# EVALUATING CD-ROM SOFTWARE: A MODEL

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CD-ROMs have become one of the fastest growing products of the information industry. Since 1988 the number of titles available has doubled or almost doubled each year.[1] This growth has created a variety of databases running under an ever growing number of software packages. In fact, the 1992 edition of The CD-ROM Directory, published by TFPL, lists 282 separate pieces of CD-ROM software for 2012 CD-ROM products (see Figure 1). Of the 282 software packages, 57.8% only had one CD-ROM title, with 42.2% having more than one CD-ROM title. Finally, only 9.22% of the software packages had ten or more titles.[2]

The high growth and increasing use of CD-ROM products has stirred great interest in the implementation of standards for the user interface of these products. A variety of standards have been proposed and are currently being developed by several groups. These include the United States Government's Central Intelligence Agency (CD-RDX), special interest groups such as the Special Interest Group on CD-ROM Applications and Technology (SIGCAT) - CD-ROM Consistent Interface Guidelines, and National Information Standards Organization (NISO) - Z39.58 Common Command Language for Online Interactive Information Retrieval. As important as these standards are, their acceptance and implementation will take time. Until CD-ROM standards are implemented on a wide scale basis it is important that these products be evaluated carefully given the number of software packages they operate under. This is especially true when libraries, faced with shrinking budgets, must ensure that their selection methods for CD-ROMs result in the acquisition of products which fulfill the user's information needs while remaining user friendly.

While CD-ROMs have been evaluated since their introduction, "reviews of CD-ROM products in the professional literature have largely been uncritical in their discussion of the user interface or have been limited to subjective general comments about difficulty of use."[3] This can be attributed to the fact that existing guidelines for the evaluation process are essentially lists of features to look for. In this paper a model will be presented that builds on the existing guidelines and checklists through the addition of a simplified ranking system. This model will enable information professionals to evaluate CD-ROM software in a more systematic fashion.

## Literature Review

Very little has been written about how to evaluate CD-ROM software. Nicholls et al believe that the most important part of a CD-ROM is the user interface and that evaluation of the interface should concentrate on its user friendliness. Their evaluation process divides CD-ROM software into five broad categories:

- hardware/software dependencies
- interface features
- search and retrieval functions
- output functions
- general production functions

Each of these categories is subdivided into evaluative criteria. They also state that not all criteria apply in every case and that specialized criteria must be developed for certain products.[4]

Like Nicholls et al, Steven Zink's evaluation criteria are centered around evaluation of the user interface. However, unlike Nicholls et al, Zink concentrates on aspects of software design that impact primarily on user friendliness. He suggests that the following areas be examined when reviewing CD-ROMs and their software:

- screen design
- use of colour, spacing, and windowing
- standard terminology
- help screens[5]

In keeping with his user friendly approach, Zink suggests that software designers refer to Paul Heckel's The Elements of Friendly Software Design[6] when designing CD-ROM software.

Tian-Zhu Li looked at 20 CD-ROM systems in academic libraries in order to discover the difficulties end users encounter in the search process. She used 26 questions to measure the search capabilities and the ease of use of each system.[7] Like the approaches above, Tian-Zhu's approach is based on a "yes/no" philosophy. By "yes/no" philosophy we mean that one simply determines whether a software package has various features or not, -No attempt is made to evaluate how well each function is implemented.

Candy Schwartz has developed yet another checklist for evaluating CD-ROMs. In this checklist she suggests that the following broad areas should be used for evaluating CD-ROM software:

- overall ease of use
- searching
- search results
- search management[8]

Each of the above areas is subdivided extensively into "yes/no" type statements.

Péter Jacsó has written a comprehensive guide to evaluating CD-ROMs in general. This guide approaches CD-ROM evaluation from a wider perspective. When discussing the evaluation of CD-ROM software, Jacsó uses many of the above criteria such as ease of use, user interface, and search capabilities. However, he deals with each criteria in a more comprehensive fashion. Jacsó divides CD-ROM software into four areas:

- interface functions
- search functions
- set and query management functions
- output functions

and provides detailed examples showing how to apply each criteria.[9]

It is evident that while the above checklists and guidelines have been developed for the purpose of evaluating CD-ROMs and their software, only Jacsó has developed a model that addresses the

process in detail. Although Jacsó discusses the evaluation process in great detail and clarity he fails to incorporate this detail and clarity in his evaluation form. The form does not mention all the major criteria discussed in the text. He also suggests that a rating scale from 1-10 be used for each criteria but does not give any guidance as to how to apply the rating system. For instance, one is supposed to rate truncation from 1-10 with no guidance as to what rates a one, what rates a 5, or what rates a 10. In our opinion, the use of such a large scale without any guidance complicates the evaluation process unduly. Our goal is to build on Jacsó's excellent work by providing a detailed evaluation form that incorporates a simplified rating scale. In addition, we believe that the evaluation process should also incorporate the CD-ROM Consistent Interface Guidelines proposed by SIGCAT.

**SIGCAT CD-ROM Consistent Interface Guidelines**

The SIGCAT guidelines, released in 1992, were developed in response to the "ever increasing assortment of software interfaces and command sets"[10] being used for CD-ROMs. This situation has created a growing frustration on the part of librarians and patrons who, in many cases, must face a variety of different interfaces and command languages when using a handful of CD-ROM products. For instance, the University of Western Ontario Library System subscribes to forty different CD-ROM titles which run on twenty-two different software packages (See table 1).

**TABLE 1**
**CD-ROM Holdings of University of Western Ontario Library System**

| Type of Library | Number of CD-ROM Titles | Number of Software Packages |
|---|---|---|
| Central | 10 | 5 |
| Science & Technology | 6 | 4 |
| Business | 7 | 5 |
| Education | 9 | 9 |
| Engineering | 4 | 4 |
| Law | 3 | 3 |
| Music | 2 | 2 |
| **Combined Holdings** | 40* | 22** |

* This represents the total number of unique titles.
** This represents the total number of unique software packages.

The SIGCAT guidelines propose thirteen basic functions that should be incorporated in any CD-ROM product. These functions are divided into three areas:

- top level
- operational
- navigational

The guidelines proposed by SIGCAT have received wide acceptance and it is anticipated that user interfaces will be more consistent in

the future. This consistency will come from following standardization proposals such as the SIGCAT guidelines and the development of interface software packages that allow several search engines to run under one interface. While not every software package will function in exactly the same fashion, an increasing number will preform the basic functions outlined in the SIGCAT guidelines. Since these guidelines contain the 13 basic functions that any software should perform, it is logical to use them as the basis for an evaluation model.

**The Model**

The evaluation process is divided into the following areas:

- top level
- operational
- navigational
- ergonomics

The Top Level area includes functions related to the overall

searching of the database. These functions include:

- Help
- Browse Index
- Searching
- Query management
- Outputting records
- Restarting
- Changing databases
- Quitting

The Operational area includes the following functions:

- execute
- break
- escape

The Navigational area includes functions dealing with the movement within the database and retrieved records.

The Ergonomic area deals with the layout of screens, the use of colour, and the terminology used on screens and in error messages.

Each of these four areas is subdivided into a number of criteria to which ranks have been assigned. The ranks indicate how well the software in question fulfills the function in question. For example, a package that has no help would be given a rating of 0 while a package that has context sensitive help would receive a 3. A low rank in a specific function indicates that the software is not very powerful with respect to this function. A high rank indicates that the software has a higher degree of performance with respect to a specific function.

While many of the functions listed in the model under the Top Level sub-areas do not have to be developed to their fullest extent, there are some functions which are extremely important and thus have a minimum level of development. These functions, which have the minimum acceptable development level marked by an * in the evaluation form, are listed in Table 2. Any CD-ROM software that does not meet the minimum level of development in each of these

functions should be examined carefully, as to its overall value, even though its overall rating may end up being satisfactory.

**Table 2**
**List of Functions with Minimum Levels of Development**

| Function | Minimum Level of Development |
|---|---|
| Help | copy of the manual online |
| Browse index | only one index available |
| Design of index: number of postings | only number of records or number of terms given |
| Search features: truncation | only right truncation |
| Search features: boolean | and, or |
| Search features: search status display | please wait message during search processing |
| Search features: set and query management | can combine searches |
| Search features: search history display | partial |

## The Evaluation Form

* = suggested minimum level of development

| RATING | FUNCTION | Score |
|---|---|---|
| | **TOP LEVEL** | |
| | **HELP** | |
| 0 | none | |
| 1 | *copy of the manual ondisc and/or in print | |
| 2 | structured help -- table of contents | |
| 3 | context sensitive help | |
| | NOTE: Help should always be activated via the F1 key and should be available at all times. Deduct 0.5 from a score if help is not available at all times (minimum score is still 0) | |
| | **TUTORIALS** | |
| 0 | none | |
| 1 | stand-alone (separate program -- manual or disc) | |
| 2 | available only from opening screen | |
| 3 | available at all times | |
| | **INTERFACE** | |
| 0 | single interface for all users | |
| 1 | two interfaces | |
| 2 | three or more interfaces | |
| | NOTE: All search capabilities should be available from every interface. Deduct 0.5 from a rating if an interface does not support all search functions - to a minimum of 0, | |
| | **BROWSE INDEX** | |
| 0 | no index available | |
| 1 | *only one index available | |
| 2 | two indexes available | |
| 3 | more than two indexes available | |
| | **DESIGN OF INDEX: NUMBER OF POSTINGS** | |
| 0 | not given | |
| 1 | *only number of records or number of terms given | |
| 2 | both the number records and the number of terms given | |
| | **DESIGN OF INDEX: CROSS REFERENCES** | |
| 0 | none | |
| 1 | See references | |
| 2 | Both see references and see also references | |
| 3 | See references, See also references, and an online thesaurus | |
| | **TERM SELECTION: FROM INDEX** | |
| 0 | not available | |
| 1 | available | |
| | **TERM SELECTION: FROM RECORD** | |
| 0 | not available | |
| 1 | available | |

| RATING | FUNCTION | Score |
|---|---|---|
| | **SEARCH FUNCTIONS: TRUNCATION** | |
| 0 | none | |
| 1 | *only right truncation | |
| 2 | left and right truncation | |
| 3 | left, right, and embedded truncation | |
| | **SEARCH FEATURES: TRUNCATION TYPE** | |
| 0 | not applicable | |
| 1 | either one character or more than one character | |
| 2 | both one character and more than one character | |
| | **SEARCH FEATURES: BOOLEAN** | |
| 0 | none | |
| 1 | *and, or | |
| 2 | and, or, not | |
| | **SEARCH FEATURES: FIELD SEARCHING** | |
| 0 | none | |
| 1 | one to three searchable fields | |
| 2 | more than three searchable fields | |
| | **SEARCH FEATURES: PROXIMITY OPERATORS** | |
| | NOTE: There are 4 common proximity operators: within a field, within a paragraph, within a sentence, and within a certain number of characters | |
| 0 | none | |
| 1 | only 1 proximity operator | |
| 2 | 2 proximity operators | |
| 3 | 3 proximity operators | |
| 4 | all 4 proximity operators | |
| | **SEARCH FEATURES: POSITIONAL OPERATORS** | |
| 0 | none | |
| 1 | specify order of terms | |
| 2 | specify order and proximity of terms | |
| | **SEARCH FEATURES: ARITHMETIC** | |
| | NOTE: only applicable for databases that have numerical data such as prices, costs, etc. | |
| 0 | none/not applicable | |
| 1 | search for a specific figure | |
| 2 | search by a range of figures (i.e., all prices between $50 and $100) | |
| | **SEARCH FEATURES: SEARCH STATUS DISPLAY** | |
| 0 | none | |
| 1 | *"please wait" message during search processing | |
| 2 | number of records found so far or percentage of search completed | |
| 3 | number of records found so far and percentage of search completed | |

| RATING | FUNCTION | Score |
|---|---|---|
| | **SEARCH FEATURES: SET & QUERY MANAGEMENT** | |
| 0 | cannot combine searches | |
| 1 | *can combine searches | |
| | **SEARCH FEATURES: NUMBER OF SEARCH SETS** | |
| 0 | less than 20 | |
| 1 | 20 to 50 | |
| 2 | more than 50 | |
| 3 | user defined limit | |
| | **SEARCH FEATURES: SEARCH HISTORY DISPLAY** | |
| 0 | none | |
| 1 | *partial | |
| 2 | total search history can be displayed | |
| | **SEARCH FEATURES: SEARCH MODIFICATION** | |
| 0 | can not modify search | |
| 1 | make previous search current one and modify it | |
| 2 | scroll through search list and modify and search | |
| | **SEARCH FEATURES: SEARCH RESELECTION** | |
| 0 | can not reselect search | |
| 1 | can reselect search but only in the same database | |
| 2 | can reselect search in any database | |
| | **SEARCH FEATURES: SAVING SEARCHES** | |
| 0 | unable to save search strategies | |
| 1 | able to save search strategies | |
| 2 | prompted to save search strategies | |
| | **SEARCH FEATURES: SEARCH LISTING & REVIEW** | |
| 0 | unable to list saved search strategies | |
| 1 | only able to list saved search strategies | |
| 2 | able to list and display saved search strategies | |
| | **SEARCH FEATURES: UPDATING PREVIOUS SEARCH RESULTS** | |
| | NOTE: This function is used to perform saved search strategies when an update to the database is received. All new records are searched using a saved search strategy. | |
| 0 | not available | |
| 1 | available | |
| | **SEARCH FEATURES: STATISTICS GATHERING** | |
| 0 | no statistics available | |
| 1 | predefined statistics available | |
| 2 | user defined statistics available | |
| | **GENERAL OUTPUT FEATURES: BUILT-IN FORMATS** | |
| 0 | only 1 output format | |
| 1 | 2 output formats | |
| 2 | more than 2 output formats | |

| RATING | FUNCTION | Score |
|---|---|---|
| | **GENERAL OUTPUT FORMATS: USER-DEFINABLE FEATURES** | |
| 0 | user cannot define formats | |
| 1 | user can create format when installing the package | |
| 2 | user can create format at any time | |
| | **GENERAL OUTPUT FEATURES: RECORD LAYOUT SPECIFICATION** | |
| 0 | no control of record layout | |
| 1 | some control of record layout | |
| 2 | total control of record layout | |
| | **GENERAL OUTPUT FEATURES: MARKING OF ITEMS** | |
| 0 | cannot mark items | |
| 1 | can mark desired items | |
| 2 | can mark items you do not want | |
| 3 | can mark desired items and mark items not desired | |
| 4 | can mark both kinds of items and items remain marked until unmarked by the user | |
| | **GENERAL OUTPUT FEATURES: SORTING OF RECORDS** | |
| 0 | cannot sort records | |
| 1 | limited sorting abilities | |
| 2 | can sort records by any field | |
| | **DISPLAY: PREVIOUSLY EXECUTED SEARCH RESULTS** | |
| 0 | can not display previous search results | |
| 1 | can display previous search results | |
| | **DISPLAY: SHORT-ENTRY HIT LIST** | |
| 0 | not available | |
| 1 | available | |
| | **PRINTING OF RECORDS: NUMBER OF RECORDS** | |
| 0 | can print limited number of records (cannot be overidden) | |
| 1 | can print limited number of records as default but can be overidden | |
| 2 | will print as many records as desired | |
| | **PRINTING OF RECORDS: PRINT FORMATS** | |
| 0 | single print format | |
| 1 | more than one print format | |
| 2 | more than one print format but user defined | |
| | **DOWNLOADING OF RECORDS** | |
| 0 | no downloading capabilities | |
| 1 | single format downloading | |
| 2 | choice of download formats | |
| | **DOWNLOADING OF RECORDS: NUMBER OF RECORDS** | |
| 0 | not applicable | |
| 1 | can download a limited number of records | |
| 2 | can download an unlimited number of records | |

| RATING | FUNCTION | Score |
|---|---|---|
| | **RESTART** | |
| 0 | must back out of menus/screens one at a time | |
| 1 | can use a single key to restart the package | |
| | **CHANGING DATABASES** | |
| 0 | can not change databases | |
| 1 | can change databases | |
| | **QUITTING** | |
| 0 | can only quit from the main menu | |
| 1 | can quit from any menu | |
| | | |
| 80 | **TOTAL TOP LEVEL SCORE** | |

**OPERATIONAL LEVEL**

| | | |
|---|---|---|
| | **BREAK (Interrupting Operations)** | |
| 0 | can not interrupt operations | |
| 1 | can interrupt some features | |
| 2 | can interrupt all features | |
| | **ESCAPE** | |
| 0 | escape function returns user to main menu | |
| 1 | escape returns user to previous menu/screen | |
| | **EXECUTION OF FUNCTIONS** | |
| 0 | execution of functions is inconsistent | |
| 1 | execution of functions is consistent | |
| | NOTE: Consistent execution of functions means that the same key(s)/menu choices are always used to perform the same task, For example, if the key to activate the Help feature is F1 on one screen and F2 on another screen then the execution of functions would be inconsistent. | |
| 4 | **TOTAL OPERATIONAL SCORE** | |
| | | |

**NAVIGATIONAL ABILITIES**

| | | |
|---|---|---|
| | **BETWEEN PAGES IN RETRIEVED RECORDS** | |
| 0 | can only move down | |
| 1 | can move both up and down | |
| 2 | can move up, down, and to a specific page | |
| | **SPECIAL FEATURES FOR MOVING WITHIN RECORDS** | |
| 0 | no special features | |
| 1 | term(s) searched appear highlighted in records | |
| 1 | can jump to next occurrence of term(s) | |
| 2 | terms highlighted and can jump to next occurrence | |

| RATING | FUNCTION | Score |
|---|---|---|
| | BETWEEN RETRIEVED RECORDS | |
| 0 | can only move forward | |
| 1 | can move forward and backward | |
| 2 | can move forward, backward, and to a specific record | |
| | | |
| 6 | TOTAL NAVIGATIONAL ABILITIES SCORE | |
| | | |
| | ERGONOMICS | |
| | SCREEN TITLES | |
| 0 | none | |
| 1 | present | |
| | NUMBER OF MENU OPTIONS IN A MENU BAR | |
| 0 | more than 8 menu choices in a menu bar | |
| 1 | 8 or fewer menu choices in a menu bar | |
| | TERMINOLOGY | |
| 0 | most terms used on menus confusing | |
| 1 | a few terms on menus confusing | |
| 2 | no terms on menus confusing | |
| | COLOUR: ON COLOUR MONITORS | |
| 0 | use of colour makes display confusing | |
| 1 | use of colour helps make the displays clear | |
| | COLOUR: ON MONOCHROME MONITORS | |
| 0 | not applicable / some aspects of display difficult to see on monochrome screens | |
| 1 | no aspects of display difficult to see on monochrome screens | |
| | SCREEN LAYOUT | |
| 0 | screens very cluttered | |
| 1 | screens somewhat cluttered | |
| 2 | screens not cluttered at all | |
| | ERROR MESSAGES | |
| 0 | most error messages confusing | |
| 1 | some error messages confusing | |
| 2 | no error messages confusing | |
| 10 | TOTAL ERGONOMICS SCORE | |
| | | |
| 100 | TOTAL SCORE | |

## nterpreting the Total Score

nder the model outlined on the previous pages, a CD-ROM software ackage can receive a total raw score of 100 allocated as follows:

| | |
|---|---|
| Top level | 80 points |
| Operation | 4 points |
| Navigation | 6 points |
| Ergonomics | 10 points |

he total scores for each area can be compared to Table 3 to establish whether a product rates Poor, Satisfactory, or Good in specific areas. e have broken the Top level area into six areas that summarize the majo unctions examined in the model. The six areas are:

- User guidance (Help, tutorials, interface)
- Index (Browse index, design of index, term selection)
- Search features
- General output features
- Record Display (screen display, printing, downloading)
- Database management (restart, changing databases, quitting)

he areas of Operation, Navigation, and Ergonomics have a small number o categories and thus do not need to be subdivided.

| AREA | POOR | SATISFACTORY | GOOD |
|---|---|---|---|
| User guidance (8 points) | 0-3 | 4-6 | 7-8 |
| Index (10 points) | 0-5 | 6-8 | 9-10 |
| Search Features (37 points) | 0-18 | 19-33 | 34-37 |
| General output features (11 points) | 0-5 | 6-8 | 9-11 |
| Record display (11 points) | 0-5 | 6-8 | 9-11 |
| Database management (3 points) | 0 | 1-2 | 3 |
| Operation (4 points) | 0 | 1-2 | 3-4 |
| Navigation (6 points) | 0-1 | 2-3 | 4-6 |
| Ergonomics (10 points) | 0-4 | 5-7 | 8-10 |
| | | | |
| TOTAL (100 points) | 0-41 | 50-77 | 86-100 |

**Conclusions**

The above model has been developed for the purpose of evaluating CD-ROM software. However, it should be remembered that this is only one part of the CD-RO evaluation process. Other aspects of CD-ROMs must also be evaluated when deciding whether to purchase a CD-ROM product. These other aspects include data quality, cost, license agreements, and hardware requirements.

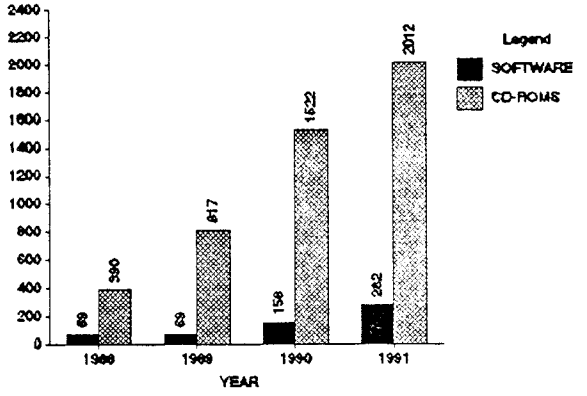
This project is also reported in:

Nicholls, Paul T. 1993. CD-ROM Buyer's Guide & Handbook. Wilton, CT.: Eight Bi Books.

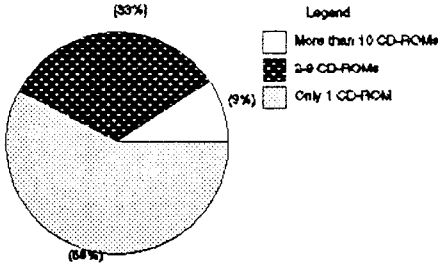
Richards, Trevor and Robinson, Christine. 1993. CD-ROM software evaluation: model. CD-ROM Professional (July 1993). (in press)

# FIGURE 1

# PRODUCT AND SOFTWARE GROWTH




## SOFTWARE USAGE




Source: CD-ROM Directory, TFPL Publishing, 1989-1992

## ENDNOTES


1. Nicholls, Paul T.; Sutherland, Patricia. "Survey of CD-ROM Titles in Print", presented at Online '92, Chicago, Il., October 26-28, 1992.

2. Finlay, Matthew; Mitchell, Joanne [eds.] The CD-ROM Directory: 1992 7th edition. London, England: TFPL Publishing, 1991.

3. Zink, Stephen D. "Towards more critical reviewing and analysis of CD-ROM user interfaces", CD-ROM Professional Volume 4 Number 1 January 1991, p. 16.

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5. Zink, pp. 17-20.

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7. Tian-Zhu, Li. "Generic approach to CD-ROM systems: a formal analysis of search capabilities and ease of use" in Interfaces for information retrieval: the state of the art Dillon, Martin [ed.], New York, NY: Greenwood Press, 1991, pp. 272-274.

8. Schwartz, Candy. "Evaluating CD-ROM Products: yet another checklist", CD-ROM Professional January 1993 [in press]

9. Jacso, Peter. CD-ROM software, dataware, and hardware: evaluation, selection, and installation Englewood, Colorado: Libraries Unlimited Inc., 1992, p. 9.

10. McFaul, EJ (Chair, SIGCAT) "CD-ROM consistent interface guidelines: a final report", CD-ROM Librarian February 1992, p. 18.