ESTABLISHING AN ERGONOMIC MULTIMEDIA ENVIRONMENT TO SUPPORT INFORMATION SYSTEMS INSTRUCTION: A CASE STUDY

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ABSTRACT: An ergonomic multimedia environment was built at one major university with the intention to improve the efficiency of teaching and learning computer related courses and conducting GDSS studies. Both the experiences of building this multimedia classroom and the features of the classroom are reported in this paper. Several computer related courses were instructed in the multimedia room during the first year. The advantages of using this new environment are also discussed. One GDSS study has been conducted so far. The graphical interface builder and object oriented environment have made the exchange of ideas between the GDSS researcher and the software developer much easier.

KEYWORDS: Electronic Classroom, GDSS, Multimedia Technology

INTRODUCTION

Management Information Systems (MIS) support the business activities and the management of business organizations. The advantages of applying MIS to organizations have been discussed by many researchers (13,14). Meanwhile, many business firms require potential employees to know how to use computers before being hired. More specifically, familiarity with word processors, spreadsheets, graphics, and database management systems packages is necessary (2,3,4,7,11). Therefore, all business majors who endeavor to be successful in their careers should have a high level of understanding of MIS concepts and software applications.

An introductory MIS course is required for all business majors in many universities. The purpose of the course is to introduce the concepts of MIS and software applications. The introductory MIS course has been taught either in the traditional classroom or in the computer lab with a face-to-face instruction method just as other MIS courses are taught. The face-to-face teaching style is highly dependent on textbooks and the instructors' ability to communicate with students (2). In such an environment, there is a communication barrier between the students and instructors. The problem is twofold. First, the students find it difficult to understand some of the concepts taught and are subsequently not able to keep up with the instructor. Second, the students tend to hesitate asking and discussing questions with the instructors.

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In a traditional classroom, students lack adequate hands-on experience needed to enhance their understanding of the software applications. When the students actually come into the computer labs, many of them experience difficulty in using the software and computers. Meanwhile, students experiencing difficulty require the instructor's individual attention. To answer specific questions, the instructor has to stop the lecture to deal with the individual's problem. This disrupts the smooth flow of the class. Similar problems are usually experienced by the other students. Hence, the efficiency of teaching needs to be improved in the traditional learning environment.

Two major difficulties of learning software applications in the traditional classroom have been identified by a survey: 1)students can not follow the instructions but hesitate to ask questions; 2)communication barriers exist between instructors and students (9) . To improve the efficiency of teaching and learning in MIS courses, a new environment is needed.

With advanced electronic equipment and state-of-the-art interior design, a multimedia classroom was proposed and built at one major university. The multimedia classroom can be used for instructing computer related courses and

conducting Group Decision Supported Systems (GDSS) experiments. The purpose of this paper is to describe the author's experience in establishing the multimedia classroom. The features of the multimedia classroom and the advantages of using this room are also discussed.

BACKGROUND

At the time the multimedia classroom was being planned, the department required a facility configuration be equipped to support teaching computer related courses and conducting research in the area of GDSS. The intent was to enhance the teaching and research performance of the Department of Computer and Office Information Systems in particular and of the College of Business Administration in general.

To achieve this overall objective, a multimedia classroom was constructed with two purposes in mind. One purpose was to use the multimedia classroom to investigate the efficacy of using GDSS to improve productivity of meetings. Another purpose was to provide a more effective teaching environment. These two purposes were, to some extent, incompatible, and therefore affected the various design options in ways described further in this paper.

In designing the classroom, we expected the environment to be as similar as possible to the environment of the traditional conference room except for the addition of electronic equipment. Emulating traditional conference rooms presumably would eliminate one possible confounding factor in the effort to focus on the effect of the electronic support. In other words, making the experimental meetings exactly like non-experimental meetings, except for the use of computer support, presumably would allow the researcher to better isolate the effects of the computer support.

MULTIMEDIA CLASSROOM SETTING

The multimedia classroom is a traditional classroom with an electronic environment in which computer related courses and GDSS experiments can be conducted. This room is air conditioned, with little external noises such as traffic noise. The lighting in the room can be adjusted easily which allows students to see both the public screen and their own monitors clearly.

The type of furniture used in the multimedia classroom significantly affects the floor plan. Two major considerations in furniture selection are: 1) types of tables and chairs, and 2) the number of students the multimedia classroom holds. A review of the literature regarding existing electronic rooms in the United States shows two major types of tables in use (5,6,12). One is the U-shape table; the other is the traditional oval or rectangular conference table.

The U-shaped table was recommended for use in the multimedia classroom for the following reasons. The classes in the multimedia classroom are always led by an instructor. A previous study indicates that when an electronic meeting environment is dominated by a senior person (an instructor in this case) the U-shaped table is better (12). The capacity of the classroom also favors the U-shaped table as this configuration can accommodate more students in the limited space available. Other minor factors, such as cabling and overall layout, support the use of the U-shaped table as well. Once the U-shape table is decided upon for the multimedia classroom, the next question that arises is the size of each workstation. Three factors should be considered in determining work space needed by a student:

1. the size of the monitor;
2. the size of the keyboard;
3. the working space required for the mouse, papers, books, and other working material.

Considering the size of the room, the sizes of the computer components, and the working space needed by meeting participants and students alike, a 2.5 feet by 4 feet working space was decided upon as the size of each workstation.

Two factors determine the selection of chairs: the first factor being the cost and the second, comfort to group participants. Since it takes a long time for group members to participate in GDSS experiments, the comfort of the chair is very important. Also, the shape and size of the chair should be compatible with the table. Although chairs with arms are more comfortable, chairs without arms were used because these chairs fit more readily with the table.

To attract the attention of students, a public screen was placed in the front of the multimedia classroom. The screen allows students to focus their attention on the instructor. It also displays more information at one time than does a single monitor (8). By using a projector, images from the computer monitor can be projected on the public screen thereby displaying it to all the students. The projector should be placed in a way that the students' view is not obstructed between the workstations and the public screen (Refer to Figure 1 on the following page).

The physical layout of network cables is one of the major problems in building a multimedia classroom. Previous studies show that an elegant environment is important for a meeting environment (5,8,12). All the necessary network cables should be either hidden or at least arranged neatly. When building this multimedia classroom, however, we also considered whether these cables could be readily accessible and modifiable. We installed a standard Ethernet and neatly arranged the cables. Although we favored a radio-based network, we finally decided not to use it because it is extremely expensive.

MULTIMEDIA CLASSROOM FEATURES

In regard to the purposes in building this multimedia classroom, the NeXT computers were selected and networked in the room. Although the NeXT computers have many advanced features, only those that are relevant to teaching and learning and GDSS research are discussed in this paper. They include the operating systems, multimedia E-mail, and a new environment for developing information systems.

First, the NeXT computers use UNIX as their operating system which provides an exceptional base for the networking and

Figure 1: MULTIMEDIA CLASSROOM

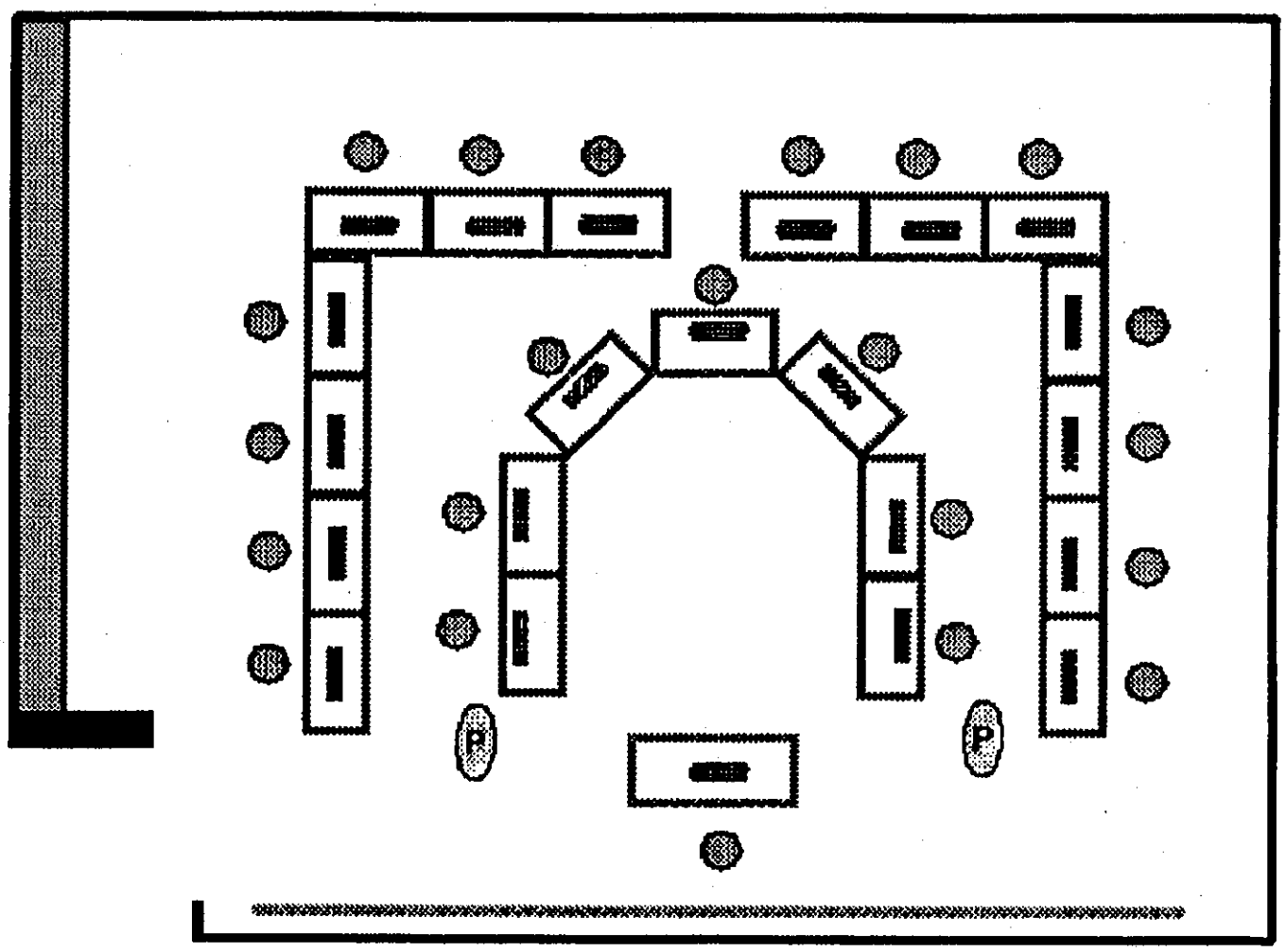
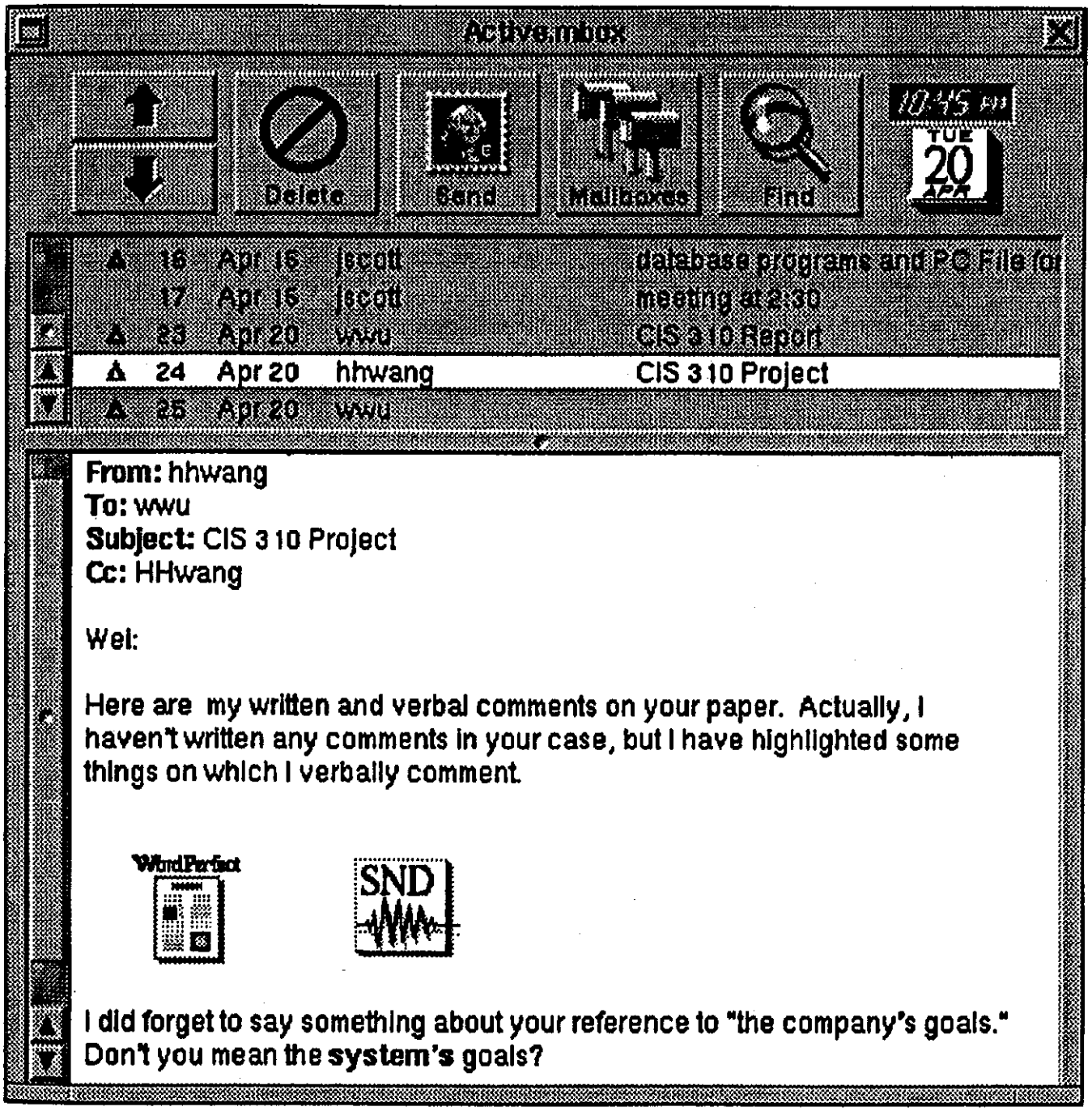


Figure 2: MULTIMEDIA E-MAIL



multitasking needs. A standard Ethernet was used to link the NeXT computers.

Second, the NeXT computers have built-in CD quality sound and multimedia E-mail systems. The term "multimedia" generally refers to a combination of two or more types of media, such as text, graphics, sound, voice, video, and animation into a computer-based application (1,10). The multimedia E-mail can send and receive sight and sound, as well as text. The high resolution of the Megapixel display makes static and dynamic sight clear and easy to read. The multimedia E-mail is a powerful tool that can be used in communication between individuals. Benefits of such a system include quick and efficient exchange of messages and data as well as easy transfer of applications across the network.

In addition, the multimedia E-mail allows one to attach whole documents, images of any kind, and sound to the mail message. Thus, documents which include pictures can be created by the student, sent by the student via E-mail to the teacher, returned to the student with both visual and verbal evaluation/feedback (See Figure 2).

Third, a new systems development environment allows students and researchers to develop a new information system more easily. The NeXTStep Graphical User Interface Builder, an object-oriented programming environment, and several other tools in the NeXT computers provide excellent capabilities for teaching systems analysis classes and developing GDSS software, even to non-programmers. Interface builders provide ready-to-use interface objects such as windows, buttons, sliders, textfields, and an intuitive mechanism for defining connections between any two objects of a user interface that might be constructed. By simply clicking and dragging, users are able to develop their own interfaces (front-end).

Keeping backup copies of applications is very essential for students to learn. In order to educate students about this important issue, instructors should require them to keep backup copies of their assignments. Meanwhile the administrator of the multimedia classroom should also backup applications periodically. The NeXT computer allows users to use two types of storage device for saving backup copies. The first is an optical disk which offers 256 megabytes of storage space; the other is a high density 3.5 inch diskette which offers 1.44 megabytes. Students can decide which device is best for them to backup their applications.

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BENEFITS OF USING MULTIMEDIA CLASSROOM

After one year of using the multimedia classroom, observations of instructors and feedback from students are favorable. According to the instructors' personal observations, communications between instructors and students have been improved during the process of instructing software applications. Students and instructors benefit from the increased interaction by using the public screen and the multimedia E-mail feature. Using the public screen, the instructor is able to display information pertinent to the whole class. Problems or errors encountered by an individual student are then demonstrated to all students. A classroom discussion may then follow. By using this new environment, students not only learn from their own hands-on experience, but also from that of others.

Another advantage to the public screen is to use it for a general instructional display. By virtue of its size, the public screen is easier for students to observe. This feature solved one of the major problems of a traditional classroom setting — the instructor's difficulty in showing students the computer monitor. The instructor is able to display the output so that the students can visualize the instructor's procedures. In this way, students are able to see precisely the demonstration of software applications. The multimedia E-mail feature also allows students to ask questions without identifying themselves. This anonymity feature encourages students to ask more questions.

The following are several examples of how the multimedia classroom worked during the first year of our study. In a managerial communication course, students submitted assignments via E-mail rather than turn in hard copies of written assignments. The soft copy of these assignments was graded by the instructor. In other words, students typed their assignments and sent them to the instructor. The instructor then made comments in the document as it appeared on the display screen. The augmented document (with teacher's writing), as well as the grade, were saved and mailed back to the student via E-mail. On one assignment, only written comments saved on the document were sent to the students. On another assignment, verbal evaluation/feedback in addition to the written comments were sent via E-mail to the students.

In a systems analysis course, students also used multimedia E-mail to send project documents (including data flow diagrams, data dictionary, and sound) to ask the instructor questions about their projects. One of the unexpected benefits of this process was that the E-mail system automatically marked each message with the date and time, so there could be no question as to when the student submitted the work. After reviewing the project, the instructor could send these documents with remarks to the students via E-mail without any delay. In this manner, the instructor and students had a very efficient tool for communicating with each other.

Although this is the first year we have had the opportunity to incorporate these communication processes in our classes, feedback from students has been primarily positive. According to informal interviews with students, most of them have responded favorably to the opportunity to learn a powerful but friendly

new system and to receive more complete feedback at their convenience. A few students who have not responded favorably indicated that they were more comfortable with the system they were used to and that they would rather not spend time learning a new system.

One face-to-face GDSS study has been conducted in the multimedia classroom. The development of GDSS software requires many ideas exchanged between the researcher and the software developer. Using the NeXTStep Graphical User Interface Builder has made the exchange of ideas easier between the researcher and software developer. According to the researcher's personal observation, the time for developing the GDSS software has been reduced compared to a similar GDSS software developed by the same researcher before.

FUTURE RESEARCH ISSUES

Although this paper has practical implications for understanding the role of a multimedia classroom to support teaching and learning in MIS courses, empirical research is needed to determine whether the efficiency of teaching and learning can be improved. To fully explore the advantage of utilizing the multimedia classroom, the following two important research questions need to be tested in future work.

1. Is an elegant and comfortable environment of the multimedia classroom important for the improvement of the efficiency of teaching and learning? A general guideline summarized from previous articles is that an electronic meeting room should be elegantly furnished to provide a comfortable environment for meetings (5,8,12). However, for the purpose of teaching and learning, is it necessary to spend a lot of money to have the multimedia classroom well furnished with comfortable fixtures, and carpet, etc.? Empirical research is needed to justify such investment.
2. Can communication barriers that exist between instructors and students be significantly reduced by using the multimedia classroom? Many GDSS researchers believe the communication barriers among group decision-makers can be reduced by utilizing information technology and structured decision-making process (5,15). A lot of research has been done to investigate whether GDSS can improve the productivity of decision making, and the results have been positive (6,15). Communication barriers are also a major obstacle to the efficiency of teaching and learning. Nevertheless, little research has been done to investigate whether the multimedia classroom can reduce the communication barriers between instructors and students. Empirical research should also be conducted to investigate this question.

CONCLUSIONS

In designing and building a multimedia classroom, many detailed and critical factors need to be considered. It has been pointed out by several researchers that an electronic meeting room should be elegantly furnished to provide a comfortable environment for meetings (5,8,12). Following this guideline and referring to the existing electronic meeting rooms in the U.S., several critical issues related to building a multimedia classroom have been described in this paper. These important issues include floor plans of the multimedia classroom, furniture selection, workstation design, public screen, hardware selection and network cabling.

At the end of first year, the instructor's personal observations and the informal feedback from students using the multimedia classroom have been in favor of the new environment. Benefits of using the multimedia classroom are the following. First, the communication problems that exist in the traditional teaching environment are reduced due to the use of multimedia E-mail and the public screen. Second, the multimedia E-mail also provides a convenient channel for instructors and students to exchange multimedia messages. These messages include assignments, remarks and grades of the assignments, and other documents related to systems development. Third, the use of the NeXT computers, interface builder, and other tools in the multimedia classroom has reduced communications problems during the development of GDSS software.

The multimedia classroom will definitely change the teaching and learning process in the near future (16). More multimedia classrooms are expected to be built in universities due to rapid decreases of hardware prices and rapid advances in information technology. To design a well accepted model for the multimedia classroom, therefore, will constitute a major challenge for the MIS faculty.

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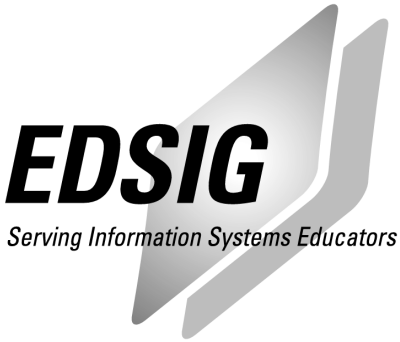

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