Interactive Instruction for Library Users and Personnel based on Hypermedia Technology

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Abstract

Following a general automatization effort in their premises, three university libraries in Greece, Spain and the Netherlands have adopted computer-based instruction for their users and personnel. Multimedia interactive programs introduce the innovative services for information disclosure. They offer guidance on the use of new technologies employed in modern libraries, such as CD-ROM based and remote bibliographic databases, on-line public access catalogs and wide area information services.

In this article, we specify the target, present the methodologies that were employed to effect computer-aided learning and suggest a deployment strategy. Qualitative and quantitative measures of the effort are given in terms of people, know-how, development time and equipment. We also describe the principles of hypermedia technology that underlies interactive presentations and offers a conceptual framework for structural and navigation facilities. We conclude with the experiences gained throughout our project.

Keywords: Computer-based training, multimedia presentations, interactive systems, on-line public access catalog, hypermedia applications.

1 Introduction

Modern libraries make extensive use of innovative electronic technologies. Most common automation efforts include the creation, use and maintenance of an On-line Public Access Catalog (OPAC) for the holdings of the library. Especially in a university setting, it is commonly asked to compile specific bibliographies, to collect citations, to locate and retrieve journal articles. To achieve those tasks, librarians combine paper sources with CD-ROM based databases for bibliographic data. Some libraries make their catalogs available

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to remote access. Cooperating libraries exploit this fact to compile a union catalog. The user locates the book or article in the union catalog and orders it to the local library, which acquires it from its partners through the interlibrary loan process (hard copy or electronic transfer).

These new services would have been impossible without the effective deployment of electronic computer technology and communications. Introducing high technology solutions in an environment with few specialized experts can prove vain, or may result in elementary use of sophisticated tools, unless people are prepared, acquainted and trained to utilize the new services. Therefore, the library staff must receive continuing education to use correctly and efficiently the automation system. They must follow its evolution, maintain its contents and possibly troubleshoot it. On the other hand, the typical library user, a student or academician, must learn the system and make most of it in a short time. The user should not rely heavily on the help and advice of the specialized librarians. For the majority of tasks, the user must exploit the guidance of the automation system. The help facilities of some systems are geared toward the administrator and appear uninteresting and incomprehensible to the naïve user. We needed to attract users to the new ways of getting things done (for example, searching the library holdings using the OPAC instead of browsing at the shelves) and we wanted to advertise the new services made available to the public (for example, compiling custom bibliographies).

The gradual introduction of electronic services at Patras University Library (PUL) is typical for most libraries. PUL started with the local holdings database. It proceeded with CD-ROM based bibliographic databases and information sources, such as encyclopaedias, full text and image bases. Later PUL accessed remote databases and was connected to the Internet. As more users learned about the new services, the library administration understood that the training of new users was becoming a resource-consuming, repetitive duty for the staff. Hence, we tried to develop educational material cooperating with other university libraries in Europe that faced similar situations.

This was part of the Telephassa project (1991–1993). Three university libraries from the Netherlands, Spain and Greece cooperated to research the new issues introduced by the extensive use of computing facilities. The main partners of the Telephassa project are Universitat Autonoma de Barcelona, Katholieke Universiteit Brabant and Patras University. DEC Holland and Synar provided technical assistance to accomplish the task. The whole effort was supported financially by the Commission of European Communities (COMETT II Programme). To smooth the transition from traditional to modern library practices, first need was to train the library personnel. Moreover, since students are the library users and they new ones keep coming every year, we found that computer aided instruction would be of great help.

So we developed fifteen Interactive Instruction Modules (IIMs). They are multimedia to make the presentation information-rich and engaging. They are interactive so that they can test the progress of the user, they can respond to specific needs and types of interest. They are also multilingual (english, greek, dutch, and spanish). These IIMs relieve expert librarians from the task of being constantly occupied at “help desks”.

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2 Target and methodology

Computer-Based Training (CBT) lies far from electronic information exposition. CBT incorporates educational methods and techniques (see [Alessi-Trollip]), such as

- learner guidance to the material that is proper for his/her background and needs,
- practice through repetition and drills, and
- knowledge accreditation through the monitoring of responses and estimation of tests.

CBT achieves memorization, but also increases perception and motivates the learner to get involved actively in the learning process ("What's in the next screen?", "I can't continue, unless I find the right answer!").

Within Telephassa, each library partner set out to develop five IIMs. They are executable programs that include text, graphics, animation, sound and video. They offer navigation facilities, so that only relevant information is presented to the user in a coherent manner. The IIMs control the degree of perception and simultaneously collect other statistical data. Each library chose topics of interest to its local patrons, bearing in mind that they should be attractive to the other participating libraries as well. The project committee approved the final subject list (see table 1).

<table>
<thead>
<tr>
<th>Barcelona</th>
<th>The use of CD-ROM</th>
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<tbody>
<tr>
<td></td>
<td>Remote and portable databases</td>
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<td></td>
<td>Library information and resources available on campus</td>
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<td></td>
<td>The use of ABI-Inform</td>
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<td></td>
<td>OPAC by networking in Europe</td>
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<tr>
<td>Patras</td>
<td>The use of the Science Citation Index</td>
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<td></td>
<td>The use of SilverPlatter information retrieval system¹</td>
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<td></td>
<td>The use of Medline</td>
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<td></td>
<td>Extended version of Science Citation Index</td>
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<tr>
<td></td>
<td>Library resources accessible through the Internet</td>
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<tr>
<td>Brabant</td>
<td>The use of Excerpta Informatica</td>
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<td></td>
<td>The use of MS Windows desktop</td>
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<td></td>
<td>Basic research strategies in libraries</td>
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<td></td>
<td>The European Documentation Centre²</td>
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<td></td>
<td>On-line Contents³</td>
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</tbody>
</table>

Table 1: The subjects of Telephassa Interactive Instruction Modules

As you will note, recurring subjects in this list are CD-ROM based databases and the access to remote collections via network links. This gives an indication of the subjects
considered as 'hot' for modern libraries.

2.1 Development teams

An interesting point concerns the training of the development teams. Three workshops took place in Barcelona, Patras and Tilburg to set up communication arrangements (faxes, E-mail, file transfer, broadcasting to all partners). Note that none of us used one's native language; all correspondence was carried out in English. There was an introduction to systematic IIM development by field experts and a demonstration on Authorware use. All teams had six months to get acquainted with their tasks and then they started to produce IIMs. The quality and relative complexity of the IIMs has been steadily increasing. A second workshop was organized to exchange experiences and practices and to demonstrate advanced programming features.

Each library formed a team responsible for IIM development. This team consisted of:

The subject expert A person with deep knowledge of the subject matter or being in charge of the service on which the IIM focuses. The various IIMs of a library have different subject experts.

The instructor Someone responsible for the definition of the educational material and the way it will be presented, so that it conveys maximum information value and achieves comprehensibility. The material must balance generality with specificity (being useful to large audiences vs. offering concrete advice and instruction on how a task is carried out).

The programmer The technical person who implements the scenario handed by the instructor on the computer.

The local coordinator Has managerial and administrative responsibilities.

During the project, thirty persons participated to these teams.

2.2 Development phases

We divided development into six phases. For each one, we give the time percentage allocated to it (see table 2).

We assembled the development platform which consisted of a high end PC running MS-Windows 3.10 and was equipped with flat-bed scanner, CD-ROM reader, video card and network connections. We used Macromedia's Authorware Pro 1.0 (and later 2.00) to develop the IIMs. This program was chosen for its remarkable ease of use even from

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1 Many bibliographic databases, such as ERIC (education), MathSci, Biological Abstracts are based on this program.

2 Branch office holding all European Community publications.

3 Tables of contents from selected journals are scanned, OCR-ed and inserted in an indexing & retrieval system. The user locates articles based on author, title, subject information, etc.
<table>
<thead>
<tr>
<th>Initialization</th>
<th>5%</th>
<th>Assessment of need, definition of objectives and target group.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product definition and macro design</td>
<td>10%</td>
<td>Content definition, collection of subject resources, production plan.</td>
</tr>
<tr>
<td>Micro design phase</td>
<td>40%</td>
<td>Flowchart and storyboard construction, Interaction specification.</td>
</tr>
<tr>
<td>Realization</td>
<td>30%</td>
<td>Programming for the 0.9 version. Initial testing and evaluation of educational merit.</td>
</tr>
<tr>
<td>Completion phase</td>
<td>10%</td>
<td>Full scale (external) testing and production of version 1.0.</td>
</tr>
<tr>
<td>Installation</td>
<td>5%</td>
<td>Transferring the software on different configurations and networks.</td>
</tr>
</tbody>
</table>

Table 2: Phases of IIM construction

nonprogrammers. Authorware employs a highly graphical, icon-based way to organize interactions, the most basic entity involved in an IIM. Interactions are arranged in flow-lines that depict their relative position during presentation. An interaction typically responds to several events or triggers, such as a mouse click, button press, time limit, input text, etc. To code any decent IIM, one has to include program scripts in special icons, so in the end writing down some simple code is inevitable. Although Authorware has received some criticism, we were satisfied with it for its flexibility and smooth learning curve.

Figure 1 is an introductory screen that appears after the initiation of the IIM. Previously, a menu offers the titles and an indication of contents from the list of available IIMs. The screen and button layout and the background are parts of the house-style, common conventions followed in all IIMs. We have tried to make them engaging and amusing, so we include caricatures, provocative responses and photos. These sometimes increase the size of the file. We did not include sound, because the IIMs will be run in libraries where sound is distracting other people. We could not afford to play video, because of restrictions in the playback equipment. The typical configuration on which the IIMs would operate are 386 PCs connected to a central hard disk on which the IIMs are kept.

In figure 2, we show two sample screens for user registration and comprehension evaluation. During our presentation we will demonstrate the use of multimedia to deliver the message to the learner and specific interactions that show the strength of this paradigm. Observe pop-up windows that explain new terms, the alternative two box layout of the house-style and the buttons which (de)activate access to other parts of the IIM based on the context and the status.

During development, significant time was allotted to assemble the educational material. Writing down text that explains simple things proved difficult. We spent time to
Learning to use
Science Citation Index
(Compact Disk Edition)

Locate articles related to your work
Discover citations to your paper
Compile complete up-to-date bibliographies

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Figure 1: Cover page for sample IIM

collect screen dumps, to take pictures using a digital camera, and to scan drawings. Minor problems with screen drivers, resolution and conversion of formats were fixed.

A useful arrangement for working with these IIMs is as follows. The library typically operates a local Ethernet network running Netware's Novell. There is one server that holds all IIMs and accesses the OPAC and the CD-ROM jukebox with the databases. Client PCs run MS Windows. The user starts two sessions: the database of interest and the corresponding IIM. He proceeds in parallel with those two, obtaining information from the IIM and applying the knowledge to the database. Most times, the user gets the work done on his own. He manages to operate the database and extract useful bibliographical data. Often, users do not want to learn; they want results. Receiving instruction is a necessary, possibly interesting, side-effect.

When the development team concluded the production of the IIM, exhaustive testing took place. We discriminate three types of testing: (i) structure testing—examines transitions and navigation patterns within the instructional material, (ii) unit testing—examines all interactions and feedback, consistent behaviour, (iii) system testing—checks installation procedure and operation of runtime networked version (final operational environment). Testing is performed by the other two courseware teams, library staff and users whose reports are most valuable.
3 Hypermedia technology

Hypermedia is a suitable conceptual framework for our interactive instruction modules. It is a well-defined field and offers entities that correspond to the atomic objects present in our IIMs. Hypermedia captures the overall structure of an IIM and the interactions of the user. We will see that ideas from this field can improve the design of multimedia presentations and assist the user in two major issues that arise when he takes CBT; namely, disorientation and cognitive overhead.

An IIM or hypermedia document consists of nodes that contain the actual information and links that interconnect nodes. The contents of a node include static data (text, images, drawings) and dynamic data (sound, animation, video). Designated areas with spatial and temporal boundaries within a node constitute an anchor. All links emanate from anchors. There are specific types of links:

Sequential Lead to next or previous node according to a serial traversal of the IIM.

Structural Shape a hierarchical edifice analogous to the chapter, section, paragraph subdivision of a printed book.

Associative Reflect relationships based on content, such as contrasts, annotations, etc.

The author is responsible for creating the educational material and it is equally important to organize its connections in a logical, useful way. The reader navigates or browses the document completing certain interactions and on the base of these interactions visits
a subset of the whole document (hopefully, only what is interesting and relevant to his interests).

Users are accustomed to collect information from paper sources. Electronic information causes cognitive overhead, because it tends to distract the user with annoying details of use. Learning with IIMs is even more difficult, so the author must take special care. One technique is to define *trails or guided tours*. As the user registers in, the system starts to collect data and forms a user profile. Trails are dynamically configurable paths that cross the document and present to the user only a part of it, according to the profile. The profile also holds the history of previous sessions of the user, so that every time he can continue instruction from the point he left. In our IIMs, we do not keep identifying information about the users; we do, however, ask for their status and interests (see figure 2.a) and we exploit hints from their behaviour (scores of drills, the degree they take and complete exercises, the time they spend on parts of the IIM).

Clearly, an IIM is not a sequential document. It looks more like a mesh. It is easy to lose one's orientation; this is called the 'lost-in-the-hyperspace' problem. The author has to offer spatial cues or points of reference. *Maps* depict the IIM structure, thus helping the user to find where he is and how he will move to some other place. Our IIMs tend to have hierarchical structure — parts analysed in lessons — and within a lesson usually the exposition is sequential. We have been using heading to denote the current position. Page numbers in the form "Page X of Y" are tools to move directly to a specific point and they give a rough indication of how much time is needed to complete the lesson. To show a succession of events, we have used small maps, so that we do not clutter the screen. We also keep the history of visited nodes and make it available using a Previous button. We believe that in an educational context, the hypermedia author should detract from offering complex interconnection patterns.

4 Conclusions

To improve utilization of electronic resources in a modern library, we developed educational material based on computers. Computer-aided instruction offers the following advantages:

- Learning takes place on a personal basis. Users with differing backgrounds and degree of computer literacy are equally satisfied. On the contrary, teaching in groups assumes that people share relatively homogeneous knowledge.

- There is interactivity between the user and the computer. On the contrary, instruction based on books or video imposes one-way information flow.

- There is flexibility concerning the time and place of instruction. When learning is driven by a specific and immediate need, users want immediate answers. They would barely learn in anticipation of a future need.
• Library personnel do not consume time for general tasks, such as “How do I find current bibliography on . . .?”, or “Where do you keep the books . . .?” (They are, however, distracted for short tips or exceptional cases.)

It is worth noting that initially nobody from Telephassa library partners had know-how on CBT. There was explicit effort within the project to transfer knowledge from technical people. We do not refer only to the technical skills of programming a multimedia application generator, but also to the instructional and pedagogical aspects of learning. Tactically, it would be better to assign the development of the IIMs to a group of experts in multimedia programming and production. Strategically, however, the project leaders chose to hire experts to guide library people to do the job. In the end, the three local teams had the necessary experience to develop reasonably advanced IIMs. This know-how is now an asset for each library and it is exploited to refine and extend the IIMs even after the project terminated (see table 3).

<table>
<thead>
<tr>
<th>Book cataloging and lookup using the PLAS program (OPAC)</th>
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</thead>
<tbody>
<tr>
<td>Automatic circulation (borrowing/return)</td>
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<tr>
<td>Bibliographic search (20 databases on 40 CD-ROMs)</td>
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<tr>
<td>Retrieval of articles from libraries in Greece and abroad</td>
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<tr>
<td>Photocopier operation and charging</td>
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<tr>
<td>Free computer use for word processing, etc</td>
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</table>

Table 3: Need for instruction in new services

Concerning the time schedule, from our experience, the development ratio has been round 1:500; for instance, a 20 minute IIM would need a total of 167 hours of development time. The project coordinators developed and all teams adopted a house-style that included guidelines for the general look of the IIMs, the placement of material, standard semantics for navigation buttons and the form of interactions. All IIMs followed this house-style and appeared homogeneous, which resulted in the elimination of cognitive overhead for the end users. After all IIMs were completed, a multimedia producer took over the task to streamline them and eliminate discrepancies. They also applied a more sophisticated three-dimensional look for background and buttons. All this would have been difficult, had we not enforced the common house-style.

From the technological point of view, CBT is now a viable and attractive alternative for libraries, thanks to the winning combination: low-cost, powerful microcomputers, high-speed communications, massive storage devices and user friendly development tools. Equally important, library people understand the merits of CBT and the public reaps the benefits of clear, immediate, engaging guidance.
Related publications


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