Potential Contribution of CD-ROM Technology to Libraries of Educational Institutions in Malaysia

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Abstrak : *Dalam artikel ini penulis cuba menghuraikan konsep CD-ROM. CD-ROM yang merupakan sistem maklumat optikal bukan sahaja dapat memperluaskan penyediaan maklumat dalam konteks perpustakaan tetapi juga dianggap sebagai satu alat pengajaran dan pembelajaran berasaskan teknologi yang canggih. Penulis mengutarakan ciri-ciri pembelajaran yang didapati pada CD-ROM serta bagaimana teknologi ini boleh dimanfaatkan. Artikel ini juga meninjau implikasi pentadbiran apabila teknologi ini diperkenalkan.*

Abstract : *In this article the author attempts to clarify the concept of CD-ROM. CD-ROM as an optical information system is not only capable of extending the scope of information in the library, but it can also be regarded as a teaching and learning tool based on sophisticated technology. The author discusses some learning characteristics of CD-ROM and how this technology can be utilised. The article also outlines the management implications when this technology is being introduced.*

INTRODUCTION

CD-ROM, an acronym of 'Compact Disc-Read Only Memory' is one member of the optical disc media. According to Tedd (1993), CD-ROM is:

'... an optical disc which can store text, graphics, sounds, etc., at high density. The contents of the discs cannot be changed by the user.'[1]

Crystal (1990) defines CD-ROM as:

'... a computer storage medium based on the use of the standard five-inch compact disc, licensed by Sony and Philips, and usually used for digital audio. One CD-ROM disc can store more than 600 megabytes of computer information, which is considerably more than a comparable size of hard magnetic disc. It is however a read-only device, and data is installed during manufacture; unlike the hard disc, the data on a CD-ROM cannot be altered. The main applications have been in providing access to large volumes of information such as encyclopedias and databases.'[2]

The significant feature of this information storage technology is the capability to store different types of data such as text, graphics, image and sound. However, the data on CD-ROM cannot be altered or erased once it is encoded to the disc.

A CD-ROM disc's physical characteristics are identical to an audio CD, being 12 centimetres (4.72 inches) in diameter with a thickness of 1.2 millimetres (0.047 inches) and weighs 25 grams. It is produced through similar processes, and plants designed for audio CD production can be adapted for mastering and replication of CD-ROMs.[3]

Although it is small in size a CD-ROM disc can store large amounts of data, equivalent to around 250,000 A4 pages of text or approximately 100,000,000 words.[4] According to Gunton (1993): 'The storage capacity represented by 550 million characters is the equivalent of about 250,000 printed pages or 300 substantial textbooks. Alternatively, a disc could hold, digitally encoded, 2,000 high-resolution colour images or 20 hours of speech.'[5]

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Like audio CD, a CD-ROM disc physically consists of a metallic disc bonded to a polycarbonate base coated with a transparent protective lacquer. A track spiralling from its centre measures some three miles long, and is arranged at a density of 16,000 tracks per inch.[6]

DEVELOPMENT OF CD-ROM TECHNOLOGY

The publication of database information on compact discs started in the mid-1980s and by early 1994 there were about 5,000 CD-ROM titles available.[7] The use of CD-ROM to store information has grown rapidly not only in number but also in subject coverage.

In many cases, the information is comparable to that available for online searching on the remote services and CD-ROM searching has become very popular, particularly in academic and special libraries. In 1990, the word 'multimedia' crept into CD-ROM.[8] 'Multimedia' is an interactive combination of graphics, sounds and video for more effective communication and presentation.[9]

CD-ROM searching is independent of any telecommunication link and so is particularly appropriate for information retrieval in parts of the world with an unreliable telephone service. CD-ROM searching is usually free once the annual subscription cost of the disc has been paid. CD-ROM searching also tends to be more 'user-friendly' than searching the remote search services. However, a CD-ROM database is often less up-to-date than a database from the same producer on an online service.

In Malaysia, favourable economic conditions and increasing availability of trained human resources make the application of new technologies possible. Although CD-ROM technology was available commercially by the 1980s, its appearance in Malaysian libraries has been slow. Other than costs, there are also obstacles like resistance to change, technical difficulties and management problems with new innovative technology. However the government's current policy on computerisation should make it possible for many institutions to take advantage of this technology.[10]

LEARNING CHARACTERISTICS OF CD-ROM TECHNOLOGY

CD-ROM technology holds great promise in enhancing learning as well as in improving the quality of education. There are a number of CD-ROM characteristics that if used appropriately will enhance learning.

Attractiveness

The multimedia CD-ROM resources are attractive since they can combine pictures, sound, along with texts and graphics. With the help of full-colour illustrations, diagrams, sound and simple clear text, the CD-ROM resources can stimulate the student's mind and encourage learning.

CD-ROM encyclopedias for example contain a variety of subjects and fascinating facts to read and enjoy. The New Grolier Multimedia Encyclopedia on CD-ROM for instance features all articles from the American Academic Encyclopedia, popular in schools and colleges in the United States. It has over 4,000 images, many in colour, plus about 85 video clips or animations and a wide range of sound files.[11]

When using the New Grolier Multimedia Encyclopedia on CD-ROM, as an example, the Multimedia Menu provides access to the many audiovisual features. The user needs to highlight 'Multimedia' on the Search Choices screen and press <Enter>. This opens the small Multimedia Window as follows:

Multimedia
Pictures
Maps
Videos
Sound

Selecting any one of the four choices - pictures, maps, videos, or sound will lead to a hierarchial index. A user who wants to browse and look at pictures needs to select pictures from the Multimedia Menu and press <Enter>. The following Picture Index will appear:

Picture Index
Actors and Actresses
Agriculture
Animals
Architecture
Astronomy
Dancers and Choreographers
Earth Sciences
Explorers
Frontier People and Indians
Geography

The Picture Index is a list of over 30 picture categories. Let's say students are interested in 'sharks'. Move the cursor to 'Animals' and press <Enter>. Then highlight 'Fish' and press <Enter>. Proceed in this way until the following screen appears:

We can access pictures of any one of the sharks by highlighting the picture title and pressing <Enter>. Pressing <Esc> will bring us back to this screen. If we want to read an article about sharks, press <Alt><A>. This will give us a list of articles related to the picture topic. The user also can try using maps, videos and sound options from the **Multimedia Menu** to make the searching experience more effective and interesting.

The other attractive feature of CD-ROM is its user interface which enables users to use the system and to find information easily.

'The user interface of any information system, including CD-ROM databases, is simply the collection of interaction methods and display features provided for using the systems.'[12]

Ease of use and user friendliness not only help, but encourage users to do more searches.

At the moment, the most exciting action in multimedia CD-ROM can be seen in three main fields:

i. Multimedia books are appearing, especially reference works and what is called 'infotainment'. Many major book publishers are venturing into CD-ROM publishing.

ii. Children's interactive stories make great use of 'point-and-click' exploration of the screen, and they also add cartoon-style animation.

iii. Games are the main reason for the purchase of CD-ROM drives.[13]

Students have their own preferences in learning styles and resources. Reading, listening and viewing for example, will have different impacts on different students. A student who is provided with his or her preference would learn faster and better. According to Sorrow and Lumpkin (1993):

'CD-ROM ... which allows for the instant process-ing of information, enhancing all styles of learning. Some of the specific learning styles which students are bringing to the classroom are visual, informal, manipulative, dydic, mobile, auditory and haptic.'[14]

The visual learner, for example, demonstrates a preference for seeing the information and thus may rely on pictures, visual aids, lists of graphs and so on.

Interactivity

The interactive nature of CD-ROM is considered to be its most important learning feature. It cannot be denied that all mechanical and electronic devices designed for personal use are interactive. Telephones, radios and even toasters and refrigerators respond to some extent to the actions of users, even if that response is limited in its effect.[15]

According to Beswick (1987), 'the computer is an interactive device.'[16] John Self defines this 'interaction' as that the computer 'can be programmed to react sensibly to what a user inputs.'[17] Givotovsky (1994) explains:

'Further along the spectrum of interaction, personal computer software is interactive to the extent that it responds in some manner to user input, although many would argue that for the most part it does so in a way that is not immediately obvious or easy from the point view of the user.'[18]

Interactivity refers to the rapid response to instructions, providing feedback to users and requiring them to be active participants. Psychologists have known for years that, 'people retain knowledge better if they are made to do something, and interaction is certainly doing.'[19]

The interactivity presented on the screen involves the display features and interactive devices. The dis-play features include the screen layout, help screen and colour, while the interactive devices are the keyboard and the pointing devices such as the mouse.

'There's one other thing that's vital to multimedia-interactivity. You need a mouse to do it, and basically it means you control the software by doing things like clicking on 'buttons' and other areas of the screen.'[20]

What limits the perceived interactivity of CD-ROM is its functionality (the tasks it is intended to perform), its interface (the means by which a user can cause the programme to perform those tasks), and its range or scope (the domain within which it performs those tasks).[21]

Active Learning Promotion

Active learning is any learning or teaching situation which is characterised by participation on the part of the learner, as opposed to passive learning of information from a lecture, talk or observed demonstration.[22]

CD-ROM resources can be used to develop active learning by allowing the user to be an active learner, controlling access to and manipulating vast quantities of information with a computer.[23] Some examples of activities using CD-ROM involving students in active learning are:

i. Searching for identified information where students come face-to-face with the CD-ROM doing simple tasks set by their teacher/lecturer

ii. Browsing for information where students are encouraged to start a search with something that they needed to find out for their class work, and then to go on to wherever their interests lead them

iii. Information-handling assignments where students are asked to complete a series of tasks including answering specific questions.[24]

The above activities would benefit students who have great difficulty in expressing ideas in writing. They participate actively in learning with CD-ROM resources.

The strategy of education is changing from the traditional methods to resource-based learning. Resource-based learning requires active learning and students have to participate, make discoveries, develop new insights and acquire attitudes through the interaction with a wide variety of resources. CD-ROM technology with its attractive and interactive nature offers a wider range of learning resources and allows instant processing of information.

Motivation

The key feature of the learning characteristics of CD-ROM is its ability to motivate the learning process. Motivation is the most important factor which affects the ability to learn. What motivates an individual student to learn may be complex. It could include the satisfaction of gaining new knowledge.

Under the Integrated Secondary School Curriculum (ISSC), motivation is vital for all students because they need to develop their information-handling skills. CD-ROM technology can help to motivate the development of essential information skills. Students also tend to become interested in and enjoy exploring knowledge or subjects which are available in CD-ROM format.

CD-ROM shares with most other computer technologies a general capacity to motivate. But more than motivation is required to ascertain that the wealth of information is handled properly.

The speed of CD-ROM gives a greater incentive for pupils to search a particular database. This is so much easier for students to use than other electronic media such as videotapes and television programmes. These media are usually so slow that children lose interest in what they are looking for, before they find it.[25]

CD-ROM can help and encourage students to develop confidence in the use of CD-ROM and other information technologies in their learning process. Since it is attractive, interactive and user friendly, CD-ROM can be used to motivate students with low abilities by helping to compensate for reading and writing difficulties when developing language and problem-solving skills. CD-ROM can be used to benefit other disadvantaged students such as the visually and physically handicapped.[26]

To a greater extent, a CD-ROM resource can be used at all times and unsupervised.[27] It provides a much greater incentive for research besides encouraging 'independent learning' and 'learn how to learn.' CD-ROM can fit in with modern educational ideas, promote a 'student-centred' approach where students can be independent, planning their own learning based on a range of resources, and it favours the modern emphasis on the learning process rather than on the facts discovered.[28]

JUSTIFICATION FOR CD-ROM COLLECTION

The main reasons why education libraries need to develop CD-ROM resources are as follows:

Library Housekeeping Applications

There are some library housekeeping applications of CD-ROM that can be adopted in educational institution libraries in Malaysia. CD-ROM resources can assist in library housekeeping activities such as acquisitions, cataloguing, public access catalogues, union catalogues and inter-library loans.

CD-ROM based acquisitions systems for instance enable the library to search a particular database, then create a file of selected items, make an online link to the desired vendor from the menu provided with the CD-ROM databases, and send the order file through a modem to the vendor's computer. The computer checks the availability of each title and then reserves the order. The advantages of using CD-ROMs are that bibliographic information of items to be ordered can be captured from the CD-ROM and kept in the database instead of a card file. However, there are limitations because to make orders online requires a connection to vendors, a facility which is not available in most libraries in Malaysia at present.

Despite the fact that there are currently an increasing number of CD-ROM based systems available in the market, not all these resources can match the library housekeeping needs in academic libraries in

Malaysia. The libraries have to choose the most appropriate CD-ROM system since their value are limited in certain library housekeeping applications. For example, currency is a major concern in public access cataloguing. Updating frequency of the catalogues is time consuming. Daily updates of CD-ROM databases require time, sufficient staff and funds.

The purchasing of CD-ROM should be based on the price and suitability of their use in the institution. It is reasonable for libraries to acquire CD-ROM titles which are related to the curriculum rather than contemplating to obtain them for housekeeping applications.

CD-ROM as a Tool for Developing Information Skills

One of education's central objective has always been to equip student with the skills needed to operate in society.[29] It is also generally agreed that information skills must be taught and learned across the curriculum.[30] Academic libraries should collect CD-ROM resources which can match the curriculum and also information needs of students because CD-ROM is regarded as a very useful tool for inculcating information skills.

'Information skills cannot be taught once and for all, nor can they be adequately developed within the confines of a single school subject or activity. They have to be introduced, explained and practised in a simple form, and then pursued in greater depth year by year and subject by subject...'[31]

Information skills are required not only for improving students' ability to search for and use information, but also to facilitate their learning in other areas. Some of the CD-ROM resources which can match the information needs and search strategies of the students can be applied in academic libraries in Malaysia. The most relevant CD-ROM titles to meet these needs are those of encyclopedias and dictionaries.

CD-ROM Resources Can be Exploited in Teaching and Learning Process

An increasing number of CD-ROM applications which are suitable for education are becoming available. Librarians in education libraries have to concentrate on developing educational materials to meet the demands of the lecturers and students.

Teachers or lecturers should exploit certain types of learning resources which are available in this format. According to Sorrow and Lumpkin (1993), these resources are :

'... appropriate for the educational community and have been researched, reviewed, previewed and utilised by students.'[32]

Since they are very attractive learning resources and can motivate students, the use of certain types of CD-ROM should be integrated in the curriculum. Every educational institution including academic libraries in Malaysia should develop a whole policy which will enable students to exploit certain types of CD-ROM resources which are relevant to the present curriculum needs.

Some of the CD-ROM titles can meet the information needs of the academic communities including lecturers, students and researchers. ERIC, Education Index, and Education Library are examples of databases available in CD-ROM format that the academic libraries should acquire in order to make them accessible to researchers and the academic community. It cannot be denied the content of these types of CD-ROM are valuable in terms of theories, philosophies and researches. The limitation of these databases is the poor coverage of articles related to Malaysia since they are not produced locally.

CD-ROM resources are also important as educational resources for general learning. The most relevant CD-ROM resources for general learning purposes are encyclopedias, dictionaries, newspapers and directories.

Specific subject CD-ROMs are also important in the learning process. Since students pursue a wide range of subjects, subject specific CD-ROMs such as languages, history, geography, art, science, economics, etc. can be considered as supplements to other resources in enhancing their learning process.

CD-ROM Buyers' Guide and Handbook[33] and CD-ROM for Librarians and Educators[34] are among the useful sources of the full range of over 3,000 CD-ROM products that are available in the market. Librarians may refer to them when choosing relevant CD-ROM titles for their collections.

MANAGEMENT IMPLICATIONS OF CD-ROM

The introduction of CD-ROM has a wide range of management implications including staff training, user education, promoting the use of CD-ROM, and collection management.

Staff Training

The application of CD-ROM technology in eductional institutions in Malaysia could cause 'techno-phobia' among staff as well as users. Techno-phobia refers to fear or aversion which arises when a new technological environment is introduced in any organisation.

Introduction of computer technology could cause a psychiatric illness, the main cause of which is the difficulties experienced in adapting to new technology. To make staff feel confident of using the equipment as well as to foster positive attitudes and enthusiasm towards the use of CD-ROM technology, adequate training should be conducted in educational institutions in Malaysia.

There should be a staff responsible for co-ordinating the training on CD-ROM applications by assessing needs, implementing activities, providing assistance with training plans and materials,and evaluating the effectiveness of the programme on a continuing basis.

User Education

Those institutions which have introduced access to CD-ROM systems to the public should make an effort to educate users on how to make use of CD-ROM resources. User education requires a continued commitment of scarce human resources and time in order to do it thoroughly.

Educational institutions in Malaysia should ensure that users are introduced to this new technology in order that they do not experience any difficulty in adapting to it. Therefore user education programme should emphasis on fostering a positive attitude and making them feel confident of using CD-ROM.

Besides introducing the basic background of CD-ROM technology, users have also to be introduced to particular CD-ROM databases according to specific subjects areas. Most user education programmes will be on a one-to-one basis, introducing a user to the system or a particular disc, although it may be possible to run some introduction and demonstration sessions for groups.

Promoting the Use of CD-ROM

Promoting the use of CD-ROM can also be done by distributing brochures or written instructions which contain information about CD-ROM databases available and how to make use of them. Specifically, the brochures should contain introductions to particular CD-ROM databases, searching CD-ROMs and other quick reference guides.

Collection Management

CD-ROM resources require a high beginning cost, particularly the basic cost related to equipment needed for the CD-ROM system. These costs include physical processing costs, a microcomputer, a CD-ROM driver and printer, subscription fees, and hardware maintenance. The initial equipment and subscription costs of CD-ROM may be higher than other information medium, such as printed materials and online services.

CONCLUSION

It is hoped that this article will provide the educational institutions including schools, colleges and universities in Malaysia with some guidelines and information on the potential contribution of CD-ROM technology in supporting the curriculum and the management implications of their adoption.

As a learning resource, CD-ROM has great potential for encouraging learning at all levels, from primary schools to postgraduate level. CD-ROM can facilitate learning by promoting active learning, interactivity, and motivation if used appropriately. CD-ROM technology can also help learners develop information skills necessary for survival in this information age.

CD-ROM technology is not replacing but rather extending the resources that can be utilised by students. It can be an alternative to printed and on-line resources. CD-ROM facilities should be made available in all the educational institutions in order that students are able to search for information independently.

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