A MODEL FOR MICROCOMPUTER INTEGRATION FOR A COLLEGE OF BUSINESS

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Since 1976 when Apple Computer, Inc. introduced its first machine built around the microprocessor chip, the market for personal computers has grown from zero to over $6 billion. 1986 sales are expected to more than triple to $21 billion.[1] The revolution in communications and information processing since that time has elevated the computer from the status of a technician's tool to a basic necessity for acquiring knowledge and solving problems. Forecasters are predicting that in the near future a large majority of our working population will have significant interaction with a computer as part of their daily routine.[2] The process of educating users or as it is more commonly termed "computer literacy", has been implicated by several factors. First, the investment in equipment alone can represent a significant capital outlay. For example, in a ten month period during 1982, The Colgate Darden Graduate Business School of the University of Virginia spent $250,000 for microcomputers and related software, classroom flat-screen color video projectors, and a new computer suite.[3] A second problem is that the recruitment of a staff of instructors to accomplish computer literacy is hindered by the economic pressure from computer related industries. In short, those with technical skills to instruct are recruited heavily by both business and academia. In practice these problems are synergistic to one another such that a University which hopes to be successful in competitive recruiting, must give serious consideration to progressive planning and state-of-the-art equipment. Thus, a University must invest heavily to attract adequate staff. To put this issue in perspective, the price tag to meet the computer literacy needs of U.S. college students is estimated to be approximately $1-billion per year.[4] Currently, colleges and universities spend only $300-million a year for the utilization of computers in instruction, or less than one-third of what is required. By the end of the 5 year period 1985-90, the estimated capital investment on a per student basis will be at least $1000 at a liberal arts institution and upwards of $6000 at a high-technology school.[5]

A significant decision for microcomputer integration revolves around computing capacity. That is, from a planning perspective, how many microcomputers should be purchased. Viewed alternatively, how much of the processing burden should be relieved from the mainframe and how much of the financial burden should the institution shoulder directly? Colleges and Universities around the U.S. have adopted several different approaches which can basically be grouped into 3 classifications.

The University Center Approach - under this approach a college or university establishes a microcomputing center with a significant number of personal computers, a computer service staff, (usually including a center director) and a major investment in software. Duke University, for example, became involved when IBM loaned them 35 PC's. Since then they have purchased 110 PC's and have established 2 major labs of 40 and 36 machines as well as 5 satellite labs of 6-11 PC's each. Most of the stations are stand-alone and not attached to a mainframe. Several additional faculty and a computer service staff have been hired. Duke has a software "stable" of approximately $100,000, the major acquisition being the University of California at San Diego's "P" system (UCSDP). The cost of this package was approximately $700 per machine. The main labs are constantly scheduled with classes.

The University of Virginia first purchased 24 microcomputers and a special room was built within the confines of the business school. This room was divided into several modules, each containing 4 or 5 microcomputers, 2 graphics printers, bookshelves, and 3 printing time sharing terminals. Further, they felt it was critical for several classrooms to have the capability to display computer output. They settled on ceiling mounted Novabeams which allow projection from any television or microcomputer. The existence of the Novabeams played a significant role in the successful implementation of the microcomputer facilities. In a capital budgeting class, for instance, a student's disk could be displayed before the whole class and

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1 "The Coming Shakeout in Personal Computers," Business Week (November 22, 1982), p. 72.

2 See, for example, A. Luehrmann, "Computer Illiteracy: A National Crisis and a Solution," Byte (July 5, 1980), pp. 98-102, and "AP Computer Science versus APC Computer Competency," Academic Connections (Fall 1983), pp. 3-5.

3 Brandt R. Allen and James R. Freeland, "Experiences in Implementing Microcomputers in a Graduate Business School," paper presented at Midwest Meeting of the American Institute of Decision Sciences, Kansas City, Missouri, April, 1983.

4 Jack Magarrell, "College Students Said to Require $1-Billion a Year for Computing," Chronicle of Higher Education, (September 1983), p. 1.

5 Ibid., p. 6.

COMPUTER EQUIPMENT REQUIREMENTS

Hardware - Estimation of hardware requirements requires careful analysis of student usage. Table 1 illustrates hypothetical enrollment and usage figures and shows that 20 minicomputers are required for the College of Business example. This assumes 225 students per semester utilizing the computer 4 hours per week. Further, it assumes each computer is available 50 hours per week and is used 90% of the time. Additionally, in order to meet faculty need, one minicomputer will be allocated to each of the five departments in the hypothetical College of Business.

TABLE 1

HARDWARE REQUIREMENTS FOR A
HYPOTHETICAL COLLEGE OF BUSINESS

Enrolled students per semester 225
Computer usage/week/student. . . . . 4 hrs.

Computer utilization factor. 90%
Number of operating hours available/computer/
week. 50
Dot Matrix Printers. . . . . .1 for each 4 PC's

Microcomputers Required:

$$\frac{\left[\begin{array}{c}(\text{Number of Students})\ (\text{Computer usage/week/student}) \\ (\text{Computer Utilization Factor})\end{array}\right]}{\begin{array}{c}\text{Number of operating hours} \\ \text{available/computer/week}\end{array}}$$

Microcomputers Required

$$= \left(\frac{\frac{225 \cdot 4}{.9}}{50}\right) = 20$$

Supplemental hardware should include dot matrix printers (20 PC's/4).

Software - The student lab should be equipped with a minimum of:

1) VisiCalc (Electronic spreadsheet to address 'What-If' applications

2) DBMS (Data base management applications)

3) WordStar (Basic procedures for word processing)

Estimated Cost

The estimated cost of a microcomputer laboratory to support classroom applications and faculty research for the hypothetical College of Business would be nearly $250,000.00.

Recommendations

The assessment of present and future needs leads to an analysis of computer equipment requirements.

The final step in the model is to formulate a set of specific written recommendations. Based on our hypothetical College of Business we might devise the following:

A. HARDWARE:

1. Student Lab: 20 microcomputers should be provided in a laboratory environment for Basic Computer Fundamentals in Business. It is recommended that a type of Local Area Network (LAN) be utilized so that the computers may access a smaller number of peripherals and reduce the redundancy of software. Networking in practice will serve as a teaching module in itself. It is recommended that the hardware consist of:

   a. IBM PC Personal Computers with 125K memory and at least 1 floppy disk drive. (20)

   b. MX-80 or equivalent dot-matrix printers, 1 to every 4 computers. (5)

   c. At least 10MB's of hard-disc storage. (1)

   d. Controllers as needed for the specific LAN.

2. Faculty Use: A Minimum of 1 IBM PC for each department of the College of Business should be available for faculty use. These should have at least 128K of internal storage and should be equipped with 2 floppy disc drives. It may be possible for several departments to share one printer.

B. SOFTWARE:

The Student Lab should be equipped with a minimum of the following:

1. VisiCalc or its equivalent.

2. DBII or an equivalent DBMS.

3. WordStar or an equivalent Word Processing program.

4. General Business Accounting software.

C. IMPLEMENTATION:

1. It is essential that the cooperation of the Computer Science personnel be obtained so that there will be no problem with integration with the present system. The technical knowledge of these personnel will be absolutely necessary for implementation and on-going maintenance.

2. It is strongly recommended that on-site visit(s) be made to campuses where this type of program is already a reality.

3. Continuous rapport with the hardware and software vendors is a necessity. The implementation of this program will serve as a show-place for their products.

4. The Lab should serve the needs of Continuing Education of the business community and Executive Development.

SUMMARY

This paper has addressed the issue of computer literacy and has proffered the dual problems of capital outlay and deficiency of personnel (and thus, knowledge) as reasons for its sluggish dissemination. Where colleges and universities have pressed forward toward a computer literacy goal, three approaches have emerged with respect to how the financial burden should be carried. These are:

1. The University Center Approach
2. The Student Expense Approach
3. The Conservative Approach

Next a hypothetical business school is examined and a model for microcomputer integration is presented. This model stresses present and future needs from three input sources, namely, students, faculty, and college or university goals. Next a systems analysis is performed stressing both hardware and software requirements and a table of estimated costs was prepared. Finally, a written recommendation for hardware, software, and implementation was outlined.