generation OPACs may be found in CITE at the National Library of Medicine, USA; OKAPI at City University, London and SPRILAB online catalogue at the Scott Polar Research Institute, Cambridge.

2. Subject access in OPACs: Problems

Subject searching in online catalogues requires the translation of users’ information needs into the terms, that have been used in the system’s vocabulary. They are then put in some specific statements or in the command language of the online catalogue, and matched with system’s vocabulary to retrieve the records to be delivered to the users. During this process, not all subject searches are one hundred per cent successful. They sometimes result in 'no retrievals' or 'too many' records, so that the users will be discouraged to proceed further. In either case, the user suffers. Larson(7) calls these two problems 'search failure' and 'information overload' respectively.( Fig. 1.1)
Fig. 1.1 Diagrammatic representation of subject access in OPACS
2.1 Search Failure

A search failure, generally deemed to be a search that retrieves nothing, is not always that obvious. If the retrieved items do not best serve the users needs, the search will be no better than a failure. However, a successful search depends upon the perfect coordination between the user and the system. Any major deficiency on the part of either of the two, results in search failure. Some of the such deficiencies are discussed below:

2.1.1 Query formulation

Users are always not able to formulate their search according to the terminology of the system, which is generally Library of Congress Subject Headings (LCSH). Interestingly, Steinberg and Metz (8) found that only 71.8% of the OPAC users were not sure that LCSH was the same used for subject access both in the card catalogue and OPAC. In fact, a number of researchers laid much of the blame for subject search failure onto LCSH, which they described as obscure and cumbersome for users. Karen Markey (9) in an analysis of 859 subject queries, found that only 18% were exact matches of LCSH. On the other hand, 36% of the queries were whatever popped into searcher's mind, and of this 36-65% resulted in no retrievals. Difficulties in formulating a search
strategy involve problems of syntax, semantics, choice of access points and how to narrow or broaden a search etc. (10). It, therefore, follows that users' lack of knowledge of LCSH, misspelling and mistyping account for only a few causes of search failure. Markey (11) suggests either educating online catalogue users about search strategy and heuristics or providing in-built instructions in the system. In the same vein, Smith (12) writes "Patrons might use LCSH but they certainly don't understand it. It has always been difficult to explain 'x' and 'xx' or 'sa', but now we have to try to understand as well as interpret for users use, UF, BT, RT, SA, NT. If patrons do know to use the LCSH volumes to structure a search and if a printed copy is available, it is entirely possible that there would be no entries in the online catalogue for the term selected and a well constructed search will result in no retrieval". This brings in the problem of assessment of intactness and accuracy of online catalogue itself, a model of which was presented by Cook and Payne (13).

2.1.2 Application of 'Boolean operators'

Boolean operators (AND, OR, NOT), a backbone of almost all Information Retrieval systems including OPACs though usually considered good for retrieval, have been criticised by Bookstein (14), Belkin & Croft (15), etc. for exploiting only a portion of the
information potentially available in the systems. Some of the main objections are discussed below:

(i) Boolean AND operator often results in search failure: For example, a search for A and B and C will retrieve records that have all the three terms and will reject those with one or two of these terms.

(ii) Boolean logic is rigid in nature, for a user making a search A and B cannot indicate that the term A is more important for his search than B or vice versa.

(iii) Documents are either retrieved or rejected, with no middle ground.

(iv) Ranking of retrieved documents according to the degree of relevance to the enquiry is not possible.

The above objections are confirmed by the Council on Library Resources studies (1983,84) reports that subject searches using keywords with a non-Boolean strategy or with search arguments providing a partial match with controlled vocabulary terms often produce a large number of citations.
As an alternative to Boolean search operator, some partial matching techniques, as reviewed by Belkin & Croft (16), were evolved. Techniques in this category are used to compare queries with documents represented as sets of features or index terms. The document representatives are derived from the text of the documents. Features can represent single words, stems, phrases or concepts and can have weights associated with them. The query terms can be derived from a query expressed in natural language or with the help of indexing vocabulary. The retrieval techniques are based on formal models of document retrieval and indexing viz. vector space, probabilistic and fuzzy set. These techniques when tested experimentally provided better results than Boolean system.

2.2 Information overload

Information overload refers to the phenomenon of the retrieval of too many references in response to a subject search so that a user actually gets bewildered and frustrated and may choose not to go further. The problem of information overload recognised by several authors such as Markey (17), Lawrence (18), Lynch(19), Mitev and Walker (20), Wibberly and Daugherty (21) may be due to the following reasons:
(i) The search term may be too broad and retrieves many items.
(ii) The number of items indexed under a given term might be increasing, as an online catalogue database grows. This increase may be more rapid in a Keyword approach then in a subject heading approach.
(iii) Truncation of terms as compared to exact search terms results in higher recall.
(iv) Boolean OR operator often creates the problem of information overload. For example, a request A OR B OR C will retrieve documents indexed by any one of these terms as well as documents indexed by all of them.

3. Subject access in OPACs: Possible solutions

To remedy the above problems, many studies have been undertaken. The following trends of research are discernible:

3.1 Improvements in search techniques

3.1.1 Word stemming

Walker, (22) while working with OKAPI (Online Keyword Access to Public Information), showed how word stemming techniques could improve subject searching. The stemming process involved
two steps. In the first step, weak stemming, reduces regular English plurals to singualrs and removes 'ing' and 'ed'. The second stage- strong stemming- removes a fairly wide range of suffixes. Search procedure involves taking the words of the user's input, subjecting them both to weak and strong stemming and feeding all the resulting terms into a combinatorial search.

3.1.2 Providing an end user thesaurus

Karen Markey (23) described the usefulness of displaying the structure of LCSH to enable an end user to find appropriate controlled vocabulary that could describe their topics of interest, irrespective of the fact of whether they are able to match the terms they enter, with the online catalogue's controlled vocabulary or not. Bates (24) argued that providing assistance in the form of a thesaurus to the end user is essential in an online environment, where the basic requirements of subject searching is to identify an exactly correct LCSH to retrieve anything. However, an end user thesaurus should be distinct from indexer's LCSH thesaurus, which according to Bates, could easily confuse naive users, as the symbols like 'x' 'xx' and scope notes, are meant for indexers and not for the end user. A thesaurus designed primarily for the user would address the questions and confusions encountered in searching. If the same thesaurus were expanded
and enriched as a front-end database, a super thesaurus, as it might be called, could contain an enormous variety of entry terms, displaying hierarchical relationships. This, along with other features, would enable the searcher to decide the best terms for a given search.

3.1.3 Extending search to full bibliographical records

Search capabilities may be improved if not limited to subject headings and titles only but extended to other fields of the bibliographical record also. A field by field enumeration of the areas in the MARC record that are useful for subject or topical information was given by Markey (25).

In another study by Connell (26), segments of the bibliographical records were examined to determine their potential for retrieving the books. The combination of approaches used to simulate manipulations of the data in the record increased recall by 20%. It goes on to suggest that the interface between the users and the content of a system be designed in order of defined priorities, such as searching by keywords in subject fields, inverted headings and headings with parenthetical qualifiers.
3.2 Improvements in indexing techniques

3.2.1 Enhancing subject headings

Numerous studies on subject access to OPACs have pointed out the deficiencies in LCSH. However, subject searching might be considerably improved if the words taken from the table of contents and indexes of the books could be added to supplement LCSH. This line of research, suggested first by Atherton (27) and followed recently by Byrne and Micco(28) showed a significant increased retrieval by 300 percent, when an average of 21 multiworded terms from table of contents and/or back-of-the-book indexes were added to the 653 field in the MARC records for each book. In another study, Schabas (29) while comparing LCSH to LCSH plus title words reported an improved recall of 14.7%. Following the same line of research, Cousins (30) demonstrated that both natural language and PRECIS enhanced records, provided an increase in recall compared with unenhanced MARC records.

3.2.2 Using traditional classification systems

Traditional classification systems are used in online searching advantageously in three ways. In the first, direct classification
search method, the user enters a class mark and the system displays relevant records for documents entered by that number or near it. In the second method, using classification as a linking device, a suitable subject heading is found from the index, the class number attached to these headings are noted down and then used to locate bibliographic records from the classified catalogue. This, however, does not obviate the need for constructing subject indexes, nor does it help people in locating appropriate subject index entries. However, the classification schedules are themselves a list of subjects and the indexes to the schedules are fairly good subject indexes. This capability of classification for use in OPACs as a third method, was realised way back and was emphasised in CLR studies but the real impetus to undertake research in this direction was provided in 1984 when DDC was made available in machine readable form. Consequently, certain interesting studies were undertaken in the USA. The first, conducted by Karen Markey (31) at OCLC, is known as ‘DDC online project’, in which DDC was used as a searchers’ tool for subject access, browsing and display in an experimental online catalogue. The result of the project indicated that the DDC enhanced subject access by providing new subject searching capabilities that are not possible through the alphabetical and keyword search, in existing catalogues. It also permitted browsing display of the class numbers, where required and retrieved items are located.
Another project under the direction of Diane Vizine-Goetz (32) at OCLC aims at online classifying with additional facilities for keyword searching, hierarchical browsing and multiple display options. Yet another one, under the supervision of Elaine Svenonius (33) was primarily designed for catalogue users. An experimental classification interface called ‘Dewey Online Retrieval System (DORS)’ consisted of 4 components viz.

(i) a database comprising the DDC 700 (Arts), schedules, Ed 20;
(ii) a database of bibliographic records;
(iii) a database of LCSH- created by collecting subject headings assigned to the bibliographic records in (ii);
(iv) a chain index to the schedules- created automatically by extracting significant terms from the schedule captions and relative index.

The interface provides vocabulary enhancements, supports call number searching, facilitates global browsing and enables the user to navigate easily and effectively through classification. DORS, however, is yet to be tested in OPACs.

In a rather different approach, Larson (34) showed how classification clustering combined with probabilistic retrieval techniques could provide an effective natural language search
technique. Generally the class number of a particular item in OPAC is treated as just another keyword, assigned to that item. In this technique, however, class numbers extracted from MARC records are used to increase the number of terms associated with an individual record, the additional terms being analogous to 'use' and 'RT' references in a thesaurus, directing the user to the controlled vocabulary of concepts represented by the class numbers. Thus, the class clusters, function somewhat like Bates end user thesaurus.

3.3 Improving Searcher-System interaction

3.3.1 Developing user friendly interfaces

A user interface is primarily concerned with the interchange of information between searcher and the system. A well designed and user-friendly interface not only covers the idiosyncrasies of the search and retrieval mechanisms but should also increase the browsability through subject headings, class numbers & keywords, and, thus, plays a formidable role in influencing users' opinion about the system. As it happens, an interactive type of front end interface, obviates the need for learning cumbersome conventional command language. This is done either by reducing the number of command options available to users or by
standardising the command language for online catalogues (35,36). The 'point and click' capability of Macintosh personal computer with its HyperCard software has been used by Case et. al. (37) and Coons (38) to develop more interactive front-end interfaces, known as BiblioMac and MacPac respectively.

This trend of research exemplified by the work of Biswas et. al. (39) attempts to develop a front-end interface that could process natural language queries in Information retrieval systems, allowing the users to search by subject without understanding 'search strategy' or 'search logic'. The interface makes it possible for users to define their own interpretation of linguistic terms, the interactive nature of the system can help the users to improve the response to a query. The suggested system overcomes some of the drawbacks of Boolean combinations, especially when dealing with partial matches. It is also possible to build user profiles in the system, so that it responds differently to the same request initiated by vastly different user characteristics.

3.3.2 Designing Knowledge based systems

Knowledge based systems are part of a new generation of interrelated technologies that have the potential to tackle the subject access problem in OPACs. Micco et. al. (40,41) were
attempting to theoretically demonstrate how an expert system could deal with knowledge representation and provide access to the accumulated knowledge of mankind by helping end users to refine their search strategies before going online, at least as well as skilled reference librarians. This was accomplished by means of a sophisticated user interface that includes a windowing process to build a user profile and negotiate an appropriate search strategy. Such systems are capable of increasing precision significantly without sacrificing recall.

3.4 Managing information overload

To manage the problem of information overload, Karen Markey (1983) in one of the C.L.R. studies, recommended that the system should (i) alert the user to limit search features by using such parameters as language, date of publication, format etc. (ii) prompt the users to enter additional terms (iii) help the user by displaying more specific terms (iv) show the users class numbers corresponding to the search terms and the number of postings for each of these classes. Svenonius (42) observed that classification could be used to screen out unwanted documents. Another method reported by Doszkocs (43) is a display of retrieved records based on term weights as in CITE system of National Library of Medicine. To provide a structure for presenting large
retrievals, an ongoing research project, 'Managing Large Retrievals (MLR)', sponsored by OCLC, intends to investigate two approaches:

(i) extending the use of limiting features, like language, format and date of publication, (ii) exploring the usefulness of library classification schemes and subject headings. From this study, Prabha Chandra (44) reports a 50% reduction of retrieved sets when a combination of English language and date was used.

4. Conclusion

As OPAC must cater for a wide range of users, most of whom do not have skills in online searching, researchers will continue to identify the problems and find their solutions, especially in subject searching, which as of now offers more problems than promises. So far the focus has been on the recognition of problems at indexing and searching stages but the future attempts appear to be aimed at developing user friendly interfaces and knowledge based systems, wherein users' obligations regarding 'search strategy', 'search logic' and 'knowledge of end user thesaurus' etc. will be minimised and searcher-system interaction will be maximised to achieve what is known as 'precision without sacrificing recall', to enable OPAC to become a 'finished perfected product' (6) at least nearly, if not fully.
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Chapter 2

STATEMENT OF THE PROBLEM

In this chapter problems related to subject access to OPACs, interface and its design involving hardware and software, followed by objectives of the study, will be dealt with.

1. Subject access in OPACs

Subject access in OPACs is a complex process involving interaction between a number of components viz. Database, subject analysis, the user, the hardware and the software, that together form a 'subject access system'. For successful subject retrieval, all these components should work in perfect coordination, which, somehow, is not generally the case. Consequently, more often than not, subject searches result either in 'no recall' (i.e. search failure) or in 'large sets' (i.e. Information overload), that discourage OPAC user to proceed further. The reasons why 'subject search' as compared to 'known item search' is more difficult are:

(i) the subject labels are not always that precise and unambiguous as that of known items. (for example a book by a given author);
(ii) the response to a subject search will rarely be as clear cut as that of known item search (i.e. whether the item is available or
(iii) subject searchers are not always too sure about what they want and what the system has offered was the best possible response to their request.

Such and other problems were investigated and solutions were found either in improving search methods (by word stemming, extending search to full bibliographical record and providing end user thesaurus) or indexing techniques (by enhancing subject headings with table of contents, book indexes and using classification systems). Even these remedies, however, were not free from difficulties, and real answer to the question of 'precision with out sacrificing recall' was found in developing 'user friendly front end interfaces' and 'knowledge based systems', where in users would not be expected to learn query formulation and heuristics or even be familiar with the indexing language of the system. However, the latter solution was not practically feasible because:

(i) it requires lot of background knowledge of expert system design that was not possible to gain within the available time frame;
(ii) the packages available were not suitable enough for building up knowledge based systems.
Hence, it was decided to tackle the problems of subject searching in OPACs by designing a front end interface wherein at least some of the enhanced indexing techniques may be incorporated by using 'point and click' capabilities of Macintosh personal computer, in such a way that the ultimate product is a novel one for the users.

2. Front end interface

To understand the nature and function of front end interface, let us examine the following conceptual model (1) of the online catalogue.

Every online catalogue system, whether microcomputer based or main frame-based, may be viewed to possess four functional layers, mediating access between the user of the system and the bibliographic data stored in the online catalogue database.

(i) The database layer

The database layer may be be considered as a machine readable form of library's card catalogue. The database layer comprising bibliographic records of individual items, the indexes providing access to those records and the devices used to store them, forms the foundation of online catalogue. Bibliographic
information in most of the online catalogues is derived from MARC records.

(ii) The database management system layer
This layer provides the primary software support for operations on the files, data records and indexes of the database layer. It is responsible for addition, deletion, modification, updating and retrieval of records from any file in the database by searching for particular values in the database indexes and reading of matching records from the database.

(iii) The database management system interface layer
This layer communicates between the user interface layer and the DBMS layer of the system. Basically it translates the user’s commands or menu selections into the appropriate sequence of database operations and hides the complexities of the database structure and underlying search and retrieval mechanisms from him. It may also perform search related activities, not handled by the DBMS itself, such as Boolean operations on lists of database records or sorting of retrieved records in systems with weighted matching.

(iv) The user interface layer
A well defined user friendly front-end interface helps in the
interchange of information between user and the system. As a most visible part of the online catalogue, the interface plays a significant role in influencing the users' opinion about the system. The basic purpose behind a user-friendly interface is to make the task of locating or finding information easy while hiding the complexities of the search and retrieval mechanism. The user interface can even overcome some of the limitations of first and second generation online catalogues through increased user interaction. For example if the interface makes the provision of authority list of subject headings used in the database, it will decrease the chances of search failure to considerable extent.

In order to create a user-friendly interface for online catalogue, the following goals, as detailed by Berger and Klemperer (2) were established by the University of California Online Union Catalogue:

1. The online catalogue interface must be able to accommodate users with varying degrees of familiarity with libraries and cataloguing practices, computers and this online catalogue system in particular.
2. The online catalogue must be easy to learn with limited support from printed materials.
3. The online catalogue interface must treat the user as person and not necessarily as one who is computer-literate. It must
minimise frustration and alienation.

4. The online catalogue interface must give the user consistent results, and if unexpected results occur, they must be explained.

In a summary of interface features, Hildreth (3) suggests that the many possible features described by a number of writers could be grouped into five clusters:

1. Easy to use
2. Friendly and cordial
3. Protective and forgiving
4. Reliable and responsive
5. Adaptive and flexible

According to Larson (4) main functions of the user interface layer are:

1. To receive and interpret user commands. These commands may be queries in a formal command language, menu selections, labelled function key presses, or ‘pointing and clicking’ with a cursor control devise like a mouse.

2. To determine from the command which actions are desired by the user and invoke the appropriate subprocedures of the DBMS
interface and DBMS layers to perform those actions.

3. To organise and format the retrieved bibliographic data or system messages for display to the user and present them on the screen.

4. To detect errors in user commands and provided guidance or help in constructing correct commands.

In designing the present interface, care has been taken to incorporate as many above listed features as possible.

3. Design of interface

The performance of interface as also of online catalogue depends greatly on the hardware and software, chosen for the purpose. The software package used to develop the interface generally controls the manner in which the information is displayed and user/system interact. The choice of software dictates the hardware for designing the interface. The hardware used in the online catalogue has a direct bearing on user satisfaction. Personal computers often permit large displays of text in many different fonts and styles. They can be linked together with Mini or Mainframe computers through local area networks (LAN). Such
PC's with their local processing power have immense potential to enhance interactive capabilities of online catalogue systems through user friendly interfaces.

The decreasing costs of terminals with graphic user interface exemplified by Macintosh micro computers, which use icons, windows and mouse technology, or more likely to be used in future online catalogues. Recently, a number of interactive type of front end interfaces have been developed using the local processing power of PC's. Many of such interfaces have made use of Macintosh personal computers using HyperCard software with its 'point and click' interactive method. These interfaces that use sound and graphics along with the text and replace command syntax, have been termed by Shneiderman (1982, 86) (5) as 'direct manipulation interfaces', for which he suggests the following three basic principles of direct manipulation:

1. Continuous representation of the objects and actions of interest to the user.
2. Physical action labelled button presses instead of complex syntax or textual description of actions.
3. Rapid incremental, reversible operations whose impact on the object (s) of interest is immediately visible.
Hildreth (6) While describing the advanced form of modern OPACs says, "many of the complex query syntax and entry requirements present in conventional information retrieval systems have been reduced to "point" and "press" actions. Query formulation and articulation have been eased through the system's assumption of implicit search and display commands, automatic "insertion" of Boolean, truncation or proximity operators and graphical query input aids".

Two interfaces using Macintosh and HyperCard are worth noting. BiblioMac developed by Case et. al. (1989) and MacPac developed by Coons (1989) provide interaction with UCLA's ORION online catalogue system and NOTIS system at Cornell University respectively. Another Macintosh compatible software package called FileMaker Pro is basically a data base management system and has some better features then HyperCard which in fact is regarded as an application builder. FileMaker Pro, therefore, has a good promise for the development and design of a novel front end interface. These software packages with their capabilities of creating, updating and linking stacks along with the scripting facilities make themselves more effective tools for developing front end interfaces by the librarians than computer programmers who do not really understand the library. However, in such interfaces where choices are made on the basis of icons or buttons
appearing on screen, there may be some cognitive and mechanical difficulties specially for novice users who have never operated a mouse. Nevertheless, it may take a little while to get used to the system but it will certainly be a fun doing subject searching on graphics terminal with a front end interface using ‘point and click’ facilities. As pointed out by Berger and Klemperer (2) and which is also a common experience that users will approach the online catalogue with differing degrees of experience and expertise in using both computer technology in general and the online catalogue in particular. It is, therefore, desirable that the front end interface should provide at least two levels of human computer interaction methods to gain access to the database. One level for naive or ordinary level users, and another for the experienced or advanced level users.

In view of the above, it is possible to design a novel front end interface using a Macintosh personal computer and FileMaker Pro for subject access to an experimental online catalogue for two different levels of users i.e. ordinary and advanced, each providing subject access by class mark, subject heading and keyword.
4. Objectives of Study

The following objectives may be stated to study the problem:

1. To develop a user friendly front end interface using Macintosh PC and FileMaker Pro.
2. To cater to the needs of two different levels of users, i.e. those who have little or no prior knowledge of subject searching using Macintosh and those who are seasoned subject searchers and like to use keyboard to manipulate search and apply Boolean logic.
3. To provide three different ways of subject searching i.e. by class number, by subject heading and keywords.
4. To assess the capabilities and limitations of FileMaker Pro in designing the interface and make recommendations for its improvement.
5. To compare the users' preference about the three approaches of subject access.

References


4. Larson ref. 1.


Chapter 3
CONCEPTUAL FRAMEWORK

A user friendly interface is concerned with the interchange of information between searcher and the system. The interaction between these two depends upon:

(i) what capabilities for subject access are built into the online catalogue;
(ii) how well these capabilities are interchanged for successful retrieval;
(iii) how well the capabilities are communicated to the users.

The designer of a subject access interface has, therefore, to decide what approaches he wants to provide to the users, whether by class numbers and/or subject headings, and/or keywords. In the 1950s and 1960s, general opinion about subject access to catalogue had been either through alphabetical term methods or through class numbers. Later research revealed the strengths and weaknesses of each method and established that a combination of the three methods, viz. controlled alphabetical terms (i.e. subject heading), controlled classification codes (i.e. class numbers) and uncontrolled keywords (i.e. natural words selected from bibliographic records) is far stronger than any single method. On
this premise, the designer of the interface prepares a database with various types of information regarding class number, author, title, imprint, subject heading, keywords etc. present in the fixed fields of the bibliographic records, which he has either downloaded from database or has developed by his own. He then has to tackle such questions as:

(i) the approaches he wants to give to the catalogue, whether by class number, subject heading or keyword or a combination of them;
(ii) whether the system will allow the use of authority files for each of the fields;
(iii) whether the designer would like to retain the structure of subject heading by joining them in one block or separate them into their constituent parts or use both approaches;
(iv) what sections of bibliographic record will contribute for the keywords approach, whether title, subject heading or the fields as well;
(v) other features to be decided include truncation, ability to device search strategy, use of Boolean operators and Help messages.

A designer would naturally like to incorporate all possible features in his online catalogue, but that may make the system too
complicated to be fully exploited by the users, thereby wasting the capabilities placed at their disposal and defeating the objective of making a powerful interface. Alternatively the interface may be as simple as possible but it may take away some of the very important features of subject searching in online catalogue. Such an interface will naturally be preferred by the users, especially those who are not advanced level subject searchers.

As almost every subject searching feature made available to users, has its own advantages and disadvantages, the designer has to decide what features to choose and how to combine them, so that the online catalogue becomes a smooth and coherent whole. To make both the ends meet, he may have to find a situation where system could separately provide complicated as well as simplified approaches for use by advanced and ordinary levels of users respectively.

Hence the proposed interface aims to provide three different types of approaches to be used by advanced and ordinary levels of users. The three approaches are discussed below:
1. Class Number Search (CNS)

The class number approach helps users to "browse the shelf" under a given class number, which brings together all the books on the same subject. Besides this, books on a given subject may be scattered in different locations in the library, such as Reference, general stack, text book section or in special collections, etc., the class number brings all of them together in OPACs. Not only that, truncating the class number from the right broadens the search, which is especially useful when nothing or little is retrieved in response to a particular class number search.

Whatever the advantages class number approach has, it is generally used in online catalogue to supplement subject heading or keyword searches (Cochrane and Markey 1985). However, this approach may be used as one of the main access points to the online catalogue by using the tree structure of the scheme of classification in identifying the areas of interest from broader to narrower levels. What actually happens in subject searching, a user wants to get documents on the subject of his interest, which he knows definitely but may not be able to define it exactly according to system's vocabulary and put it into search statement correctly, a problem that results in either "search failure" or "information overload". The idea behind CNS is that the interface
should itself enable the user to identify the concepts from broader
to narrower classes successively, until he reaches to a fairly
specific class from where he would like to see the records
contained in the database. The argument for this approach uses
the fact that we are able to recognise many more terms than we
can verbalise and that the interface is designed for those with
subject expertise rather than system searching expertise. The
interface proposes to achieve this end just by clicking on the class
number once in an "ordinary level search" and by entering the
class number and clicking once in an "advanced level search".

2. Subject Heading Search (SHS)

The origin of the subject heading approach in a catalogue goes
back to Cutter's Rules for Dictionary Catalogue (1904), the first
rule of which prescribes to make entries under the most specific
heading. However, by the time Cutter's rules were published, the
practice of listing the books under the subject heading, rather
than under the catchwords taken from titles, had gained ground.
This in turn created the problem of standardisation, as different
headings for the same concept were being used in different
catalogues. Consequently, A.L.A. list of subject headings, based on
various printed catalogues of the time, was published in 1895.
Later on, Library of Congress started publishing its own list of
subject headings, actually used in subject cataloguing of its collection. As the Library of Congress subject headings list became more and more popular in libraries, it finally replaced A.L.A. list.

In online catalogues, the Library of Congress subject heading list is the major means of providing subject headings for library records. However, according to Aluri (1991), the users of online catalogue face a number of problems, that are mainly due to philosophy of assigning subject headings and ambiguity of Cutter's rules, which presumably played a significant role in the formulation of L.C. subject headings. Some of these problems are discussed hereunder:

2.1 The concept of specific entry.

2.2 The concept of user and usage.

2.3 The indexing depth.

2.1 The concept of specific entry

Cutter's concept of specificity is not free from ambiguity because specificity depends upon such variables as the nature of the collection, the nature of the user and the size of the authorised vocabulary. Generally a subject heading assigned to describe the entire subject content of the document, may be either too broad or
too narrow for a particular user or a particular collection. For indepth indexing, the indexer would prefer to assign subject headings to all the major concepts covered in the document and not by the notion of specific entry.

2.2 The concept of user and usage

In general, a subject heading is the one that is supposed to be looked by most of the library users. But the concept of "users" itself is quite vague, as it is used in very many different senses. They are variously referred to as specialists and non-specialists, scholars and non-scholars, ordinary and advanced readers. They are also categorised on the basis of their information needs, such as current, retrospective, exhaustive and also on the basis of the type of libraries, i.e. academic, public or special. The notion of user has a direct bearing on subject heading assignment, because the specificity of a heading is judged in relation to the type of user.

Usage is another concept linked closely with the user. According to Haykin "the heading chosen must represent the usage of the class of readers for whom the material on the subject within which the heading falls is intended". This was supported by Cutter (1904) who says: "General rules, always applicable, for the choice of names of subjects can no more be given than rules without
exception in grammar. Usage in both cases is the supreme arbiter—
the usage, in the present case, not of the cataloguer but of the
public in speaking of the subjects”.

As LCSH have got to be changed in view of the "users" and "usage"
of the material on the subject in the library, this brings in
arbitrariness in the choice of subject heading. In fact a great deal
of criticism of LCSH is because they are expected to serve all types
of users in all types of libraries.

2.3 Indexing depth

The depth of a subject index depends upon two factors, viz. the
number and level of subject heading assigned to a work and the
presence of records without any subject heading in the database.
At the time of subject indexing, the indexer generally assigns as
few subject headings to a document as possible. O'Neill and Aluri
(1991) pointed out that the catalogue records of the books in the
library are assigned on an average 1.4 subject headings only. This
number is far too small to bring any level of depth in subject
indexing. Another aspect influencing the indexing depth is the fact
that many records in the catalogue do not have any subject
heading at all. This may be due either to the problem of
obsolescence or the fact that some of the emerging topics do not
yet have a generally accepted name.

In view of the above, the interface will provide subject heading approach to serve those users who wish to approach the database by a particular topic heading. Field 650 of MARC format dealing with topical heading subject heading will serve the purpose. After entering the search term, the system will provide the user with a list of subject headings along with their corresponding class marks. For a given subject heading, he may go to retrieve the references from the database or may navigate further through class numbers to get relevant records under a given class number. The idea behind the class number approach in SHS is that the search term entered by the user may be too broad or too narrow to retrieve either large sets or only few items, that may not satisfy the user.

3. Keyword Search (KWS)

In the two approaches discussed so far, both class codes and subject headings are taken from authorised controlled vocabulary lists by classifiers and cataloguers respectively, who analyse the subject contents of the work and express it in form of appropriate classification code or subject heading. The process is time consuming and expensive too. Another, rather easier way of
deriving subject heading is from the bibliographic record itself, wherein subject bearing terms or keywords are picked up from various fields such as titles, series, conference names, subject heading, content notes, etc. The process known as derived indexing may be done by computer software in online catalogues. The concept of keyword indexing proposed first by H.P. Luhn (1) has established itself in bibliographic retrieval systems, despite various reservations and criticisms. The KWIC indexes in chemical titles, biological abstracts, permuterm indexes in Science Citation Index, Arts and Humanities Citation Index, Social Science Citation Index, and the free text searching in online bibliographic databases are the examples in point. Keyword search is likely to result in successful retrieval because users are likely to remember at least some of the keywords in titles, they are looking for.

Generally keyword access is made either through titles or subject heading. Both the approaches have their own merits and demerits. Keyword approach using title keywords does not result in complete recall, as it relies heavily on the fact that titles are fully informative and contain specific and current terminology. But keywords access from titles give a better recall than traditional subject headings, especially when the latter is not completely accurate. In such cases, keywords-title nicely overcome the
problem of assigned subject heading. As the form of entry in LCSH causes another problem, keywords-subject heading improves recall in an online catalogue.

In view of the above, the proposed interface, in addition to class number and subject heading approaches, aims to provide keywords approach by taking keywords from title fields only.

References

Chapter 4
RESEARCH DESIGN

1. Selection of the Subject

In the present era, hardly any other discipline has influenced and even revolutionised the modern world so much as Electronics. Hence, the scope of the subject Electronics has been changing so rapidly and widely that the definition of the subject has had to be changed time and again. Originally the term was used to deal with the behaviour and application of devices that use flow of electrons in evacuated containers. Later on the term was made to include their flow in gasses, liquids and solids and ultimately was applied to a particular branch of electrical engineering, which deals with movement of electrons along conductors and which interestingly, however, is now more logically said to be a branch of electronics. Because electrons are fundamental constituents of the matter, it is difficult to limit the scope of the subject, as also the electronics industry. Thus, the subject electronics is found to play a significant role in all major fields of social activity and world industry. The field of electronics includes radio, radar, television, aids to navigation, industrial control systems, high speed computers, sound recording and reproduction equipments; test and measurement instruments; medical apparatus and other
equipment involving electron tubes or semiconductor devices; information processing, storage and retrieval by means of digital computers. Other fields included in Electronics are manufacturing industries and electronic control mechanism.

In view of the importance of electronics in present day life and the fact that the specialists in that subject who could evaluate the interface, would be easily approached in a University of Technology, as in Loughborough, the choice of the subject in which an experimental online catalogue for subject access might be developed, ultimately fell on 'Electronics'.

2. Preparation of the database

A database in an online catalogue is a machine readable form of a library's card catalogue. The bibliographic records of individual items and the information contained in different fields of each record forms the foundation of online catalogue. A database may be prepared either manually or by downloading. The first method involves selection and preparation of the bibliographic entries representative of all subject areas, either from secondary or primary sources and then keying in information in different fields and subfields, a process that is time consuming.
3. Downloading from BNB on CD-ROM

Having selected the subject 'Electronics' for creating a database layer in an experimental online catalogue, the next problem is to download the bibliographic information. For the purpose, BNB on CD-ROM that contains records in UK MARC format was used. MARC tags viz. '082' for DDC class number, '100' for author, '245' for title, '250' for edition, '260' for publisher, '650' for subject heading were used for downloading.

A number of search options are available in BNB on CD-ROM, but Dewey search option was considered to be the best for designing a subject access interface in which one of the dominant approaches is by class number. Hence, the 20th. edition of DDC was used to pick up the class numbers for electronics and its subdivisions. In DDC 20, Electronics 621.381 is divided into the following three broad groups:

- 621.381 01-09 Standard subdivisions
- 621.3813 Microwave electronics
- 621.3815 Components and circuits

The class microwave electronics is subdivided into:

- 621.381302 Standard, test, measurement
- 621.38131 Wave propagation, transmission
The class components and circuits was subdivided as follows:

621.38132  Circuits, analysis, design
621.38133  Components and devices

621.38150218  Standard, test, measurement
621.38151  Electronic tubes
621.38152  Semiconductors
621.38153  Printed circuits & special purpose circuits
621.38154  Supplementary component devices

Thus using the above class marks, the records are downloaded using MARC format and saved in the destination file.

4. Conversion of MS-DOS file to Mac file

The file thus created with downloaded records is a MS-DOS file and can not be used on Apple-Mac systems unless it is changed to the Mac format. This was done by Apple File Exchange which can translate files from Mac to Mac or Mac to MS-DOS or MS-DOS to Mac. Thus, the system changes MS-DOS to a Mac file, which in fact is a text file.
5. Scripting in HyperCard for automatic record making

A new file is created in HyperCard consisting of required fields for bibliographic information such as class numbers, author, title, edition, publisher, subject heading, keywords etc. A button is created on the Card for which a script (Appendix 1) is written.

The purpose of the script is to select data from the text file and put it into appropriate fields in HyperCard stack. Clicking on this button activates the script that makes record automatically taking them from text file and putting them in the HyperCard file. Provision has been made in the script to clean some unwanted symbols like $ etc. also.

On the same HyperCard stack another button is created with a second script (Appendix 2). This script is meant to output the fields of HyperCard stack into the merge format that could easily be imported into a FileMaker Pro file.

6. Importing records into a FileMaker Pro stack

To import records from a merge file to a FileMaker Pro stack, the following steps are taken:-
6.1 Defining fields

A new file is created in FileMaker Pro. A define fields dialog box appears (Fig. 4.1). A field name like class number is typed in the name box and field type i.e. text, number, date, time, picture, calculation and summary is selected. Text field contains any thing from one character to many pages. Number field can contain as many as two hundred fifty characters in one line. Calculation fields hold the results of a calculation in the form of text, numbers, date or time. A formula is worked out for a calculation field. Summary field contains the result of a formula using the information in one field over a group of records. FileMaker Pro computes the value and puts it in the field. The database in question possesses mostly the text fields and one summary field where in total number of found records is given.

After selecting the type of fields, click create. For the calculation field such as ‘reno’ (reference number), click ‘Options’. Another dialog box (Fig. 4.2) appears, where in a simple formula ‘reno’=1 is typed in. Click ‘OK’. For the summary fields, FileMaker Pro opens a dialog box (Fig. 4.3), wherein a pop-up menu in the left side gives a choice of a number of variables like Total, Average, Count, Maximum, Minimum etc., while that on the right side gives a list of the fields. As we have to give total number of references in the
Define Fields for "U7F"

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class no</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Title</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Subject heading</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>PI, Pub, Yr</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Online message</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Edition</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>Keywords</td>
<td>Text</td>
<td></td>
</tr>
<tr>
<td>reno</td>
<td>Calculation</td>
<td>Total of reno</td>
</tr>
<tr>
<td>found records</td>
<td>Summary</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4.1 Defining field dialogue box.
Fig. 4.2 Calculation field dialogue box.
Fig. 4.3 Summary field dialogue box.
summary field, click 'Total' on the left and 'reno' on the right, meaning thereby give total of reference numbers in the summary fields. Similarly the other fields are created and finally click done. FileMaker Pro goes to browse and blank fields with their labels on the left appear on the screen so that new records can be added to the database.

6.2 Process of importing

Two files are now available at our disposal. First is a merge file that contains all the records downloaded from BNB on CD-ROM and another is the blank file in FileMaker Pro, having the same fields as in merge file. FileMaker Pro is now to be told to import information from merge file to blank records. In browse mode, select import from the file menu. An import dialog box appears. The directory shows only those files that can be imported to FileMaker Pro. Click 'import records from file on disk'. Choose the file type from pop-up menu that is to be imported. Select the file to be imported and click open. Another dialog box (Fig. 4.4) appears which helps in establishing relationship between fields in the external file and those in the FileMaker Pro file. The left side of the dialog box displays information in the first record in the external file while the right side shows the available fields in FileMaker Pro file. The arrows in between the two boxes indicate
Fig. 4.4 Dialogue box for import in FileMaker Pro file.
the mapping order that can easily be changed by moving the pointer over the FileMaker Pro fields and dragging it to the matching position. For example, class number against class number, author against author and so on. When all set, click on 'Add new records' and 'OK'. When all the records have been imported, FileMaker Pro returns to the browse mode. Thus, the database is ready in FileMaker Pro.
Chapter 5
DEVELOPMENT OF INTERFACE

Having prepared the database layer in Electronics that serves as a foundation of an experimental on-line catalogue, one can proceed to develop a front-end human computer interface, for which the capabilities of File Maker Pro will be made use of. The following paragraphs discuss the model of the interface to be developed followed by practical implementation of those capabilities of FileMaker Pro that will serve as basic tools for its design.

1. Model of interface design

As explained in the diagram (Fig. 5.1), apart from the ‘Top menu’ and ‘explanation screen’ the search operation of the interface is a three step process involving input, selection and output. Whichever the search, the Top menu is linked with the explanation screen that explains what the search is all about. The latter in turn is linked with the input screen where the search criteria is either entered or pasted from the dictionary. The next screen, called ‘output screen’, in response to the search criteria, presents a list of terms along with their class numbers, from where more relevant search items may be selected to finally
Fig. 5.1 Diagrammatic representation of interface design
retrieve records in the 'output screen'. The last two screens have provision to see the full reference as well as help screens.

Hence the interface works on the basis of a few Layouts and Scripts that will be developed using FileMaker pro.

2. Capabilities of FileMaker Pro for interface design

FileMaker Pro is a single file database that contains all data, Layouts and indexes. Despite being a flat file database with no programming language, it has enormous capabilities to create powerful single-user and multi-user applications. This is probably due to the fact that it presents a single default interface accompanied by some powerful features. The default interface is simple because it displays all available options in the menu bar at any stage. The powerful features include its capability to prompt the user to enter the field names immediately after opening the file, multiple Layouts of single document and graphics. The capabilities of FileMaker pro that are used for the type of model interface described earlier, are discussed below:

2.1 Layout

One of the most important features in FileMaker Pro is the
ability to create different Layouts independently of one another. As soon as, fields are defined, FileMaker Pro creates a standard Layout with the defined fields ready to intake data in them in Browse mode. One can create as many Layouts as there is disk space available. Each Layout can be tailored to serve a particular purpose, for a Layout can be changed independently without effecting the data. A layout may be in standard from, blank form, columnar form and envelope form. For the purpose of interface design, standard, blank and columnar layouts are needed. Except blank form, the other two layouts have a header, a body and a footer. A Layout may be made to possess only the desired field (s) i.e. a standard Layout may have all the defined fields or may have one to many different fields. Besides that, different objects i.e. graphics may be added to a given Layout. So much so one can start with a blank Layout and add text and graphics to best serve the purpose.

2.2 Adding text to a Layout

Text on a Layout is required to label a field and/or button, to write instructions, a heading, or record number. In FileMaker Pro, the typed text on the Layout creates a text object that can be selected, grouped, moved, shaped, cut or copied as required. The text can be edited in typical Macintosh fashion by selecting text
tool in Layout and dragging across text or by double Clicking a word to select it. The selected text can then be cut, copied or cleared. Text can be formatted to change the font style. Text alignment, line spacing, and colour is done either through Format menu or by double clicking a text, in which case a text format dialog box enables to change font, size, style, alignment, line spacing and colour all at once.

2.3 Creating graphic objects in a Layout

Graphic objects can be produced in a Layout by using Drawing tools palette, Line width, Colour and Pattern controls available in the Status Panel in Layout mode. Graphics makes the screen attractive and powerful as different colours may be assigned to different objects performing different functions. The palette consists of tools for drawing a line, rectangle and oval.

2.4 Buttons

Buttons play an important role in developing a user friendly interface by minimising the users’ role in subject searching and yet maximising the system’s efficiency. Any Layout text or graphic object can be a button but fields can not be used as buttons. Buttons can be copied from the template file or can be
created by using tools meant for creating graphic objects in Layout mood. They may be made of any shape and size and can be cut, copied or disabled.

Buttons are created in a Layout to perform three different functions, viz.

(i) perform a Script, for which a Script is defined, as discussed in the next section;
(ii) perform a command, for which the options are provided in the system to select from;
(iii) switch to a Layout, button may be linked to particular Layouts. (Fig. 5.2)

Creating a button and linking it to a Script or command gives power with out programming. In the present interface following buttons have been created to perform a number of commands.

2.4.1 Go Back: Button marked with 'Go Back' is actually connected to the last screen Layout. This button helps in back tracking step by step.

2.4.2 Top Menu: This button is always linked with 'Top Menu' screen. clicking on this button during the search, takes to the first
Before level: I

When book title, a sub

1. This set

2. This will give you more room to manipulate your search by using keyboard, applying Boolean & other facilities

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Fig. 5.2 Define button dialogue box.
screen of the search process.

2.4.3 Help: This button is connected to a screen that contains text to help understand the function to be performed on the screen, for which this button is meant.

2.4.4 Previous Record: This button performs a command to go to the previous record.

2.4.5 Next Record: This button performs a command to go to the next record.

2.4.6 Search: This button performs an assigned Script and brings the system into find mode and pause until a search criteria is entered.

2.4.7 Display: This button performs a command ‘Find’ and thus, completes the function of the Script to display records in a given Layout.

2.4.8 Full Reference: This button performs a command ‘Paste from

2.4.9 Dictionary: This button performs a command ‘Paste from

64
index'. Hence, clicking in a field and 'Dictionary ' button shows the index of the values in that field in a pop up box, called 'View index' (Fig. 5.3).

2.5 View Index

View index is another important feature of the FileMaker Pro that creates an index of all the values in a text, number, date, time and calculation field. This may serve as an authority list of the field values and will go a long way in subject searching, because the index will help the user to select a value of his/ her choice. The selected value can then be pasted into the current field for finding records. Thus, eliminating the chances of misspellings while entering the search criteria, thereby improving recall and relevance.

This capability of FileMaker Pro is specially useful for free text searching in Keyword access. In subject heading approach also where one may like to retain the structure of Library of Congress List of subject Headings, each constituent of the heading may be joined by a hyphen, in which case the system will index them as single word.

In the interface, the 'View Index' facility is hidden in the
Fig. 5.3 View Index dialogue box.
"Dictionary" button, which is created in the Layout to perform a command 'Paste from index'.

2.6 Scripts

FileMaker Pro supports a basic Scripting capability, which is not a programming language but more a way of building up a batch file type list of actions. This automated Scripting is its strength as well as weakness. Strength because it gives power without programming and weakness because one can't go beyond the built in provisions. Nevertheless, it performs well and the Layout design factors coupled with script enable a user to create good-looking and easy to use applications.

A Script is a command that carries out a sequence of actions, thereby bringing consistency by doing a job the same way each time. Several Scripts may be chained together to perform a succession of functions. For example, one may like to search references under a given subject heading and would like to see it in a columnar form giving subject heading, its corresponding class number, author, title etc. and even like to have a printed list in a different Layout. In such a case two Scripts are created and are chained together. Any number of Scripts may be defined but only 50 of them will be shown in the menu and the first 10 of them are
automatically assigned a key board short cut. A Script may, however, be changed, renamed or deleted.

The following two types of Scripts were developed for the interface:

2.6.1 General Script for searching

2.6.2 Special Script for CNS

2.6.1 General Script for searching

This Script is so called as it is used for searching in all the three approaches. This Script is developed to perform following functions:

A. To bring the system to Find mode and pause, so that the search criteria are entered.

B. To sort and retrieve records under the given criteria. To return to a given Layout in which records are to be seen. This Script is created thus:

In Layout mode, Script is selected from menu bar. A Define Script dialog box (Fig. 5.4) appears, wherein the Script name is to be
Define Scripts for "U7F"

- Find 621.381
- SHS search
- KW Search
- KW-TITLE SEARCH
- CN-TITLE search
- sh-cn-tit search
- sss621.38
- sss621.381
- cl-sub-tit search
- 621.3813 CL-SH SEARCh
- 621.3815 sssearch
- 621.3815 sssearch
- 621.38 cl-sh search
- 621.38 cl-sh search

Fig. 5.4 Define script dialogue box.
typed. Click 'options' and another dialog box (Fig. 5.5) for the 'Definition for Script' appears. In this box, check 'Find' and 'Sort' boxes and in their pop-up menus, select 'Go to find and pause' and 'Restore sort order and sort' respectively. Check 'Return to' and from the pop-up menu select the Layout to which FileMaker pro is required to show the found sets of records. Check 'Include in menu' box. Click 'OK'. The earlier screen (Fig. 5.4) reappears. Click 'Done'. The Script is now ready to be assigned to a graphic object like a button.

2.6.2 Special Script for CNS

The input screen in CNS has a number of buttons each representing a particular subject area in electronics. The aim of this Script is to enable each button on the screen to retrieve the records that the database has for that class. This is made possible by a unique capability of FileMaker Pro by which the latest search can be assigned to a particular Script.

Therefore, to develop a Script like this, a class number e.g. 621.381 is searched to retrieve records under it. This is the most current search done by the system. This search can be made a permanent feature of the button, 621.381 Electronics, by writing another Script.
Fig. 5.5 Definition of script dialogue box.
For the purpose, select 'Define Script' from the menu bar. Type the name of the Script as 621.381 in the dialog box that appears and click on 'Options'. In the next dialog box, check on 'Find', 'Sort' and 'Return to...' boxes to choose 'Restore find requests and find', 'Restore sort order and sort' and 'Return to....' respectively as discussed in section 2.6.1. Check 'Include in menu' box. Click 'OK' and yet another dialog box (Fig. 5.6) appears, in which click on 'Replace Find Requests'. Click 'OK'. Back track the dialog boxes and click 'Done' in the 'Definition for Script' box. The Script for the 621.381 electronics is ready and can be assigned to 621.381 electronics button. On clicking, the button 621.381 will always retrieve all the references under that number. Similarly the Scripts may be created for all the subdivisions of electronics.

3. Designing the three approaches

Using the Layouts and Scripts the three approaches are designed thus:

Step 1- A blank Layout is created for 'Top Menu' and linked with the following screen.

Step 2- A blank Layout is created for explanation screen and linked with the following Layout.
The following information is needed to perform this script. You can:

- Keep the information already saved for this script
- Replace it with the information currently in use

Page Setup: ○ ○
Import Order: ○ ○
Find Requests: ○ Keep ○ Replace
Sort Order: ○ Keep ○ Replace
Export Order: ○

Fig. 5.6 Replace dialogue box.
Step 3- A standard Layout is created in which only the required field is retained and others are cut off. A search button is created to carry out a general search Script that after allowing to enter search criteria switches to the next Layout.

Step 4- A columnar Layout with the required fields and buttons is created. It also switches to the next Layout by the help of the search button which performs another general search Script. This is also linked to a standard Layout and help screens.

Step 5- Another columnar Layout is developed which is linked to a standard Layout and help screen.

All the three searches are designed accordingly and required buttons are created on them.
After the interface has been designed as per the steps in chapter 5, it is now ready for use. This chapter, therefore, describes the working of the interface with a view to explain the objectives and functions of each screen with which they have been designed.

FileMaker Pro consists of just one file, which contains all data, layouts, scripts and indexes. Clicking on the FileMaker Pro icon opens up the file. The Top screen (Fig. 6.1) not only welcomes the user to the interface and explains what subject access is all about but also gives a choice to select the user level, i.e. ordinary or advanced. The user then chooses the suitable level and proceeds further.

1. Basic principle of searching

In whatever level, the interface provides three different access points to the database for subject searching, i.e. by class number, subject heading and keywords. The basic principle underlying these approaches is that the user, in response to a search be provided with a list of related terms along with their class numbers to enable him/her to select precisely the required terms.
WELCOME TO SUBJECT ACCESS INTERFACE IN ELECTRONICS

When books on a particular topic are sought without precisely knowing author or title, a subject search is generally made.

Before using the interface, select and click on your user level:

1. This will enable you to search without using keyboard

2. This will give you more room to manipulate your search by using keyboard, applying Boolean & other facilities

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Fig. 6.1 User level screen
from the list to navigate further to retrieve the records from the database. Thus, the system, in addition to information retrieval, also performs as a type of end userthesaurus.

2. Ordinary Level Searching

The whole process of searching in ordinary level is limited to the 'point and click' method. Clicking in ordinary level box on the top screen takes the user to the 'Top Menu' (Fig. 6.2) that offers the three options of subject access viz. Class number search (CNS), Subject heading search (SHS) and Keyword search (KWS). At this stage the user may or may not have at least some knowledge of the three approaches but the message, 'For more information, click in any box' given at the bottom of the screen, prompts the user to proceed further.

2.1 Class Number Search (CNS)

Clicking in CNS box makes another screen (Fig. 6.3) appear. Here, the user is explained about the 'Class number', 'What to do instructions' and 'Help' messages. Clicking anywhere on the screen takes the user to import screen (Fig. 6.4) where all the subdivisions of the subject electronics are shown in boxes. This tree structure should help the user to identify his/her own area of
This interface provides the following search options:

1. CLASS NUMBER SEARCH
2. SUBJECT HEADING SEARCH
3. KEYWORD SEARCH

(for more information, click in any box.)

Fig. 6.2 Top Menu Ordinary level
User Level - Ordinary

( Class Number Search)

The number by which books are arranged on the shelf in a library is called Class Number, e.g. 621.381 = Electronics.

The next screen shows the divisions and subdivisions of the subject.

Remember this search is characterised by this colour throughout.

Click anywhere to start search and follow "What to do?" instructions.

Click on Green Button for "Help".

6.3 Explanation screen - CNS - Ordinary level
User Level - Ordinary (Class Number search)

What to do?
The subject 'Electronics' is divided into the following broad areas.
Select your area of interest and click in the box.

Electronics
621.381

- Systems, testing, design
  621.381 01-09

- Microwave electronics
  621.3813

- Components & Circuits
  621.3815

  - Standard, test, measurement
    621.381302

  - Wave propagation, transmission
    621.38131

  - Circuits, analysis, design, parts
    621.38132

  - Components & devices
    621.38133

  - Standard, test, measurement
    621.38150218

  - Electronic tubes
    621.38151

  - Semiconductors
    621.38152

  - Printed circuits & special purpose circuits
    621.38153

  - Supp. component devices
    621.38154

Fig. 6.4 Input screen - CNS - Ordinary level
interest. The user is asked to select and click on that. The progress of sorting is shown by the status message, until the retrieved records are shown on a new screen (Fig. 6.5) that consists of only two fields i.e. subject heading and class number. From here the user may go to see the full reference (Fig. 6.6) by clicking the desired button or may like to navigate further. The idea behind the latter is that the subject area chosen earlier may either be too narrow to retrieve only a few records that may not satisfy the user or too broad to have a large number of references that may discourage user to proceed further. Hence this screen acts as a type of end user thesaurus that can be used to select more relevant terms to search further to retrieve more specific items. Therefore, the second option on the screen asks user to click 'Search'. The system changes to 'Find' mode with two fields ready to intake the search term(s). Clicking in a field e.g. subject heading followed by 'Dictionary' button results in the appearance of 'View Index' box containing an alphabetical list of Library of Congress subject headings of the records that the database possesses. From the list, user may click on a subject of his/her choice and click 'Paste'. The same heading appears in the field. Thus, the chances of misspelling, a common complaint in keying in a search, are completely avoided here. Click 'Display'. The system finds the records relevant to the given criteria and shows them in a columnar layout (Fig. 6.7) with class number, subject and title
Your area has the following subjects. You have two options:

1. to see full reference, click a line and
2. to search further
   1 Click Full Reference
   2 Click Search
   2 Click Dictionary
   2 Click (in popup box, click the selected subject & Paste)
   3 Click Display

**Subject heading**

Electronic-control

**Class no**

621.38101120

Fig. 6.5 Selection screen-CNS-Ordinary level
Class no: 621.38101120
Author: Bohlman K. J. Kenneth John
Title: Control systems technology
Edition: Dickson Price 1990
Subject heading: Electronic-control
Keywords: Control Systems Technology

Fig. 6.6 Full reference-CNS
### User level - Ordinary

**What to do?**
To see full reference, click a field and

**Full reference**

<table>
<thead>
<tr>
<th>Subject heading</th>
<th>Class no</th>
<th>Title</th>
<th>Found Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analogue-circuits</td>
<td>621.381520</td>
<td>Analogue electronic circuit design</td>
<td>4</td>
</tr>
</tbody>
</table>

**Fig. 6.7** Output screen-CNS-Ordinary level
fields. The total number of records retrieved are shown in a small box at the top left corner. From here also full bibliographic references (Fig. 6.6) can be seen as per the instructions.

2.2 Subject Heading Search (SHS)

Clicking in SHS takes the user to the next screen that explains Subject heading, 'What to do?' instructions and 'Help' messages. Clicking anywhere on this screen presents another one that possesses only subject heading field (Fig. 6.8). To retrieve references from the database, the user is asked to click 'Search' button followed by 'Dictionary' button. A view index box with an alphabetical list of subject headings appears. By scrolling a given subject heading may be selected. Click the subject and 'Paste'. The heading now appears on the field. Click display. The system displays the retrieved records in a columnar layout i.e. selection screen that shows only two fields viz. subject heading and class number (Fig. 6.9). The idea behind this screen is to alert the user about all the related subject headings along with their class numbers that the references in the database have. The user may note down the subject headings of his/her interest. From here the user may like to see the full references or search further by clicking 'Search' followed by 'Dictionary'. A 'View index' dialogue box appears again from where the noted subject heading may be
Fig. 6.8 Input screen-SHS-Ordinary level
User level - Ordinary

What to do?

Your subject has following heading(s). There are two options:

1. To see full reference,
   Click a Field and

2. To search further, note the subject/number on a paper
   Click
   Click in the subject/number field below & click.
   (In popup box, click on a subject/number and paste)
   Click

Found records 3

Subject heading

Analogue-circuits-Design

Class no

621.381520

Fig. 6.9 Selection screen - SHS - Ordinary level
clicked and pasted on the relevant field. Click 'Display'. Status message shows the progress of sorting of the retrieved records until they appear on a new layout with class number, subject and title fields. Full bibliographic records may be seen by clicking 'Full reference' button.

2.3 Keyword Search (KWS)

This search is exactly the same as the earlier one except the 'View index' box shows here a list of single worded keywords taken from titles of the references, thus allowing free text searching. An input screen is shown in Fig. 6.10.

3. User Level Advanced

As this approach is meant for advanced level users, the interface does not provide the use of system's dictionary but allows user to enter the terms of his/her choice and use 'AND', 'OR' Boolean operators.

The 'Top Menu' provides the same three approaches. Clicking on any of them takes the user to a common screen (Fig. 6.11) that gives explanation about the each approach. A common screen is not likely to confuse advanced level users, as may be the case in
Fig. 6.10 Input screen-KWS-Ordinary level

**User level-Ordinary (Keyword Search)**

**What to do?**

1. Click
2. Click
   (In popup box, select & Click on the Keyword & paste)
3. Click

Keyword: Analogue Circuits Design
User level-Advanced

About the three approaches

1. Class Number Search: The number by which books are arranged on the shelf in a library is called Class Number, e.g. 621.381 = Electronics. Next screen shows the divisions and subdivisions of the subject. Click anywhere in this box to start search and follow "What to do?" instructions. Remember this search is characterised by this colour throughout.

2. Subject Heading Search: A standard term in a subject is called 'Subject heading', e.g. Microwave transmission is a standard term for Electronic transmission. Click anywhere in this box to start search and follow "What to do?" instructions. Remember this search is characterised by this colour throughout.

3. Keyword Search: A keyword is generally taken from the book title and is not necessarily standardised, e.g. the title "HEMTs and HBTs devices, fabrication, and circuits" may have all underlined words as Keywords. Click anywhere in this box to start search and follow "What to do?" instructions. Remember this search is characterised by this colour throughout.

Note - When stuck, click on green button for help.

Fig. 6.11 Explanation screen-Advanced level
3.1 Class Number Search (CNS)

Clicking on CNS takes the user to another screen (Fig. 6.12) which is more or less similar to its counterpart except that it has a class number field, more detailed 'What to do?' instructions and the provision of using various symbols while finding. The user has to select and click the box denoting the area of his/her interest. The system changes to 'find' mode and 'pause'. The cursor in the class number field starts blinking to accept the search number which the user has to type in. Clicking on 'Display,' retrieves records in another layout (Fig. 6.13) which consists of the subject heading and class number fields only. The number of found records is indicated at the top of the list. The idea behind this screen is to show the user what subject headings the data base contains under the class he had chosen. Hence, the user is provided with two options to either look at the full bibliographic record or to proceed to search further. Accordingly the user is asked to note down the subject headings and/or class numbers, under which he needs to search further. The same are typed in the relevant field. The screen provides for 'AND' and 'OR' searches. For 'OR' search, Apple key and 'N' is pressed on the keyboard. New fields appear under the earlier ones, in which alternate search term or number may
What to do? **User level-Advanced** (Class Number Search) **Help** Go Back Top Menu

1. Choose & Click the subject area of your interest from the boxes given below
2. Type the class number
3. Click

Enter Class No. → 621.381520

- **Electronics** 621.381
  - Systems, testing, design 621.381 01-09
  - Microwave electronics 621.3813
  - Components & Circuits 621.3815
    - Standard, test, measurement 621.381302
    - Wave propagation, transmission 621.38131
    - Circuits, analysis, design, parts 621.38132
    - Components & devices 621.38133
    - Standard, test, measurement 621.38150218
    - Electronic tubes 621.38151
    - Semiconductors 621.38152
    - Printed circuits & special purpose circuits 621.38153
    - Supp. component devices 621.38154

Fig. 6.12 Input screen-CNS-Advanced level
User level-Advanced (Class Number Search)

What to do?
Your area has the following subjects. You have two options:-

1. to see full reference, click a field and
2. to search further

2.1 Note down on a paper, subject(s)/number(s) of your interest
2.2 Click
2.3 Type it in the relevant field and click

OR Search - Press apple key & N on Keyboard, type another search, click 'Display'.
And Search - Add one search word, than another & so on without using 'and'.

<table>
<thead>
<tr>
<th>subject heading</th>
<th>class no</th>
<th>found records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical-electronics-trades</td>
<td>621.381502812A</td>
<td>2</td>
</tr>
</tbody>
</table>

Fig. 6.13 Selection screen-CNS-Advanced level
be typed. For 'AND' search, type one search term and then another and so on without typing 'AND' in between the terms. In any case, click 'Display' and the system retrieves records in a columnar layout which has three fields viz. subject heading, class number, title. The total number of retrieved records are shown on the top of the list. To see full bibliographic reference, click a field and 'Full reference' button on the screen. During the search, one can use '=' for exact, '<' for less then, '>' for more then, '<=' for less or equal, '>=' for more or equal. All these symbols are to be typed before the search term or number.

3.2 Subject Heading Search (SHS)

Clicking on SHS button on the 'Top menu' takes a user to the common screen from where one can move to the next screen (Fig. 6.14) consisting of a subject heading field only. Clicking on 'Search' button brings the system to 'find' mode. The user is then required to type his search term and click 'Display'. The system retrieves records in a columnar layout (Fig. 6.15) showing subject heading and class number fields. As in CNS, the aim of this screen is to provide a list of subject headings with their class numbers related to the query. The user may either go to see the full reference of a given item or may note down the headings and/or class numbers under which he may like to search further, using
User level-Advanced

What to do?
1. Click
2. Type the subject under which you want references
3. Click

Enter Subject heading

Microoptics

Fig. 6.14 Input screen-SHS-Advanced level
What to do?
Your subject has following headings. There are two options:
1. To see full reference, click a field and 
2. To search further under a subject heading
   /Class no:
   2.1 note them on a paper & click
   2.2 type them in relevant field
   2.3 click

OR Search- Press apple key & N on Keyboard, type another search, click 'Display'.
And Search- Add one search word, than another & so on without using 'and'.

Subject heading       Class no       Found records
Micro                  621.38120

Fig. 6.15 Selection screen-SHS-Advanced level
Boolean 'AND' and 'OR'. The next screen displays the retrieved records in two fields viz. class number, title. Complete record may be seen by clicking a line and 'Full reference' button.

3.3 Keyword Search (KWS)

This search is exactly the same as the SHS except that the subject heading fields are replaced by the keyword fields.
Chapter 7
DEVELOPMENTAL STAGES OF INTERFACE

As the design of a building undergoes many changes to come to the final shape, so also the present interface has undergone as many as seven versions with the seventh in its final form. The chapter, therefore, discusses some major areas of interface that have undergone changes as a result of the process of continuous evaluation.

The changes that have occurred during the evolution of interface from its first version to the final one, may be grouped into

1. Changes in the three subject approaches
2. Changes in the search mechanism.
3. Changes in the instruction and messages.

1. Changes in the three subject approaches

As the interface provides a classed approach through CNS; controlled alphabetical vocabulary approach through SHS and uncontrolled keyword approach through KWS, the changes have occurred in all the three subject access points as discussed below:
1.1 Class Number Search (CNS)

The class number search, as it is known now has changed through three stages.

In the first stage, this approach used to be designated as 'Successive step searching through class number' (SSS). It was so called because the hierarchy of classes was maintained by a number of successive screens (Fig. 7.1, 7.2), in which each class mark took the user to its more specific classes and its corresponding subject name takes to the screen, called input screen, wherein search criteria may be entered.

The successive level of hierarchy though helped generally in identifying user's area of interest, but was found cumbersome to use by some and difficult to understand by others. Hence, it was replaced by the tree structure of the subject provided on just one screen that would be used for identification of the subject area from general to specific level, as well as for entering the search number in relevant field provided for the purpose (Fig. 7.3).

Evaluators of the interface still felt it drudgery to identify a box representing their area of interest, clicking it and then entering its class mark in the field provided. They wondered if it could be
<table>
<thead>
<tr>
<th>621.381 Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>621.381 01-09 Systems, Testing, Design, Optoelectronics</td>
</tr>
<tr>
<td>621.3813 Microwave electronics</td>
</tr>
<tr>
<td>621.3815 Components and circuits</td>
</tr>
</tbody>
</table>

7.1 Screen showing subdivisions of electronics in SSS
<table>
<thead>
<tr>
<th>621.3813 Microwave Electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>621.381302</td>
</tr>
<tr>
<td>621.38131</td>
</tr>
<tr>
<td>621.38132</td>
</tr>
<tr>
<td>621.38133</td>
</tr>
</tbody>
</table>

Note down the number & click its subject to retrieve references

7.2 Screen showing subdivisions of Microwave electronics
What to do? (Class Number search)

1. Choose & Click the subject area of your interest from the boxes given below.
2. Type the class number.
3. Click FIND box.

Class no: 621.38131

Electronics 621.381

Systems, testing, design 621.38101-09

Microwave electronics 621.3813

Components & Circuits 621.3815

Standard, test, measurement 621.381302

Wave propagation, transmission 621.38131

Circuits, analysis, design, parts 621.38132

Components & devices 621.38133

Standard, test, measurement 621.38150218

Electronic tubes 621.38151

Semiconductors 621.38152

Printed circuits & special purpose circuits 621.38153

Supp. component devices 621.38154

Fig. 7.3 Tree structure of electronics with class number field
possible for the system to retrieve records right away, just by clicking a given box. This was made possible by a third change. The class number field was removed and each subject area box, when clicked, retrieved records under that class number.

1.2 Subject Heading Search (SHS)

This search has undergone development in two ways i.e. layout and indexing technique. In the early versions, clicking SHS on the top menu, used to take the user straight to the input screen, which, in addition to the subject field consisted of other fields as well. In the latter versions only subject field was retained on the input screen.

In the early stages of interface design, the subject field consisted of LCSH. FileMaker Pro prepares an index from each word and also makes search from each of them in subject field, which was as good as making keyword search. Hence, in the final version, the LCSH structure was retained by linking each term by a hyphen.

1.3 Keyword Search (KWS)

Here also the first screen used to take the searcher directly to input screen and was changed as in SHS. Here also the system
used to index the single key words. During the successive stages of evaluation, there came a stage when single worded title keywords were joined together in strings. To enable access to each keyword, words were dropped from right of the string one by one, as shown below:

A-B-C-D
   B-C-D
       C-D
           D

This appearance of keyword strings, however, was not liked generally by the users as it inhibited free text searching. Thus, the keywords were freed in the next and final version.

2. Changes in the search mechanism

As may be seen from Fig. 7.4 and 7.5, the search mechanism was only a two step process in early versions involving input and output screens. The input screen or the search screen was initially a blank card (Fig. 7.6) in standard layout that consisted of all the fields and certain buttons such as ‘Find’, ‘Next’, ‘Previous’ etc. All the three approaches were connected to the same input screen, wherein only a given field was useful for a given search, while
Fig. 7.4 Diagrammatic representation of interface design in earlier versions.
<table>
<thead>
<tr>
<th>Class no</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
<td></td>
</tr>
<tr>
<td>Title, edition</td>
<td></td>
</tr>
<tr>
<td>edition</td>
<td></td>
</tr>
<tr>
<td>Subject heading</td>
<td></td>
</tr>
<tr>
<td>Keywords</td>
<td></td>
</tr>
</tbody>
</table>

**Online message** Enter your search in a relevant column & Click Find

**Fig. 7.6 Input screen in standard layout**
others were confusing the searcher as much as the 'Next' and 'Previous' buttons. Moreover, the user had to click in a relevant field before entering the search criteria. Subsequently changes were made and separate screens (Fig. 7.7) with only one required field, were provided for each search.

The output screen also has undergone many changes. It was initially a columnar layout with two fields i.e. the search field and the class number. This used to serve twin purposes i.e. for seeing the full reference and also for noting down the items of user's choice to enable him to search further. However, there was no way to perform that search then and there.

Hence, a third screen which may be called as selection screen was introduced. The purpose of this screen was to let user select the items of his choice from the list of related items which system has retrieved in response to the search criteria that user had entered on the input screen. Finally the records are retrieved on the output screen.

3. Changes in Instructions and Messages

Another important area of interface design that underwent improvements in successive versions, is instructions and
What to do?

1. Click in this box.
2. Type the subject under which you want references. OR Click in subject dictionary box, select & click on the subject in popup box & paste.
3. Click FIND Box.

Enter subject heading: **Telecommunication**

fig. 7.7 Input screen with only one field
messages. Instructions specify the functions or actions to be performed by the user, while messages inform user about various aspects of searching. This area of interface design has a direct bearing with the changes described in sections 1 and 2 above. However, major changes that have occurred in explanation, input and selection screens are described hereunder:

3.1 Explanation Screen

The purpose of this screen is to explain a user 'what the subject access is all about?', 'What the three approaches are?', 'How they should proceed?', Initial versions of interface had only one composite explanation screen (Fig. 7.8) with three parts each devoted to a particular search. This, however, was found inconvenient, as the user who is pursuing a particular search, is exposed to this screen which not only contained information about his selected search but also about others, that is quite unnecessary for him at that moment. Consequently, each approach was provided with a separate explanation screen with more precise and concise instructions (Fig. 7.9).

3.2 Input Screen

Informative changes in the input screens have gone parallel to the
About

Subject access and the three approaches

When books on a particular topic are sought without precisely knowing Author or Title, a subject search is invoked. This interface serves subject approach in following ways:

1. Class number Search: A Class number is the number by which books are arranged on shelf, e.g., 621.381 = Electronics. This search is based on the assumption that every reader recognises his/her subject from broader to narrower areas successively, till he/she reaches to a fairly specific class of his/her choice and thereupon finds references under that class. Click anywhere to start search:

2. Subject Heading Search: A standard term in a subject is called a subject heading. This approach is helpful when you want to search references by a known term. Click anywhere to start search:

3. Keyword Search: A keyword is generally taken from the title and is not necessarily standardised. A keyword search helps in finding references, when certain words denoting subject, are known. Click anywhere to start search:

NOTE: PLEASE FOLLOW "WHAT TO DO ?" INSTRUCTIONS DURING A SEARCH.

Fig. 7.8 Composite explanation screen
The number by which books are arranged on the shelf in a library is called Class Number, e.g. 621.381 = Electronics.

The next screen shows the divisions and subdivisions of the subject.

Remember this search is characterised by this colour throughout.

Click anywhere to start search and follow "What to do?" instructions.

Click on Green Button for "Help".

Fig 7.9 Separate explanation screen for CNS
structural changes of the input screens themselves. For example, when the screen was a standard layout (Fig. 7.6) with all the fields, the instructions were different and when it got changed to single field input screen, the instructions got changed accordingly (Fig. 7.10). When the concept of 'Dictionary' was introduced, the instructions were further improved and simplified by using arrows (Fig. 7.7).

3.3 Selection Screen

This screen is meant to help user select items that have been retrieved as a result of his input search criteria and search further. In the initial stages, output screen was used to serve as selection screen also. But the instructions were not as precise as they should have been (Fig. 7.11), because the search mechanism itself was not greatly refined. Therefore, as the problem of searching was taking shape, so also the instructions in the selection screen. Then, there came a stage when the selection screen got over crowded , because it provided a number of options viz. search further, see full reference, Boolean, use of dictionary and also some symbols for finding. Too much information made the instructions indistinguishable and screen cluttered.
Enter 621.381 20

What to do?

Enter the number, under which you want references and Click here →

Fig. 7.10 Input screen in CNS showing instructional changes
Fig. 7.11 Selection screen in earlier versions
Later on it was observed that not all users try all the options provided. For example, when option was given to type or to paste search criteria from dictionary, a particular type of users always went for later. The same group of users were hardly found to employ Boolean searches or making use of symbols for finding.

4. Conclusion

The continuous process of evaluation of interface and getting the feedback led to the conclusion that the users of online catalogue may be broadly grouped into—those with little or no knowledge of subject searching called ordinary level users and those with high level of skills of subject access called advanced level users. While the former wish to confine their search to just ‘pointing and clicking’ to retrieve records without using the keyboard, the latter, always in pursuit of getting most of the material pertaining to their subject, want to have more room for manipulation of their search criteria by using Boolean and other facilities. It was, therefore, decided that the interface should separately provide access to both group of users, keeping in view their temperaments and also requirements. It is with this view that the final version, described in foregoing chapters, was designed.
Chapter 8

EVALUATION OF INTERFACE

Apart from the continuous evaluation of the successive versions involving the development of the interface with the users, the final version was subjected to a more formal evaluation through questionnaire and interview. Owing to the time constraint, this evaluation was not in as much detail as it should have been. However, some useful reactions on different aspects of the interface were received. This chapter discusses the objectives of the evaluation, methodology used, the questionnaire and the outcome of the evaluation process.

0. Introduction

Any system is developed according to the thinking of the designer. The exercise of evaluation studies the difficulties faced by the users of the system. The problems are then, analysed by the designer for making necessary improvements in the system. Subject access to OPACs is a complex process involving a number of components viz. document, index, hardware, software, searching and searcher. In a small project like this, it was not possible to evaluate each component individually. However, evaluation was carried out specifically with a view to determine
the user-friendliness of the interface. Hence, the interface was evaluated keeping in view the following objectives:

(a) To discover if the user retrieves the required records easily. If not, what part of the system is creating difficulties in retrieval.

(b) To discover the user's view about consistency of the system.

(c) To get the views about the organisation of various layouts.

(d) To know the views about the instructions and massages.

(e) To discover the views about the three ways of subject access.

(f) To know the user's views about visual clarity of various layouts.

1. Method of evaluation

There exist a variety of evaluation methods such as transaction log analysis, interview and observation, focus group interview, questionnaire, simulation etc. For evaluation of the present interface, only two methods i.e. questionnaire followed by an interview, were found to be practically feasible. It was decided
that the user should first of all be exposed to all the parts of the system through some questions, so that they have a real feel of what the system is about and how it works. This should be followed by an interview to get the feedback about the different aspects of the system. The interview method was preferred at this stage because interactive method is always better to get the user's reactions. Thus, the questionnaire (Appendix III) consisted of two parts. While the first part was meant for the user, the second part was to help the interviewer to note down the feedback.

As the system provides two different routes for subject access depending upon the user level, the evaluators were grouped accordingly into two i.e. ordinary and advance depending upon the probability with which they have used online catalogue, made subject searches and applied Boolean logic. In ordinary level ten under-graduates from the department of Information and Library Studies and also from some other departments were invited for evaluation. Their questionnaire had fewer questions on the basis of the facilities, interface has for them. An equal number of advanced level users comprised of post-graduate students from Library Science, Electronics and also few library workers.

At the time of evaluation, the user was introduced to the interface and its three ways subject approach. About twenty to twenty five
minutes were given to each user to explore the system, followed by a questionnaire to be completed within fifteen-twenty minutes. This was followed by a twenty five minute interview.

2. The questionnaire

The first part of questionnaire consists of a set of six questions. The questions were framed in such a way that the user, in order to answer the question will try all different approaches provided in the interface. For example, to answer the first question, the user has to use CNS, to find the total number of records. To answer the second question, he has to use 'full reference' facility provided on the screen. Similarly he has to search further to answer the third question. Questions four and five were related to SHS whereas the last question was meant for KWS.

For advanced level users, there were two additional questions to enable them to try Boolean options and also the symbols such as =, >, <, etc. while searching.

In the second part of the questionnaire, meant to assist the interviewer, following areas were identified:
2.1 Visual Clarity (Question 1-5)

Visual clarity is one of the most important features of a system. As the interface has many different layouts each with some set of instructions, buttons to perform various functions, messages, fields in different colours, the success of the interface depends on the fact that every aspect of the screen should be visually clear and the different types of information on the screens should be uncluttered and distinguishable. If not, all the efforts of the designer will go in vain for the user will bewildered and unable to perform necessary actions to retrieve records. Hence, this aspect addressed questions relating to identification of each screen, clarity of instructions, messages and displayed information, impact of different colours on system's operations.

2.2 Consistency (Question 6-8)

Another important aspect for a system to be evaluated, is the consistency in various functions, instructions, messages, location of buttons and assignment of colours. Consistency not only aids the user's memory and makes their job easier but also leads to economy of time. Thus, this aspect of interface evaluation covered questions related to assignment of colours to different screens, buttons and fields; search mechanism for similar results; location
of various instructions, messages and buttons.

2.3 Informative feedback (Question 9-11)

As the interface used certain jargon and works on the basis of certain instructions which should be strictly adhered to while searching, it is worth while to get a feedback about them. Therefore, the second part of evaluation addressed issues pertaining to the clarity of instructions, terminology used help screen and explanation screens for each search etc.

2.4 Usability (Question 12-14)

An interface is basically a layer between the user and the system that should work in such a way that it could make user's job much easier and effective. Thus, the success of the efforts of interface design depends upon its usability. It is important, therefore, to get the feedback related to the problems in understanding the search mechanism and carrying out search operations.

3. Response and discussion

As the survey deals with only a small population of users working with a database of 300 records only, statistical analysis of the
answers is of little relevance here and one should not generalise too widely from the answers received from the first part of the questionnaire, which was basically designed to acquaint the users with various parts of the system, so that his views could be known during the interview stage.

3.1 Part I

3.1.1 Question 1: How many records has the catalogue in the class 'components & devices'?

The question was concerned with the identification of given subject area from the tree structure in CNS and to find out records under that. The users seem to have understood this part of interface quite well, as all the users of both levels, responded correctly.

3.1.2 Question 2: From the list in 1 above, find the name of an author for a work on 'Fibre optics'?

This and the following question were meant to guide the user to use other facilities given on the layout. Question 2, therefore, was concerned with the use of 'Full reference' button to switch over to another part of the database to find out the name of author. The
question was successfully answered by all the users.

3.1.3 Question 3: From the list in 1 above, find the number of records under the subject 'Microwave-devices'?

This question involved the use of further search option on the referred screen. Most of the ordinary level users could perform this search successfully, while the rest could either not understand the question or the steps involved in that option. Some of them were still using the 'Full reference' button to answer this question also. The same mistakes were committed by advanced level users also, as only half of them could answer this question correctly. However, when the similar option was used in other searches, the success rate was much higher.

3.1.4 Question 4: How many records are there for the subject 'Amplifiers'?

This question involved the SHS approach. It was found that majority of ordinary level users found the answer correctly where as the success rate was 100% in advanced level.

3.1.5 Question 5: How many records can you find under the class number for 'Amplifiers'?
This question involves further search option in SHS through class number which some users in both the categories could not understand correctly here. The general problem seemed to be due to not following the instructions correctly and systematically. Users in ordinary level could not understand that they had to click in the class number field first before clicking the dictionary button. One advanced level user also did not fully understand that he had to search under that class number on the same screen. Instead, he noted the number for 'Amplifiers' from SHS and searched it via CNS, but retrieved the records anyway.

3.1.6 Question 6: Who is the publisher of 'European Intelligence Network Conference'?

This question involved the KWS from any of the four keywords from the title and was responded correctly by all the users in both the categories.

3.1.7 Question 7: (For advanced level users)

How many records can you find for:

   Design AND circuits,
   Design OR circuits?
This question was meant to check if the users correctly understand the instructions for making these searches. About half of the users could make these searches successfully. Others had difficulty in either understanding the instructions or they were trying to enter the search items, as asked i.e. using 'AND' 'OR' in between the two terms. That means, they did not read the instructions carefully, a general complaint in OPACs.

3.1.8 Question 8: (For advanced level users)

Find records exactly under 621.38153520?

This search involved the use of certain symbols before entering the search term. The majority of the users could perform this search successfully, while others had to use 'help' screen, before retrieving the information.

3.2 Part II

Part II of the questionnaire that was meant for interviewing the user, addressed following four issues:-
3.2.1 Visual clarity (Question 1-5)

Almost all the users agreed that the assignment of different colours makes the screen visually attractive. Only one of them had her own liking about the colours used. Contrary to this, most of the users were not too sure if the assigned colours to different layouts and buttons makes the system easier to operate. They were of the view that once they knew what search they were in, they did not bother to remember the colour. However, they felt that the colour scheme chosen might be helpful for a regular user of the system. Most of them felt that colours assigned to SHS and KWS should have been more contrasting as in CNS. Asked if the different type of information is clearly distinguishable on the screen, almost all of them replied in the affirmative. At least, one advanced level user complained that the instructions were not easily distinguishable when the background colour was dark as in CNS. Another user suggested to put the instruction for a given option in a box, but that would be confused with the buttons.

Almost all of them agreed that the displayed information was very well organised and that the screens remain uncluttered even with the large amount of information. One ordinary level user suggested that the boxes for two different options on the same screen should be separate and marked numerically. She did not
like the numerical division method (i.e. 2.1, 2.2...) for numbering the steps, but that is simply a matter of personal preference.

3.2.2 Consistency (Question 6-8)

With regard to the question of consistency in the search method the respondents seemed to agree fully. Only one user pointed out the difference in search method for CNS in the input screen, which of course is different than other approaches. The users in general liked this feature and expressed that it helps the search a great deal. There was complete agreement on the issue of consistency of location of same type of information on different screens. As to the locations of buttons, users in general noticed uniformity. A few of them pointed out that the location of 'Help' button was not always the same in all layouts. This happened only on those screens where there was paucity of space for accommodating longer instructions and buttons both.

3.2.3 Informative Feedback (Question 9-11)

The users of the interface generally felt no difficulty in understanding where they were in the system because of the heading given on each screen. Some of them were helped by the colour screen as well. As to the on-screen instructions, there was a
mixed reaction. While some said they were both clear and concise, others felt that they were concise but not always clear. The first view was expressed by most of the ordinary level users, whereas the second one was by advanced level users, who cited two examples. One in SHS, where user has to choose between subject heading/class number and another while making 'Boolean' searches. In the latter case one of the users was confused as to where to start Boolean search because the general statement for 'Advanced level user' contains:

"This will give you more room to manipulate your search by using keyboard, applying Boolean and other facilities,"

This user put the search statement in the subject heading field on the first screen in SHS, where there is no provision of Boolean. The second complaint was the ambiguity of instructions for Boolean searches. To one of them, it was not clear if he had to press 'Apple key & N' for OR search after entering the first search criteria. However, they felt that these problems will not arise, once the user gets used to the system. Realising the shortage of space for more elaborate instructions, they suggested a few more changes in the instructions for Boolean and the detailed ones in the 'Help' screen, which they found inadequate in such cases. For the ordinary level users, however, the 'Help' screens were OK.
3.2.4 Usability (Question 12-14)

Users in all categories did not report any difficulty in understanding the terminology used in the system. When users from Electronics department were asked specifically about the terms like class number, subject heading and keyword, they were of the view that library users are mostly familiar with these terms. The users were fully satisfied with the explanation given for each search and reported no problems whatsoever in any group. As to the question of which of the three approaches, they found easier, they had their own choice with their own reasons. Some of them felt that they were equally good and was difficult to say which one was better because in a given situation one approach might serve better than other.

However, one of the user from Electronics department noticed the overlapping boundaries of various divisions of the subject in CNS and hence felt negatively about that approach. He preferred the other two approaches. This however, is a reflection on the divisions of electronics in Dewey Decimal Classification 20th. edition. But as the knowledge is progressing the subject boundaries are getting more and more blurred making it difficult to have unanimity on the divisions of a subject.
3.3 General Comment

Some of the advanced level users were requested to try ordinary level approach also and asked their preference between the two. The reaction was again a mixed one. One user felt that advanced level search is better and less time consuming than the other one, as making selection from a 'Dictionary' was time consuming especially when dictionary was quite large. Other reasons of preference were the Boolean search and use of keyboard that provides more freedom to the user. However, another user saw the two approaches having their own advantages and disadvantages. For example, Boolean search is available in advanced level only which is devoid of a 'Dictionary' facility available in ordinary level only. Similarly, typing a search is possible in advanced level but not so in ordinary level. According to him, even an advanced level user may some time wish to consult a dictionary as much as an ordinary level user may like to use Boolean or key in search himself. For him, the two approaches should be merged together so that the user can get best of both worlds, that is available in earlier versions of the interface.

As to the general comment, users, by and large, were more than satisfied with the system. While some one was "greatly impressed with system's dictionary", others found it "quite fun to use the
interface" and "needed only 10-20 minutes for getting familiar with it". In any case, the general feeling was that they, "get the required information by one way or the other" and that was "the beauty of the system", which they liked most.

4. Recommendations to improve the interface

In view of the evaluation performed, the following recommendations may be made to improve the interface:

1. The instructions should be made clearer, specially when more than one search options are provided.

2. The colours used for SHS and KWS should be made more contrasting but not too dark to lessen the visibility of the instructions.

3. The location of various buttons be made more consistent despite the space problem.

4. Instructions for Boolean search be given fresh look. On the first screen for user level, it should be made explicit that the Boolean searches be employed where provided only.
5. Help messages should be improved further, specially when Boolean searches are to be elaborated.
Chapter 9
CONCLUSION

The present work is an attempt to develop a user friendly interface to mitigate at least some of the problems of subject access in OPACs. Despite the time constraints, the project has tried to give a fairly reasonable insight into the current state of subject access problems in OPACs by examining the evolving trends of research and possible solutions employed. One of the solutions to that problem by developing novel interfaces, that surely has great promise, was implemented by using FileMaker Pro. In the process, some of the enhanced indexing techniques were implemented for improved subject retrieval by developing a user-friendly front end interface. In view of great and growing interest in the subject of electronics in modern era, a database of about three hundred records representative of all broad areas of the subject was prepared. The interface provides three different ways of subject access to the database i.e. by class number, subject heading and keywords. According to Aluri, "there is little doubt that efficient subject retrieval systems of the future will employ all three methods: classed approach, controlled alphabetical vocabulary and uncontrolled keywords". (1). The interface not only proved the above statement beyond any doubt by providing three approaches in one system but has gone a step forward by
implementing various possible combination of approaches, that could make subject searches more accurate and exhaustive. It was made possible by providing SHS in CNS and CNS in both SHS and KWS. Where as the former helps in narrowing down a CNS, the latter broadens a search in SHS and KWS. Besides this, the system provides free text searching through uncontrolled title keywords but retains LCSH structure in form of strings. The latter helped a great deal in picking up a subject from a dictionary or displayed list for further retrieval.

The selected software i.e. FileMaker Pro, by and large, proved helpful in interface design because of some of its unique features. For example, it is a single file database containing all data, multiple layouts, scripts and indexes, ability to assign buttons to a layout which can trigger scripts and switch layouts and perform many functions. It has a simple method of scripting in which options are already provided to choose and chain the scripts. An additional facility is its ability to produce an index of each word or number present in each field.

Making use of these and other features, the aim was to design an interface which could obviate the need of menu bar or status panel. While every attempt was made to achieve this end, certain inherent draw backs of the software made the work more
difficult. These are:

1. There is no way get rid of the menu bar from the screen.

2. The view index box could show 20 characters only which was inadequate for representing long strings of words.

3. Boolean operators could not be searched straight away by using them with the terms. Lengthy procedures are involved to perform ‘OR’ ‘NOT’ searches. The latter is not possible without using ‘omit’ method box on the status panel, as there is no keyboard method to that search. Hence, the interface did not provide ‘NOT’ search. For ‘OR’ search, a new request could be created by using keyboard but that was found difficult by the users. Only the ‘AND’ search was simpler.

4. There are no facility for explicitly saving or cancelling changes made to a record. If by mistake a user keys in search criterion without going to ‘Find’ mode, that information becomes the part of the database, unless it is marked and deleted. For any database this not good practise. In fact, through out the programme there is a distinct lack of save or cancel button.

5. FileMaker Pro does not have a programming language but supports a basic scripting capability which is just a way of
building up a batch file type list of actions and does not give much freedom for scripting according to the need.

6. Where as it is possible to create a picture field in FileMaker Pro, it can not record the sound that could be used to give some instructions and messages for the user. The latest version has recovered this defect.

1. Scaling up the interface for a real library situation:

Even with the above limitations of the software, it is probably worth exploring how the system could be applied in a real library situation. This will call for some necessary changes in the interface. As general library clients access a catalogue from author, title also, the two additional approaches could easily be provided because the experimental database consists of both these fields. As both of them are known item searches, a small script with find and switching the layout will do the job. With these two additional approaches, the interface can easily be implemented in a library specialising in electronics. But for a library dealing with all branches of knowledge, changes will be required in CNS only, for which following three methods may be proposed.
In the first method, successive screens method which was used in earlier versions of interface, may be employed to take a user from general to specific classes in the hierarchy. The designer will have to take decision about the level of generality and specificity of classes i.e. from where to start and where to end the successive levels. The designer may find it a time consuming process. In the case of too many subdivisions of a class to be accommodated on one screen, either the pattern of tree structure may be changed from horizontal (as in present interface) to vertical or half of the subdivisions may be shown on the next screen.

Another method involves the creation of a separate file for Dewey knowledge base and use it as look up file for finding the number of a given subject and using it for retrieving records under that class number.

A third method could be to create a separate field in the database, that contains subject and its corresponding class number. The contents of this field may be used as 'View index' under the disguise of a 'Dictionary' for finding a required subject along with its class number, which could be used in retrieving records from the catalogues. The problem of twenty character limit may again crop up in the view index, which might be taken care of by the Claris Corporation in the successive version of FileMaker Pro.
Alternatively the designer will have to decide a point where subject code could be introduced rather than repeating the same notation with all the deeper class marks. As for example, 621.381 for electronics, could have been replaced by a single code in all the deeper class notations, making the class marks shorter and more mnemonic for user. This strengthens the view that the classification system for computerised retrieval should be different than that for shelf arrangement, because as Aluri puts it, "the quality of online subject retrieval via a classification scheme depends on the computer hardware and software capabilities and on the structure and notation of the classification scheme". (2)

2. Suggestions for further research

As with any research, this project has left several questions unanswered. Apart from what has been discussed in the preceding paragraphs, the following are the ideas about further study into this complex subject:

1. To study optimum interrelationship among the three methods of subject access.

2. To compare retrieval using LCSH string index and single worded subject index.
3. To compare the retrieval of KWIC index and single worded key word index.

4. To explore the possibility of weighted retrieval in the present interface.

5. To explore the possibility of truncation while searching through this interface.

Subject access in OPACs remains a dynamic process in which the three facets of online catalogue viz. the database, search process and user interface continue to be improved. In any case, the interface should strive to curb the perennial problems of subject access (i.e. search failure and information overload) as much as possible. Though, according to Hildreth (3), "the online catalogue will never be a finished perfected product" but this is not the case with OPACs only. To this author nothing is perfect in the world, the process of identifying problems followed by improvements continues as time goes by and human race progresses.

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2. Ibid. p. 162.


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APPENDIX I

Script in HyperCard for automatic record making.
on mouseUp
  global holdit
  put returns & return into cardmark
  put "082." into class
  put "100." into auth
  put "245." into tit
  put "250." into ed
  put "260." into pub
  put "650." into sub
  put "660." into subj
  put "690." into prec
  open file "macintosh hd:electron"
  repeat until it is empty
      read from file "macintosh hd:electron" until "#"
      put 15 into startval
      put it into holdit
      put number of characters of holdit into enum
      repeat with cnum = startval to enum
          if character cnum of holdit = "$" then
              put " " into character cnum of holdit
              delete character cnum+1 of holdit
          end if
          if character cnum of holdit = return then
              put " " into character cnum of holdit
          end if
      end repeat
      delete character 1 to startval-1 of holdit
      if it contains class then
          put holdit into field cn
      end if
      if it contains auth then
          put holdit into field author
      end if
      if it contains tit then
          put holdit into field title
      end if
      if it contains ed then
          put holdit into field edition
      end if
      if it contains pub then
          put holdit into field publisher
      end if
      if it contains sub then
          put holdit into field subject
      end if
      if it contains subj then
          put holdit into field subj2
      end if
      if it contains su then
          put holdit into field subj3
      end if
      if it contains prec then
          put holdit into field precis
      end if
      if it contains cardmark then
          dome nu "new card"
          -- put cardid into field year
          -- else
          -- put " " into field year
      end if
end repeat
close file "macintosh hd:electron"
end mouseUp

on cleanup
global holdit
put 14 into startval
put it into holdit
put number of characters of holdit into enum
repeat with cnum = startval to enum
  if character cnum of holdit = "$" then
    put " " into character cnum of holdit
    delete character cnum+1 of holdit
  end if
  if character cnum of holdit = return then
    put " " into character cnum of holdit
  end if
end repeat
delete character 1 to startval-1 of holdit
end cleanup
APPENDIX II

Script for merge file in FileMaker Pro.
on mouseUp
    open file "mergefile"
    write "cn;author:title;edition:publisher:subject;subj2;subj3;precis;"&return to file
    repeat with cno = 3 to 341
        put field cn&";"& field author&";"& field title&";"& field edition&";"& field publi;
        put field subj2&";"& field subj3&";"& field precis&";" into hold2
        write hold1&hold2&return to file "mergefile"
    go next
end repeat
    close file "mergefile"
end mouseUp
APPENDIX III

Questionnaire.
Evaluation of Subject Access Interface in Electronics

Questionnaire: Part I

Introduction

You must have used an online catalogue in a library, looking for books by a given author or title. Often when you need books on a given topic, you access catalogue by a subject. This interface allows three subject approaches, by Class number, Subject heading and Keyword. Please try each one of them.

Please choose your user level as ordinary, use this interface and answer the following questions:

1. How many records has the catalogue in the class ‘Components & devices’?

2. From the list in 1 above, give the name of an author for a work on ‘Fibre-optics’?

3. From the list in 1 above, find the number of records under the
subject 'Microwave-devices'?

4. How many records are there for the subject 'Amplifiers'?

5. How many records can you find under the class number for 'Amplifiers'?

6. Who is the publisher of 'European Intelligence Network Conference'?

**For advanced level users only**

7. How many records can you find for:
   
   Design AND Circuits;
   
   Design OR Circuits?

8. Find records exactly under 621.3815 3520?
Part II

Please answer the following questions

1. Do you think use of different colours makes the screen visually attractive?

2. Do you think, assigned colours to different screens and buttons makes the system functionally easy?

3. Is different type of information clearly distinguishable on the screen?

4. Do you think the displayed information looks well organised on the screen?

5. When a screen has large amount of information, do you think it makes the screen uncluttered?

6. Do you find consistency in the search method?

7. Do you find same type of information in the same location on different screens?
8. Do you find consistency in the locations of buttons?

9. Is it always clear where you are in the system?

10. Do you think the instructions and messages are always clear and concise?

11. Do you think 'Help' screens are really helpful?

12. Did you face any problems in understanding the terminology used?

13. Is the explanation given for each search clear and enough?

14. Which of the three approaches you found easier?

15. General comment: