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AN INTERACTIVE HYPERMEDIA TECHNOLOGY FOR TRAINING: AN EXPERIENCE WITH HYPERCARD

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<Abstract>

With the globalization of the economy, companies face more intense challenges and competition such as continuing changes of business environment, making rapid progress in technology, and increasing diversity of global markets. Under the intensive competition, companies should retain very well trained employees, and invest a lot of resource for training to maintain competitiveness. Training is one of the major expenses for cooperations. Interactive hypermedia can save companies time and money for training. With interactive training material, such as hypermedia courseware, trainees tend to be more interested in and less resistant to complex training. Mason and Mitroff Management Information Systems research model is the foundation of the paper, and the key variable examined in this research is the MODE OF PRESENTATION. This paper studies on interactive hypermedia technology and presents an experience with HyperCard that is one of the most popular interactive hypermedia tools.

트레이닝을 위한 상호작용 하이퍼미디어 기술: 하이퍼카드를 이용한 개발의 예

김대룡
경영정보학과

<요 약>

경제의 세계화와 함께 기업들은 사업환경의 계속적인 변화, 급속한 기술의 발전, 점증하는 세계시장의 다양성과 같은 더욱 강도 높은 도전과 경쟁에 직면하게 되었다. 그러한 격렬한 경쟁 하에서 기업은 더욱 잘 교육 훈련된 인적자원을 보유하고 육성해야하며, 경쟁우위를 유지하기 위해 많은 자원을 교육훈련에 투자해야 한다. 교육 훈련에 드는 지출은 기업의 주요 비용중의 하나이며 상호작용적이고 대화식의 하이퍼미디어 기술은 교육에 투자하는 기업의 시간과 돈을 절약시켜 준다. 하이퍼미디어 교재와 같은 대화식 상호작용 교육자료로 피교육생은 더욱 흥미 있어하고 복잡한 교육훈련에 덜 저항적이다. 메이슨과 미트로프 경영정보시스템 연구모델이 이 논문의 근거가 되고, 이 연구에서 시험된 주요 변수는 표현양식이다. 이 논문은 대화식 하이퍼미디어 기술에 관해 연구하고 가장 인기 있는 상호작용 하이퍼미디어 중의 하나인 하이퍼카드를 이용한 훈련자료 구축을 소개한다.

I. INTRODUCTION

With the globalization of the economy, companies face more intense challenges and competition such as continuing changes of business environment, making rapid progress in technology, and increasing diversity of global markets. Companies that want to conduct training can use computer-based training (CBT). Most studies conclude that CBT is more effective than traditional classroom lecturing (Bangert-Drowns, et al., 1985; Kulik, 1994). CBT has many benefits such as reduced time consumption in training, individualization of training, and consistency in the training material. These benefits make CBT a better method for training. In part, with advances in technology, companies have been forced to consider more interactive training materials. Recent findings in this area indicate that interactive computer programs such as hypermedia can create responsive and active training environments (Calmbacher, 1994, Langley and Porter, 1994; Marx, 1995; Robins, 1994).

With interactive training material, such as hypermedia courseware, people tend to be more interested in and less resistant to complex training. Effective, interactive hypermedia training can provide people with individualized training tailored to their own progress. Using advanced computer technology, hypermedia training can effectively deliver the required knowledge and skills when they are needed (Fetterman and Gupta, 1993). Ample evidence that hypermedia training is more effective and efficient than any other training material has already been found (Lungstrom and Sorensen, 1993, Sorel, 1993).

Interactive hypermedia goes by several different names. Among them are interactive hypermedia, hypermedia, or multimedia. Many industry pundits have used the broad terms 'Hypermedia,' or 'Multimedia' to describe the classification of interactive hypermedia products. However, simply lumping these new applications under the titles

hypermedia or multimedia leaves out the most important factor in the hypermedia-the end user By adding the term 'Interactive,' the definition can be ensured to include the end users' ability to interact with the technology (Anderson and Veljkov, 1990). For this reason, this paper uses the term "Interactive hypermedia" instead of hypermedia or multimedia

This paper focuses on two major topics - one is on what the interactive hypermedia is, and the other is on HyperCard which is one of the most popular interactive hypermedia tools

II. MANAGEMENT INFORMATION SYSTEMS FRAMEWORKS

Lucas, Clowes, and Kaplan (1974) describe a framework in information systems as "a conceptual model for organizing thought and discussion about information systems" Several frameworks originated by separate authors have been conceptualized for a couple of decades These conceptual models have helped to classify past and present MIS studies and to generate potential research hypotheses. As with other MIS research, this study is categorized into one of many MIS frameworks Mason and Mitroff Model is the basis of this paper.

Mason and Mitroff (1973) propose that an information system consists of at least

> "one PERSON of certain PSYCHOLOGICAL TYPE who faces a PROBLEM within some ORGANIZATIONAL CONTEXT for which he needs EVIDENCE to arrive at a solution (i e, to select some course of action) and that the evidence is made available to him through some MODE OF PRESENTATION"

This definition clearly states the key variables used in MIS research They insist that a program of research in MIS should seek to explore the different characteristics of an MIS by manipulating these variables systematically Among the systematic manipulations of variables, a possible relationship between the mode of presentation and an undefined measure of effectiveness can occur. The key variable examined in this research is the MODE OF PRESENTATION on training

Information can be transmitted to an information user through some mode of presentation Some modes of presentation such as drama, art, graphics, and group discussions may be more effective in some information contexts. Mason and Mitroff (1973) insist that media such as television, radio, films, and telecommunication will act as more important roles in the MIS. This suggests that advanced technologies such as hypermedia can be used for an effective training.

III. LITERATURE REVIEW ON INTERACTIVE HYPERMEDIA

1. A Brief History of Interactive Hypermedia

Vannevar Bush, science advisor to Franklin D Roosevelt, is credited with originating the concept of interactive hypermedia He stated. "The human mind does not work linear way It operates by association With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts" (Bush, 1945) Bush envisioned a future, now here, of a vast and growing quantity of research information, and lamented our inadequate methods of sharing and reviewing that information. He attributed this inadequacy largely to the "artificiality of systems of indexing." These alphabetic or numeric indexing systems require one to trace down material by sequential searches from subclass to subclass. Bush proposed the development of a microfilm-based device called a 'memex.' The device would be contained in an individual's desk and would enable the user to link related articles by pressing a series of buttons. Futuristic for their time, Bush's ideas are largely implementable using today's interactive hypermedia technology (Wiggins and Shiffe, 1990).

2. Definition of Interactive Hypermedia

Interactive hypermedia is a collection of computer-centered technologies that give users the capability to access, manipulate and link sounds, images, video as well as texts. Just as word-processing programs that enable users to integrate text and graphics, interactive hypermedia programs enable users to access not only libraries of text documents but also storehouses of music, sound effects, speech, still images, animations, and movies. In addition, users of interactive hypermedia can manipulate the above components and add their own materials to their application (Ambron and Hooper, 1990). In other words, Computer-supported interactive hypermedia is a new technology-based medium for thinking, learning, and communication Users can browse, annotate, link, and elaborate on information in a rich, nonlinear, hypermedia data base (Ambron and Hooper, 1988).

The interactive hypermedia technology links multiple collections of information together under the hierarchy of a single application And also, largely PC-based at the moment, it combines a variety of technologies, including computer hardware, software, video, telecommunications, and publishing. Interactive hypermedia means non-sequential access. People are linear, which means we exist in time. Therefore the information we receive comes to us linearly. Textbooks and audio recordings are strongly linear We cannot extract the contents of a textbook without reading it from start to finish Until recently, most information have been organized for retrieval from a computer in a linear fashion, that is, in a set sequence Interactive hypermedia allows users to

combine interactive video, maps, animation, text, graphics, sound, and statistical data in a non-linear format. Interactive hypermedia differs from traditional paper documents and databases by allowing the users to move immediately from a piece of information to another associated information, typically by a simple click of a button (Wiggins and Shiffe, 1990)

Multimedia means two or more media, but it is more than just multiple media. People frequently apply the term Hypermedia to almost any combination of text, graphics, animation, sound, and video Even with two or more media, we often do not get interactive hypermedia, rather, something better called 'multiple media' Several media are often in the same room, but what each of them does, does not affect the other one's functions. Rather, what they do is called 'parallel play.' This means that the multiple media are physically collocated, but not integrated Watching the evening news on your computer display is an example of parallel play, not interactive hypermedia (Grimes and Potel, 1991).

3. Uses of Interactive Hypermedia

Interactive hypermedia can be used to learn an increasing wide variety of skills, from how to use computers and associated software to learning foreign language. Interactive hypermedia can also be used to develop expertise in areas such as finance, management and communications. Uses of Interactive hypermedia in training and education will greatly enhance learning effectiveness.

(1) Education

Interactive hypermedia is a good tool for teaching basic and complex concept of almost any subject in an informal or formal way. It can also be used for 'what if' scenarios, where you can make decisions and then see the results of those decisions. One of the real benefits of interactive hypermedia is that you can use interactive hypermedia course positively. That is, you can interact with the material. You can choose the directions and depths of the course with the interaction. Another benefit is that you can easily gear the pace of the course to match a student's capabilities.

(2) Training

Training is a major expense for cooperations. Interactive hypermedia can save companies time and money. It offers great productivity gains, especially in the area of training. At present, despite being capable of reducing associated time and costs, hypermedia systems are used in less than 10% of all company training programs (Cole, 1991).

Interactive hypermedia is a natural for training, providing a level of interaction and feedback not possible with a paper manual. Suppose a company is introducing a new software package. Normally the employees have to attend a course or master through training manuals. But an interactive hypermedia system would allow learners to call up

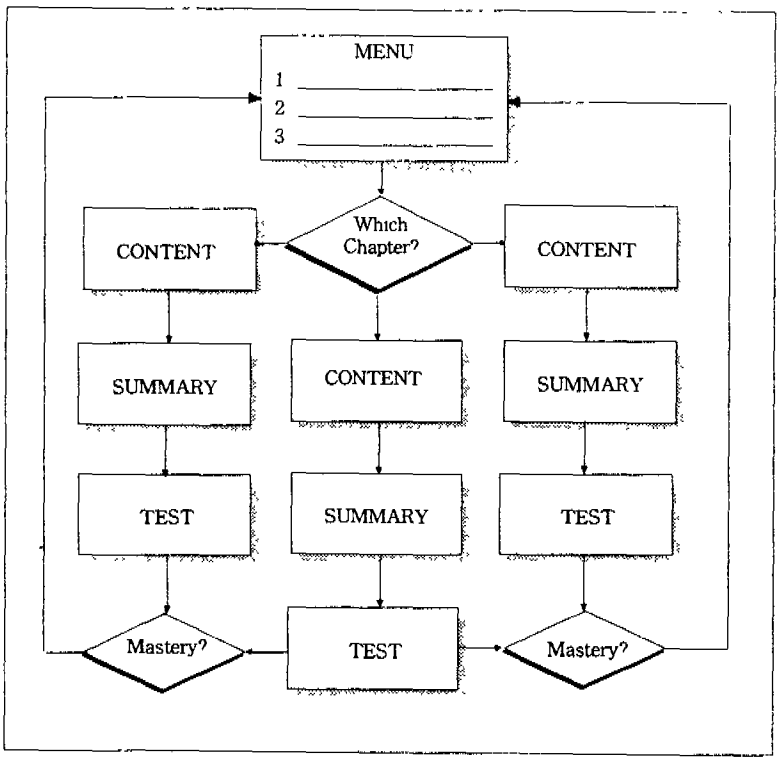
moving video pictures of the demonstrator, who could guide them through the software. To be effective, training systems must provide trainees with realistic situations and a high degree of interactivity. Because of its ability to integrate media, an interactive hypermedia has great potential in training.

IV. DEVELOPMENT OF INTERACTIVE HYPERMEDIA

1. Design of Interactive Hypermedia

Any one design idea does not cover all the needs of interactive hypermedia application developments, but it is valuable to establish a basic interactive hypermedia design because it gives you a starting place. The basic interactive hypermedia design also help you concentrate on creative methods for involving the end user, placing the learner in control of the interactive hypermedia environment. Figure 1 shows a basic interactive hypermedia design.

Figure 1. Basic Interactive Hypermedia Design



Anderson, Carol J. and Velikov, Mark D, "Creating Interactive Meltimedia: A Practical Guide", Ill, Scott, FOresman and Co., 1990, p 146

2. Development Phases of Interactive Hypermedia

This section deals with the nuts and bolts that put an interactive hypermedia team together and create an interactive hypermedia project. The creation of an interactive hypermedia project is somewhat analogous to building a house. An architectural works with a client to create the blueprints from which to build the house. The team requires these blueprints to ensure the house will be structurally sound and meet the client's needs. Like the architectural team, your interactive hypermedia team requires assistances to create the blueprint for creating an interactive hypermedia application

(1) Analysis Phase

The purpose of the Analysis Phase, is to provide a clear set of written guidelines for future project development. These guidelines will be used by everyone involved in the project The result of the Analysis Phase, is a narrative document consisting of: goals for the project, statement of general approach or treatment, listing of objectives, description of the target audience, prioritized listing of the subject content/topics to be included, and description of system and learning environment

(2) Design Phase

At the beginning of the Design Phase developers' have a description of the project. At the end of this phase, developers have a blue print for all the rest of the work that must be performed. In the Design Phase, developers move from what must be done to how it should be done. The work done during this phase determines the 'look and feel' of the project. At the end of this phase developers will have an overall design plan for the entire project consisting of; an itemization of the interactive formats to be applied to each objective, a flowchart detailing message and program flow, selection, and branching, strategy statements for media, motivation, sequence/structure, interaction, adult learning, and evaluation, and preliminary estimates for user time on system, final product layout by time and topic, costs

(3) Development Phase

During this phase, all of developers' idea is put to paper as a means of documenting developers instructional model. The type of documents prepared during this phase will depend on the scope of developers project, but will include any or all of the following; collections of text, an overall storyboard, showing all elements of the finished project, a video storyboard, an audio script, shot lists for still images, art or computer graphic renditions.

(4) Production Phase

During this phase developers' idea is captured onto video or audio tape, computer discs, or even paper, ready for final assembly. The production phase generally results in the followings, videotape and/or audio tape masters to be used in the final product, and captured or original still images and/or graphics stored as computer files which will be transferred to final product

(5) Authoring Phase

Once developers have a copy of their product, it is possible to begin development of a supplementary, computer-based program to present information. This phase include the following, to access and control the peripherals, and to test users understanding of the material During this phase, developers will use an authoring packages to develop your computer interface. Considerations during this phase include, screen and message design, coordination of computer display and other peripherals, program flow and branching based on student response and feedback, and on-line testing of student understanding

(6) Validation Phase

During the validation phase, developers conduct a field test of their finished product. In addition to test the product with representative users, it is desirable to check all the linkages, branches and loops work the way they were intended It may also be appropriate to ask users whether they can browse the material well by provided links. During this phase, the following points should be considered, are all objectives adequately covered in the finished program?, do all linkages, branches and loops work correctly?, do students "like" the finished product?, and is the product installable and will it run unattended?

V. POTENTIAL IMPACTS AND CHALLENGES

1. Potential Impacts of Interactive Hypermedia

Virtually every aspect of a corporation may be affected by the implementation of interactive hypermedia. However, the largest impact will be in information retrieval, display, playback, and storage. Instead of creating materials on a computer which will later be turned into printed documents and color slides, the "desk-top presenter" will gather information for direct presentation by the computer to a monitor, large-screen projector, or to other desk-tops Further, the information can easily be sent to a videotape, CD, or other media for widespread distribution or archiving. Interactive hypermedia can also be part of an overall corporate information systems, providing

better and more complete information to decision makers. Another possible advantage is better training through the use of interactive hypermedia. Better training can give companies advantages over its competitors. Interactive hypermedia can offer companies to share information more broadly and in a dynamic way. This will enhance companies' ability to compete in today's fast-moving business marketplace (Romeo, 1991).

The engineering industry will benefit from interactive hypermedia technology as well. Given the progress in interactive hypermedia technologies and object-oriented database systems, in a few years, architects and designers can use interactive hypermedia to customize their original designs by calling up typical designs from multimedia repository. Manufacturing industry will also benefit from interactive hypermedia technology. When interactive hypermedia technology is completed with expert systems that can pinpoint potential problems in a production line, the "concept-to-production" cycle time can be reduced. This enables product customization at low cost (Robinson, 1990; Verity and Wadekar-Bhargava, 1991).

2. Challenges of Implementing Interactive Hypermedia

The major challenges are divided into the following four categories. First, there are still many confusions over interactive hypermedia's relevance. Most users are still focused on the integration of relatively pervasive media types such as text, graphics, images, and spreadsheets. There is a common perception that hypermedia is only "video in a window," and that hypermedia is only for training applications. Second, bottlenecks in communications networks are another limitation in interactive hypermedia. Most networks are designed to support only text originally, thus the transition speed of hypermedia material is still slow. Third, Standards are still a major issue in interactive hypermedia. The transmission standards for audio and video interchange are not set up yet. However, there has been only some convergence. For example, industry has agreed to the JPEG (Joint Photographics Experts Group) standard for still-image compression and the MPEG (Moving Picture Coding Experts Group) standard for moving-image compression (Fox, 1991) Fourth, the absence of a well-defined application-development methodology is a major restraint on the growth of interactive hypermedia technology. Interactive hypermedia application development involves teams of people who have different problem-solving approaches. The differences in their training and approaches to applications development will pose a major challenge to the project managers of such development teams. It is, therefore, important that a good interactive hypermedia application development methodology is developed soon (Romei, 1991).

VI. HYPERCARD-A POWERFUL TOOL FOR INTERACTIVE HYPERMEDIA

1. HyperCard

HyperCard is Apple's entry into the authoring system market and has a good deal of excitement among users HyperCard is a powerful interactive hypermedia development tool. However, the true definition of an authoring system is a system that does not require the use of a programming language to create your courseware. HyperCard requires programming knowledge in HyperTalk to take advantage of its capabilities. For those who are not familiar with HyperCard, its concepts are quite simple. As an interactive hypermedia designer, you create HyperCard stacks. Stacks are made up of cards, and the combination of cards and stacks are what make up your course. HyperCard offers the standard Macintosh drawing and text tools to create backgrounds and on-screen elements - cards, buttons, and fields.

HyperCard is an extremely popular end-user programming language. Since its release into the market in August 1987, HyperCard has opened the door to a new class of capabilities. From the viewpoint of the current interactive hypermedia environment, it is the ideal software for controlling external interactive hypermedia devices such as videodisc and CD-ROM players. HyperCard is an incredible tool in the hand of users who are willing to understand and use it and an inspiring tool for teachers who have time, willingness, and ability to use it. However, it causes a plenty of fear when not understood. HyperCard is not easy to use. HyperCard is not always logical and fun. HyperCard is not the end-all of programs. HyperCard will not solve every training problem. HyperCard is not a complete educational package Still, it is a step in all the right directions.

2. The Characteristics of HyperCard

There are actually a lot of key features in the HyperCard, but the following features seem most important of all. First, HyperCard provides the possibility of truly multi-modal presentation. It can control and present sounds, images, text, and graphics in a dynamic or static manner under user control. This means that it can be a full-fledged partner in learning, where learning abilities and styles are clearly multi-modal in nature Second, HyperCard is the ultimate do-it-yourself medium. It allows you to design screens, deal with text and images, and create your own links - all with tools built into the program. The things you can do, even if you are a fairly naive user, are very powerful. In fact, HyperCard provides novice programmers access to much of the full power of the Macintosh interface. The quickness with which you can create a meaningful program and user interface means that it is ideal for prototyping. Much of

the interest in HyperCard has come from developers because it is a tool that finally lets them demonstrate what they had in mind to do all along - without incredible programming hassle Third, the structure of HyperCard mirrors some of the successful strategies for learning, and it therefore becomes a useful tool for thinking and developing reasoning. HyperCard serves as a framework for learning The HyperCard structure actually mimics some of our thinking process. For one thing, it tends to involve manipulating bite-sized pieces of information - a graphic, a sound, an image. There is something quite natural about using lump of information here and there rather than accessing page after page of information HyperCard is clearly a tool of associative thinking HyperCard itself is about association It is easy to link card to card by descriptive buttons, and this button linking structure can be quite complex HyperCard is clearly very popular and successful with developers of educational applications It lets educators and developers produce operating prototypes of many programs that they have always wanted to create but previously found very difficult to do (Semper, 1990)

3. HyperCard in Training: The Potential

Trainers have always used several media in a classroom. They have used lectures, books, films, TV shows, and dramatic presentations All these media served trainees well in the classroom, but they have a serious shortcoming. What trainers have always wanted to do is to get trainees to wrestle with knowledge. Trainers want them to enjoy an original relationship with data, to interact with facts and existence, and then to invent and build their own understandings. Trainers hope trainees construct their own ideas and concepts.

Suppose that a trainer wrestles with knowledge in its original, "non-linear" form. He or she represents his or her own knowledge in a similar form to the original idea, but not an exact copy Then the trainer writes the representation into a book, produces it as a video, or lectures it in the classroom with speech and other media. The web-like structure of the original knowledge is now transformed into a "linear" layout in the final training session. Most of the original elements are there, but they cannot be related to one another in the original way. When trainees study trainer's material in linear way, it is hard to capture trainer's original idea. The chances of the trainees' conceptions matching the original form of knowledge are slim. While HyperCard cannot guarantee for every trainee to wrestle directly with knowledge in its original form, it can come closer to the original idea than has been possible with the media that trainers have used in the past. HyperCard can change the ways we use technology in training It can organize knowledge into web-like relationships and links. It lets trainees find their own pathways to the original knowledge. It can present reality through pictures, graphics, and sound as well as words by links (Lengel and Collins,

1990).

4. What You Can Do with HyperCard

Don't make the mistake of thinking that you will have to become a computer programmer to put HyperCard to use. You can accomplish a pretty good products without learning any of the HyperTalk scripting language, and you can do a great deal with simple scripts Here is lists of accomplishments with/without scripting Without scripting

Making a card
Making a background.
Making a field and place it on the card or background. - Choose a style and font for the field, then type in a field
Making a button and place it on the card or background. - Choose a style for a button, then use the button to link the card to another card or stack.
Copying or cut and pasting cards, buttons, and fields.
Drawing on or pasting graphics on to a card or background.

With simple scripting, developers can write one-line or two-line scripts for cards, fields, or buttons.

Going to another card, with a specified visual effect.
Hiding and showing fields, pictures, and buttons.
Playing sounds.

With slightly more advanced scripts.

Dragging objects on the screen to simulate animation
Playing several sounds in sequence.

This paper will show a brief description about an instance of interactive hypermedia courseware written with HyperCard.

VII. AN INSTANCE OF INTERACTIVE HYPERMEDIA COURSEWARE WRITTEN WITH HYPERCARD

1. Objective of HyperCard Courseware Instance

As described above, interactive hypermedia can be an excellent tool for training any complex or basic concept. Any trainer, who is looking for better way to train, can enhance training efficiency by adding integrated multiple media into his or her training material. The trainees can also learn without losing trainer's original idea by using the interactive hypermedia actively. This idea can be applied for any kind of training area.

There are a lot of examples which are already developed or developing for school students and for specific department in the university, but not yet for employee training. One of the objectives of this courseware written and produced by HyperCard with a tip of HyperTalk is to show that interactive hypermedia technology can also be used for training. The other reason to develop this by using HyperCard is to show the power of HyperCard which is one of the most popular authoring systems around the training application development groups

2. Target Users

Defining target users at the very beginning is very important for your stack design. Designer have to consider about what trainees have previous experience with computers, especially with the Macintosh computers, and with HyperCard. The author assumed that target users have only a little experience with Macintosh, and do not have much experience with HyperCard, because it is the technology that is not yet broadly accepted technology. Target users of this courseware are university level business school students, because getting involve industry employees in assessment test is not easy for the developed material.

3. Description About Cards in the Stack

(1) About the Stack

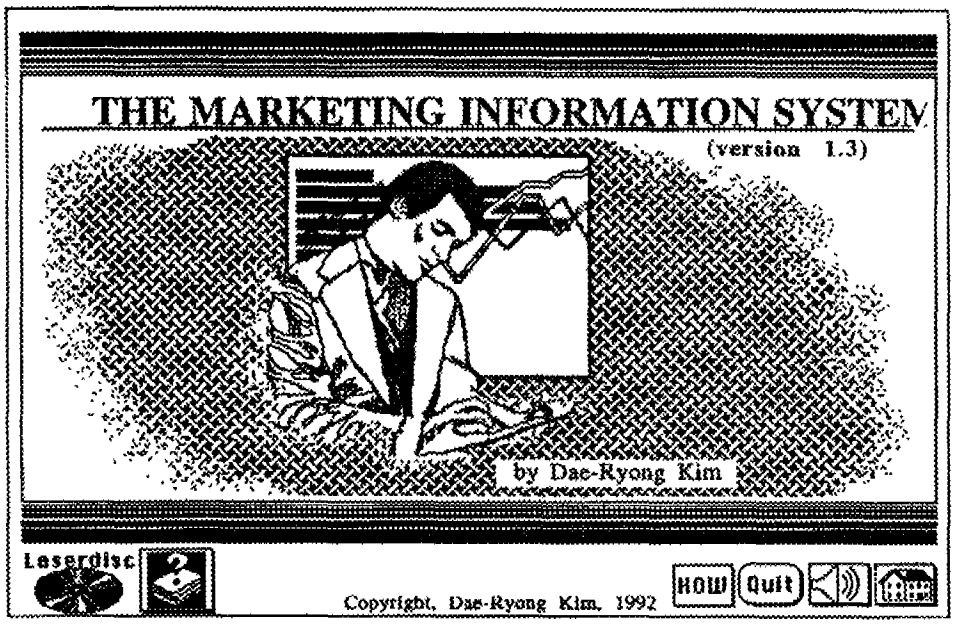
The contents of the stack is extracted from the textbook, Marketing Management - Analysis, Planning, Implementation, and Control (Kotler, 1988) One chapter, Marketing Information Systems and Marketing Research, of the book was chosen for development. The stack includes texts, graphics, animations, and a little audio The stack has 8 backgrounds and 46 cards. These cards are connected each other through the buttons. The stack includes the following cards Title card, About the laserdisc card, About this stack cards, Main menu card, Introduction card, How to use this stack cards, Stack map cards, and five marketing information system topic cards written on the different background.

(2) Title Card

A user can learn about your stack from the moment the first card appears on the screen. Title card gives you a chance to introduce stack to users and to set the tone of the whole stack. The stack card include its title, some copyright information, a 'Laserdisc' button that guides to laserdisc information, a 'Question mark' on the stack button that leads users to the information page of more about this stack, a 'Quit' button that shows users "Do you REALLY want to quit?" message box, a 'Speaker' button that playback welcome speech, and a 'Home' button that lets you go to the

main menu card. Figure 2 shows the 'Title' card.

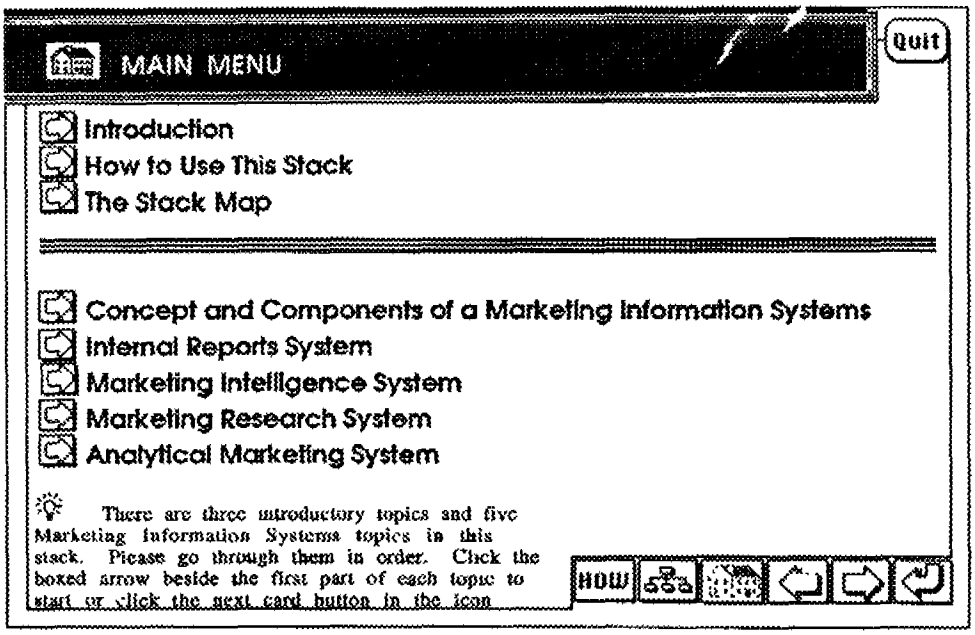
Figure 2. 'Title' Card of the Stack



(3) Main Menu Card

Main menu card is the heart of this stack. The card lets users choose one of many options. By clicking each menu button, users can browse specific topic that they want to study. The card has three introductory buttons: Introduction, How to Use This Stack, and The Stack Map buttons Five main topics are followed by the introductory buttons. Users can open the main menu card by clicking the 'Home' button at the title card Users can return to the main menu card when they finish study a specific topic. Small arrow buttons are in front of the topics. These buttons lead users to go to the first card of the topic cards directly. In addition to those, an icon group is at the bottom right of each card. The buttons in the group let users go forward or backward a card by a card Return arrow in the group lets users go back to the title card Figure 3 shows the 'Main Menu' card.

Figure 3 'Main Menu' Card of the Stack



(4) Stack Map Card

Stack map is a powerful navigation tool in a stack, because it satisfy many users' need at once. A stack map differs from a menu in that the map provides a visual presentation of both overall stack pieces and connections between those pieces. The best stack map should also be alive. Users can click any area on it to travel to any chosen topic.

There are two stack maps in the stack. Users can find a graphical map at first The users can go to the other bar-chart like stack map card when you are confused at the first map. The author used a 'dissolve' tool that is one of many visual effects in the card. Figure 4 and 5 show the examples of the 'Stack Map' card.

Figure 4. The First 'Stack Map' Card of the Stack

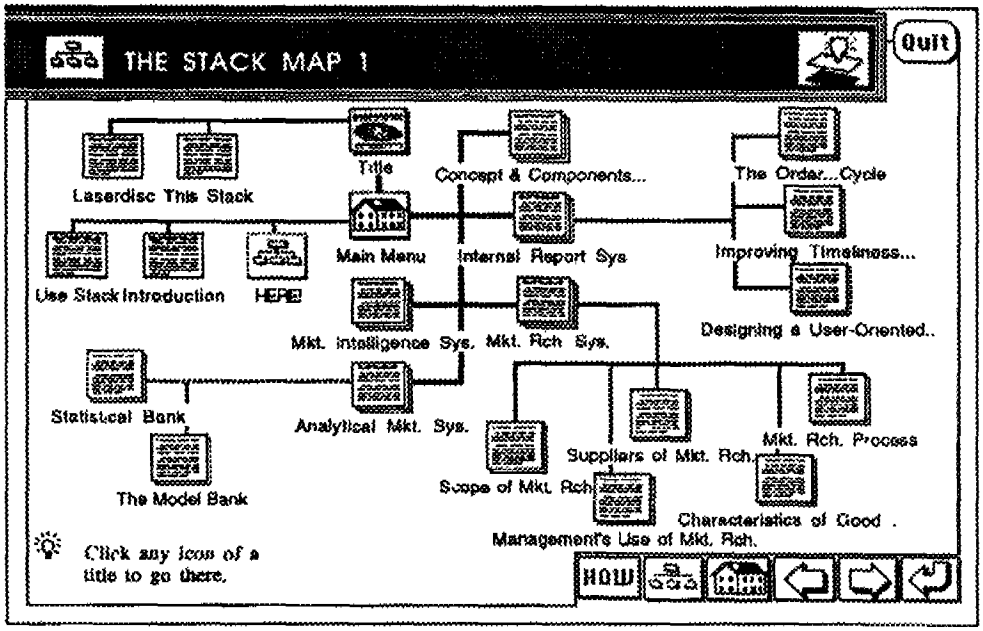
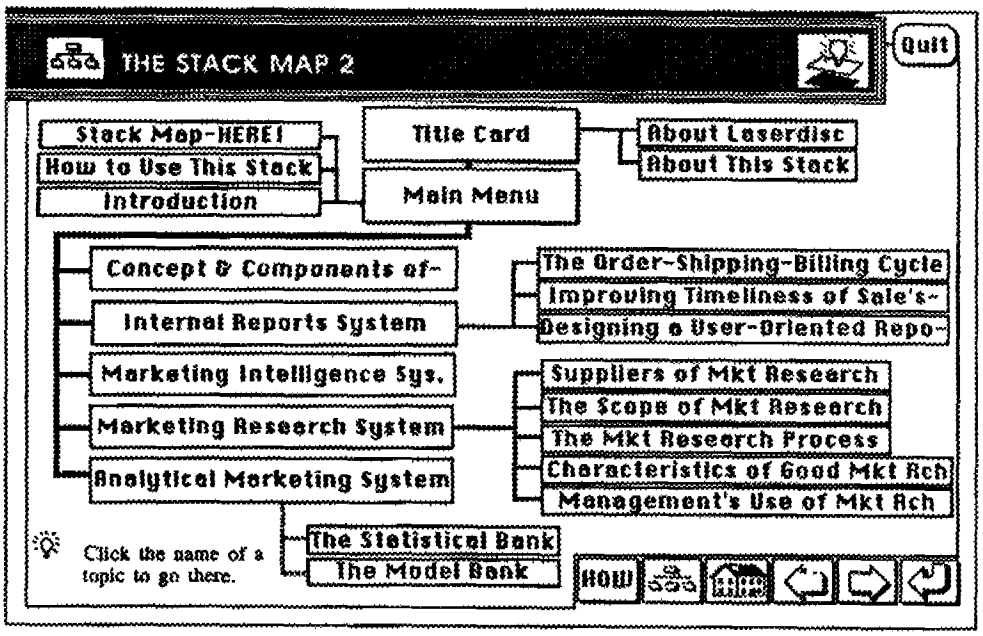


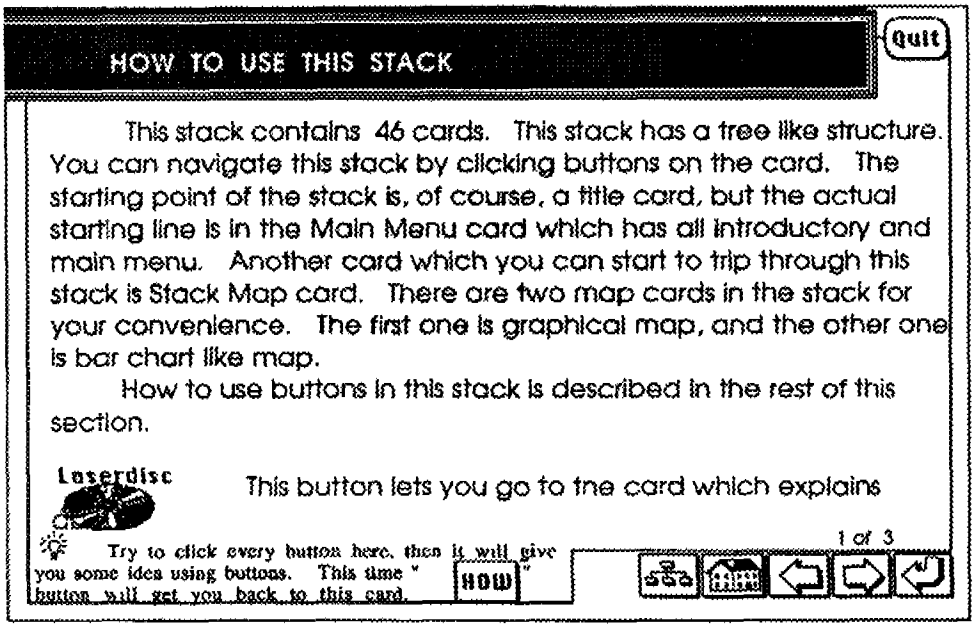
Figure 5 The Second 'Stack Map' Card of the Stack



(5) 'How to Use This Stack' Cards

The cards give uncertain novice users the information and physical practice necessary to feel confident using and exploring the rest of the stack. It provide a concise overview of the stack's content, teach the stack's structure, and tell the users how to navigate the stack. The 'How to Use This Stack' card of this stack gives the structure of the stack and explanation about buttons. Figure 6 shows the 'How to use this stack' card.

Figure 6 The First Card of 'How to Use This Stack' Cards



(6) Sound In the Stack

Sound can be used for many purposes. First, one of the most common uses of sound is to reinforce the user's sense of transition. As with visual effects, if you are using sounds this way, it gives consistent and brief feeling Developers need to use the same sound and visual effect for the same movement Second, sound sometimes represents the point of a card. Like an illustration, it demonstrates the property of the stack's text discussions. For example, a stack identifying birds might provide both the bird's picture and its song for users' reference Third, sound or music can be a way to tell users that something is happening, even though nothing is visibly changing on the screen. Fourth, sound can give users specific feedback, like an 'auto highlight' button, a dialog box, or a pop-up field. The message can be hidden, such as a particular chime with successful or unsuccessful actions, or can be direct, such as a voice that

tells the user the information. Fifth, some stacks, such as Product demonstrations or presentation stacks, are most effective with a continuous soundtrack, like a movie would use. The sound in this stack is mainly used for the first and the fourth purposes It includes voice and simple beef. The HyperTalk script of 'Home' button is as follows

```
on mouseUp
  play "harpsichord" tempo 200 "e d c d e e e"
  repeat until the sound is "done"
  --wait here for the sound to finish
  end repeat
end mouseUp
```

(7) Animation In the Stack

Animation has a big impact on users. But because of their exposure to movies and television, users have high expectations of animation quality. Animation is an interesting way to open stack, to illustrate movement within stacks, and to announce the beginning of another section of the stack. This stack has an animation. This animation was made by drawing several slightly different object through 5 cards. The animation in the HyperCard can be seen by showing the slightly different object consecutively. The HyperTalk script for the animation is as follows

```
on mouseUp
  Play Action
  push card
  repeat 5 times
  visual dissolve
  go to next card
  wait 20
  end repeat
  wait 200
  visual dissolve
  pop card
end mouseUp
```

VIII. CONCLUSION AND FUTURE DIRECTION

While there will clearly be difficulties in developing and using interactive hypermedia, the power of the visual image and sound effect cannot be underestimated.

Interactive hypermedia provides the opportunity of putting the control of these images, sound, and other media such as graphics as well as text in the hands of the users. It can be concluded that there will be an explosion of digital information and the interactive hypermedia technology will help developers organize the information. The interactive hypermedia technology is here, but it still has a way to go before it is easily accessible. However, tomorrow's interactive hypermedia can be expected to add full elements of media. Interactive Hypermedia will be improved its technology enormously in the future so that publics as well as specific developers and experts can access it easily Interactive hypermedia technology can also be expected to help even the illiterate participant in the 'Information Age,' by improving the authoring systems, and to become increasingly important in training, education, and our homes and offices.

Tomorrow's interactive hypermedia is going to open windows into a vast new world of information Many interactive hypermedia applications suggest a possible future for computer-aided planning Planners will soon be deluged by a flood of digital information. Combining interactive hypermedia elements to several applications will provide the potential for building powerful decision aids For example, tomorrow's interactive hypermedia will be used in many group decision support area by allowing groups of decision makers to sit around computers and use it in brain-storming sessions The interactive hypermedia can also be linked dynamically with current analytic models and knowledge-based systems to form a rich-media based information system.

There is a growing interest in the interactive hypermedia system in which all users have access to such a customizable information system. Users can establish his or her own links and trails through the interactive hypermedia system. They can also add new information to the system. For power users such as scientists, intelligence analysts, and engineers, the interactive hypermedia technology will be indispensable to interpreting floods of information clearly and easily. Interactive hypermedia will be the next revolution in computer and information age.

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