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## USING LOTUS TO BUILD AN ACCOUNTING INFORMATION SYSTEM

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*ABSTRACT: This paper presents a teaching methodology developed to deliver fundamental principles of management information systems (MIS). The methodology is used in the MIS core course taught in an undergraduate school of business. It is a LOTUS 1-2-3 project consisting of two independent but related components: (1) a set of exercises which develop students' computing abilities and spreadsheet knowledge and (2) a set of instructions for building a partial accounting information system. Students work through the exercises and then build the accounting system. The exercises and instructions for building the accounting system are described first. Then the strengths of the methodology are discussed.*

*KEYWORDS: teaching methodology, management information systems, LOTUS, accounting information systems*

### INTRODUCTION

The successful teaching of management information systems (MIS) requires extensive use of hands-on experience. As with most computer-related concepts, the understanding of MIS is difficult when teaching methods are limited to textbook readings and classroom lectures. For the world of information systems to come alive in the minds of students, instructional methods need to be supplemented by hands-on experience [1] [2] [3]. This paper presents a project that was designed to meet this need.

The project was developed for the MIS core course taught in an undergraduate school of business. Students in this course are typically first-semester juniors and have completed approximately one semester of business school courses. These courses most often include financial accounting (a prerequisite), microeconomics, statistics, principles of marketing, and business law.

Approximately thirty to forty percent of the students have had some hands-on computer experience. However, this experience is usually limited to the use of electronic mail and, in a few cases, simple spreadsheet work.

Lecture material in the MIS core course is divided as follows: 25% to hardware and software concepts; 25% to computer applications; and 50% to MIS concepts, including analysis and design. Lectures are supplemented with classroom computer demonstrations and hands-on laboratory assignments. These assignments introduce students to both minicomputer and microcomputer environments and cover: electronic mail; text editing; word processing; file manipulation; spreadsheets; graphics; and databases.

The MIS project was designed with two primary goals in mind: (1) to create a project in which students would learn to use spreadsheet technology confidently and (2) to teach a working knowledge of

fundamental MIS principles. A review of leading texts in the field revealed that available experiential learning materials fall primarily into two groups - stand-alone application exercises and case studies [4] [5] [6] [7] [8] [9]. There were no learning materials available that simultaneously satisfied the goals of teaching spreadsheet technology and MIS principles. Thus the methodology described in this paper was developed. It has been used successfully for the past two years.

In the next section, the teaching methodology is described. Then the strengths of the methodology are discussed, with particular attention to its ability to deliver fundamental principles of MIS.

### AN INSTRUCTIONAL TECHNOLOGY: THE MIS PROJECT

The MIS project consists of a set of preparatory exercises followed by a set of instructions for building a partial accounting

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information system (AIS). The preparatory exercises introduce students to spreadsheet technology and develop the necessary skills for building the AIS. The AIS instruction set provides students with step-by-step instructions for building a balance sheet, a price list, and a sales register for a retail company. These three statements are linked together so that sales recorded in the sales register are immediately reflected in the balance sheet, and changes in the sales price of a product are immediately reflected in the sales register, and then in the balance sheet. The preparatory hands-on exercises are described first followed by a discussion of the AIS instructions.

### The Preparatory Exercises

Four preparatory hands-on exercises are used to develop knowledge of LOTUS and prepare students to build an AIS. (These exercises are available from the author upon request.) The total time required to complete the four exercises is just a little over two hours, plus or minus thirty minutes, depending on students' prior exposure to spreadsheet technology. The exercises are completed over a period of 2-3 weeks with classroom discussion of each exercise occurring before the next exercise is begun. The instructor is present in the laboratory to oversee the work and to answer questions while the students work on these exercises.

Each preparatory exercise is designed to build on the previous one. Having no predecessor, however, Exercise 1 is naturally the one that introduces students to the largest number of spreadsheet concepts. It instructs students to build a travel expense report which lists the name and amount of four different expenses along with a total travel expense amount. The exercise requires approximately 25 minutes and students are given the cell references for entering the data. The concepts introduced in this exercise are:

- identifying cell references;
- entering labels, numbers, and formulas;
- underlining;
- changing column widths;

- saving; and
- quitting.

Exercises 2 and 3 are designed as a unit to introduce students to the concept of linking cells. In Exercise 2 students are required to create a worksheet that shows the sales data for a hypothetical company by region of the country and by quarter of the year. Students are told which cells to use and the exercise takes approximately 40 minutes. The concepts introduced are:

- identifying individual cells;
- copying formulas; and
- printing.

Exercise 3 requires the student to build a partial income statement in the same worksheet as that used for Exercise 2. Input for the Total Sales line of the income statement is drawn from the sales data completed in Exercise 2. That is, the cell showing the amount of Total Sales in Exercise 3 contains a formula that refers to the cell from Exercise 2 containing the sum of the quarterly sales data. This third exercise requires approximately 20 minutes, and cell references are not given. The concepts introduced are:

- retrieving a file;
- manual versus automatic recalculation;
- linking cells with formulas; and
- exploring what-ifs.

The fourth and last preparatory exercise requires the student to build a five-year sales model. The model predicts sales, cost of goods sold, and gross margin for a hypothetical company based on three operating assumptions: (1) amount of first year sales, (2) sales growth rate, and (3) cost of goods sold percentage. Once again, cell references are not given. The only new concept introduced in this exercise is the formatting of numbers. Nevertheless, Exercise 4 requires approximately 45 minutes for students to complete and appears to be the most difficult to grasp conceptually. There are many formulas to create in this exercise and that, combined with the abstraction of model building itself, probably accounts for the difficulty

of the exercise. Once finished, however, students are impressed with their efforts and excited about the speed with which the program can recalculate their model's 5-year predictions when one of the three operating assumptions is changed.

### The Accounting Information System

Once the preparatory exercises are completed, students are ready to build the partial AIS. Students are encouraged to first select a small retail business before beginning their spreadsheet work. This company functions as a working model for the accounting system developed in this part of the MIS project. They are encouraged to talk with the owner or manager of their selected business and to gather operating and financial information. Students are allowed to create imaginary companies if they like. However, regardless of whether their company is real or imaginary, students must identify several items of information about their company before beginning to build their accounting systems. This information includes: the name of the company; 3-5 products sold by the company, along with their cost, sales price, and optimal inventory quantity; and the company's critical success factors as well as any managerial reports generated to monitor these factors.

Once their retail business is identified and described, students are ready to build the AIS. It consists of a balance sheet, a price list for the 3-5 products identified above, and a sales register. These three statements are built sequentially and placed side-by-side in the same worksheet. Then they are linked together. In this manner, entries to the sales register flow immediately to the balance sheet and changes in prices flow immediately to the sales register and then to the balance sheet. To complete the AIS, students are given a set of instructions which are now briefly described. (This AIS instruction set is available from the author upon request.)

The first part of the AIS instruction set gives directions for creation of the balance

sheet. Students are instructed to use formulas for four balances: total assets, total liabilities, owner's equity, and total liabilities and owner's equity. All other account balances are entered as numbers. In some cases, the balance sheet information will have been obtained from an interview with the owner or manager of the student's selected retail company.

In most cases, however, it is estimated by the student.

Directions for setting up a price list are given in the second part of the instruction set. The price list is stored to the right of the balance sheet in the same worksheet. It has one column each for the product number, description, cost, and sales price

of the 3-5 products identified earlier for the company.

The third part of the AIS instructions gives directions for creating a sales register. The register contains eight columns as shown below:

Students are instructed to create at least

(Company Name)  
Sales Register  
For period beginning 1/1/89

<u>Date</u>	<u>Customer</u>	<u>Item(s)</u>	<u>Cost</u> <u>Per</u>	<u>Item</u>	<u>Total</u> <u>Cost</u>	<u>Accounts</u> <u>Revenue</u>	<u>Cash</u>	<u>Receivable</u>
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15 hypothetical sales entries and to enter the appropriate information in each column. Students are also instructed to put formulas referencing their price list in the last five columns. In this way, changes in the cost or sales price of an item will be reflected in the sales register.

The final instruction set directs students to link their sales registers to their balance sheets so that individual sales are automatically reflected in the cash, accounts receivable, and inventory balances. Finally, to test the effects of a change in sales price, students are instructed to increase the sales price of each item in their price list by 25%.

Thus the instruction set teaches students how to create a partial AIS. Students are given three weeks to complete the assignment. They work on their own time but are allowed to ask the instructor any questions they want during that period. The creation of the system takes an average student about 8-12 hours, not including the time to identify and research a local

company on which to base their work. When finished, each student hands in a diskette and hard copy of their AIS, including a cover sheet with the information about the company, its products, and its critical success factors. (A copy of a complete AIS is available from the author upon request.)

Upon completion of the AIS, students feel that the project was well worth their time and that they have developed a sound understanding of information flow through a computerized system. Student evaluations of the course document this success. Eighty to ninety percent of students identify the MIS project as the most beneficial part of the course. Many state that the project is the best way to learn MIS concepts and that they enjoyed going out and interviewing a local businessperson. In addition, many feel that they have acquired sufficient knowledge and self-confidence to recreate a LOTUS-based AIS for another small company. Reasons for the students' self-reports of success

are discussed in the remainder of this paper.

### STRENGTHS OF THE MIS PROJECT

The MIS project has been a successful teaching methodology in the MIS course in which it is used. Thus far, approximately 400 students have completed the project, and the clear majority feel that the project is an important and essential part of the course. Several factors contribute to this impression but none more than the real-world context developed for the accounting system and the development of end-user computing skills. Both of these factors are now discussed.

#### Real-World Context for Accounting Information System

In an ideal world, information systems courses would have a field component in which students help in the analysis, design, or implementation of an actual firm's information system. In reality, there are

simply not enough companies to accommodate the number of students passing through our schools of business. In upper level courses, we can often divide our MIS majors into groups and assign each group to a real world volunteer. But in our core courses - those in which hundreds if not thousands of general business students pass each academic year - this is not a viable alternative. Therefore information systems faculty need to design hands-on projects which come as close as possible to modeling real-world conditions [10].

The project described here was designed in an effort to create a methodology that can be completed in the computer laboratory, while maintaining as much flavor of the real world as possible. For example, accounting information systems are more structured and concrete than are other types of information systems. Thus they are more easily understood by the beginning student. They are also one of the most prevalent types of information systems in the workplace. For these reasons, the MIS project is designed around an AIS. Recall that students are strongly encouraged to interview the owner or manager of the company on which they base their projects. They are also required to identify operating and financial information about their companies, along with critical success factors and the reports designed to address these factors.

Additional attempts to bring the accounting systems to life include challenging students to identify the pieces of their AIS's that are missing. Recall that their systems contain only a balance sheet, price list, and sales register. Students enjoy discussing those additional system parts that would be necessary to fully account for a company, e.g. an income statement, an accounts payable register, and an inventory system. They can also be challenged to specify how they would go about integrating these missing pieces into their existing AIS's.

All of these efforts ground the accounting information system in reality and help provide students with a real-world context for their work. This context becomes a

framework into which students can place their newly acquired MIS knowledge and from which they can extrapolate and develop additional information systems concepts and structures.

#### Development of End-User Computing Skills

After completion of the MIS project, students feel confident in their ability to move on to upper-level courses in the curriculum requiring more extensive use of computers and computer software, i.e. finance, intermediate and advanced accounting, and marketing courses. Feedback from faculty teaching these courses confirms the students' feelings of success.

The MIS project, from preparatory exercises to the building of the accounting information system, was designed with the intent of developing students' ability to explore computers and computer software. This author's experience has shown that students who are spoon-fed their computer knowledge will not be successful end-users. Rather, those who learn to experiment and explore software on their own, who do not require step-by-step directions to utilize computer technology, who are allowed to make their own mistakes will be the most successful in the long run. . .and will be the end-users of tomorrow.

Thus the MIS project is designed so that students are gradually left more and more to their own devices. For example, the preparatory exercises are conducted in the computer laboratory with the instructor present, while the accounting system is constructed outside of class time without the instructor present. Even within the four preparatory exercises, students' abilities are developed through materials that build upon previous exercises, become less detailed, and place increasing amounts of responsibility on the individual student's judgment. This development of end-user computing skills contributes significantly to students' feelings of accomplishment at the end of the project.

#### Other Benefits

The development of a real-world context for the accounting information system and the development of students' end-user computing skills are the primary factors contributing to the success of the MIS project. However, there are some additional benefits to using the project. First, students quickly comprehend what a simple database can do for them while working on the sales register component of the AIS. Recall that the last five columns of the sales register must be filled with formulas linking these figures to the product cost and sales price columns in the price list. Students soon realize that entering the cost and sales price extensions for each sale in the sales register is a time-consuming and repetitive process. At this point, it helps to explain that a database containing the price list information would compute the extensions automatically, but since students are creating the accounting system from scratch, they must provide the extensions themselves.

Secondly, students gain a first-hand knowledge of the power of spreadsheet software to conduct what-if analysis. This what-if ability, when combined with modeling capabilities, is the most impressive aspect of spreadsheet software. Recall that after linking the balance sheet, price list, and sales register together, students are instructed to raise all product sales prices by 25% and to measure the effect on their sales registers and balance sheets. Thus they obtain first-hand experience with a spreadsheet's modeling and recalculation abilities. They witness the effects of 3-5 simple changes - effects which pervade their entire AIS but which are computed in less than a second's time.

In conclusion, when students finish the MIS project, they feel that they have developed a fundamental understanding of information flow through a computerized system. Both the real-world context created for the accounting system and the development of end-user computing skills contribute significantly

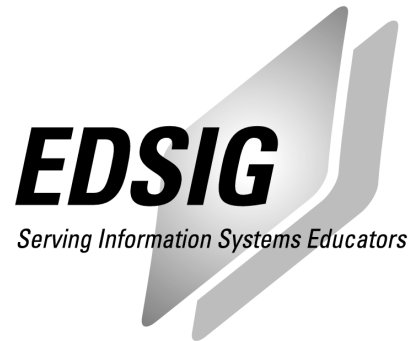
to this ability to understand the basic principles of MIS. In addition, students develop an appreciation for the power of database and spreadsheet software.

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