Improving Business Education with SAS: Business Students Perceptions

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ABSTRACT

The objective of this paper is to investigate how we can improve business students education using SAS, both in PCs and in the mainframe environment. An experiment was conducted at California State University, Chico in 1992 with students enrolled in an introductory course in Management Information Systems. The subjects in this experiment were in management, marketing, finance, accounting, production, MIS and in other nonbusiness majors. The students were exposed to SAS for the duration of that introductory and required 16-week course. A survey was conducted at the end of the course where the students were asked to express their perceptions and expectations about SAS use in the business environment. The results are reported and discussed. The implications of this study may prove to be important for a large number of Business Schools in U.S. and in other countries.

INTRODUCTION

Where are business schools with respect to their use of computers and information technology? Frand and Britt conducted the 1992 UCLA survey of business schools. Their sample included 178 AACSB accredited business schools. According to their study the schools' collective responses suggest that the use of mini and mainframes for instruction have become institutionalized (see Figure 1), with little expansion and routine replacement of obsolete technology. Frand and Britt also report that collectively, business schools are in the initial action phase for multimedia systems implementation and in the start-up phase in the use of high performance 32-bit graphics workstations, faculty and student use of CD-ROM databases and Windows implementation for IBM/IBM-compatible systems. They also report that in contrast, the business schools collectively reflect a mature phase with respect to computer operating budget, mini/mainframe use in research and for administrative support, the number of microcomputers and microcomputer labs, and faculty and student usage of microcomputers as a productivity tools. There are several other findings in that report, but we will concentrate primarily on the ones just reported here (Frand and Britt, 1992).

Hypothesis

The following hypothesis will be formulated for testing in this study:
1) Undergraduate business students have not used mainframes before this experiment,
2) Undergraduate business students have not used statistical packages before this experiment,
3) Undergraduate business students prefer to work with microcomputers if they can choose between mainframes and microcomputers,
4) Undergraduate business students are more interested in using computers after this experiment,
5) Undergraduate business students consider that it is very important to own a PC after this experiment.

Theoretical Base

The theoretical foundations for this study are in the research conducted by Jason Frand and Julia Britt on the changing nature of the business school computing environment over the past ten years. They have published most of their work in the Communications of the ACM. Frand and Britt have used SAS for their statistical analysis. They have made available upon request the SAS files for their surveys. Frand and Britt are members of the Information Systems Research Program, The Anderson Graduate School of Management, University of California, Los Angeles, California.

Limitation of the study

This study, in the present form has the following limitations:
1) The sample was selected from only one campus in the California State System.
2) The subjects were students in the College of Business with a business major, or from other colleges but with a business minor during 1992.
3) The experiment was conducted during an introductory business management information systems course, a required course for all undergraduate business students.

Assumptions

The first assumption is that undergraduate business students at CSUC are not familiar with mainframes, since most of prior courses do not use computers or use microcomputers instead of mainframes. The second assumption is that undergraduate business students at CSUC do not have prior experience with statistical packages, and more specifically with SAS. The third assumption is that subjects in this experiment represent a good sample of undergraduate students enrolled in the College of Business at CSUC.

Importance of the study

Organizations in various industries use both mainframes and microcomputers in their daily operations. These organizations visit our campus twice a year trying to recruit our students and they specifically ask for mainframe and microcomputer skills. According
The review of the literature about textbooks currently used in introductory courses on business information systems indicates that the large majority of the textbooks talk about mainframes in some chapters but most of their assignments and projects involve the use of word processing, spreadsheets and databases for microcomputers. This study is important for the SAS community because it indicates that book writers should focus on producing textbooks for undergraduate business students. Most of the existing books are written for this type of audience. SAS books for undergraduate business students should have meaningful SAS examples in marketing, finance, accounting, production, MIS and in management.

This study is important for business educators because students should be exposed to both mainframes and microcomputers before graduation. SAS is a good teaching tool since it is available in mainframes and microcomputers. If SAS is presented in an introductory business information systems course, together with word processing, spreadsheets and databases, students will have the skills to use it in more advanced courses.

This study is important for business students because it indicates an area where they can improve their background and skills. If they master the use of mainframes and microcomputers, and if they learn how to use SAS, they may improve the quality of their projects and papers. SAS can import spreadsheets and databases files from other packages. The integration of text, graphics, and tables will allow students to produce projects and papers with a professional look. These projects, papers, skills with word processing, spreadsheets, databases, statistical packages (SAS), and experience with both mainframes and microcomputers will be very impressive in a student's resume.

Organization of the study

The second section of this study will review the literature used nowadays in introductory business information systems courses in the U.S.A. We will also review publications related with the use of SAS in the business academic environment. We will end this review with a summary of our findings. The third section will describe the research design and methodology. The population and the sample are introduced. The experiment is described in details. The survey form is discussed. The analysis of the data, and the corresponding tests are presented. The fourth section presents the major results and a discussion of the findings. The fifth section will have the summary, conclusions and recommendations for further study. Finally we have the references cited in this study.

REVIEW OF RELATED LITERATURE

The information technology is changing very fast and the publications oriented towards the business academic community are found in large numbers. We have decided to concentrate in the period from 1990 to 1993 for this study since these publications are more likely to include the last developments in technology, software and hardware (see Figure 2). Our purpose in this literature review was: (1) to determine if both mainframes and microcomputers are included in the text, (2) to identify if projects and assignments are oriented towards microcomputers and/or mainframes, and (3) to find out if statistical packages, more specifically SAS, are used in those publications identified in the period 1990-1993 for introductory business information systems courses. After analyzing the publications in Figure 2, we noticed that all the authors have chapters, projects and assignments using productivity tools for microcomputers. None of the publications have projects and assignments for mainframes. Another interesting finding is that there are no projects or assignments using statistical packages, and more specifically they not use SAS or refer to SAS in their suggested assignments.

We tried to find SAS books oriented towards new computer users, with lots of examples. We were able to find one that seems to be very appropriate for business students written by Ronald P. Cody and Jeffrey K. Smith, in its third edition, published by North-Holland in 1991, and its title is Applied Statistics and the SAS Programming Language.

The foundation of this study is the work of Jason Frand and Julia Brit, from the John E. Anderson Graduate School of Management at the University of California, Los Angeles. The 1992 report by Frand and Brit was the ninth annual UCLA survey about business school computer usage. The title of this last report is Where are Business Schools in the Process of Computerization?

The review of the literature seems to indicate that:
1) The textbooks used primarily by business schools are oriented towards microcomputers and the use of productivity tools like word processing, spreadsheets and databases.
2) Business students are being exposed to microcomputers in introductory business information systems courses, but they have none or very little experience with mainframes.
3) Business students are not being exposed to statistical packages such as SAS in introductory business information systems courses.

RESEARCH DESIGN AND METHODOLOGY

This study was conducted during 1991-1992 when the author was involved in teaching and reformulating an introductory business information systems course for business students in the College of Business at the California State University, Chico. One of the objectives of this course was to teach the students how to work with microcomputers and with mainframes. SAS was the most important tool in this experiment because we have SAS for microcomputers and for mainframes. The SAS language is highly compatible in both platforms. The subjects used IBM or IBM-compatible microcomputers in the microcomputer lab and the IBM mainframe lab in the College of Business microlab or their own machines at their at their homes or in the university dorms for this project. The mainframe was an IBM 4381 with VM/CMS operating system. The software was SAS version 6.07 in the mainframe, and the SAS version 6.04 under MS-DOS in the microcomputers in the College of Business microlab. The groups used different communication programs to access the mainframe from remote sites, like Kermit, CrossTalk, Telnet, Connect and others. The groups that used our lab had access to TELNET and FTP for accessing the mainframe and for file transfer.

Design of the Experiment

The subjects were separated into groups of four students. Each group was supposed to work on a group project assigned by the instructor during the course and to present the same project in class at the end of the course. Each individual student was required to use the data and results produced by the group project to produce an individual research paper. The steps involved in the experiment were as follows:

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<table>
<thead>
<tr>
<th>Year</th>
<th>Author</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>Hicks</td>
<td>Information Systems in Business: An Introduction</td>
</tr>
<tr>
<td>1992</td>
<td>Kanter</td>
<td>Managing with Information</td>
</tr>
<tr>
<td>1993</td>
<td>Kroenke &amp; Hatch</td>
<td>Business Information Systems: An Introduction</td>
</tr>
<tr>
<td>1993</td>
<td>Laudeon &amp; Laudeon</td>
<td>Business Information Systems: A Problem-Solving Approach</td>
</tr>
<tr>
<td>1992</td>
<td>Long &amp; Long</td>
<td>Microcomputers: Concepts</td>
</tr>
<tr>
<td>1993</td>
<td>Long &amp; Long</td>
<td>Computers</td>
</tr>
<tr>
<td>1991</td>
<td>Martin et al</td>
<td>Managing Information Technology: What Managers Need to Know</td>
</tr>
<tr>
<td>1991</td>
<td>McKeown</td>
<td>Living with Computers</td>
</tr>
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<td>1993</td>
<td>McKeown &amp; Leitch</td>
<td>Management Information Systems: Managing with Computers</td>
</tr>
<tr>
<td>1993</td>
<td>McLeod</td>
<td>Management Information Systems: A Study of Computer-Based Information Systems</td>
</tr>
<tr>
<td>1991</td>
<td>O'Brien</td>
<td>Introduction to Information Systems in Business Management</td>
</tr>
<tr>
<td>1993</td>
<td>Parker &amp; Case</td>
<td>Management Information Systems: Strategy and Action</td>
</tr>
<tr>
<td>1992</td>
<td>Schultheis &amp; Sumners</td>
<td>Management Information Systems: The Manager's View</td>
</tr>
<tr>
<td>1993</td>
<td>Sprague &amp; McNurlin</td>
<td>Information Systems Management in Practice</td>
</tr>
</tbody>
</table>

1) Library Data Collection: the subjects were requested to visit CSUC library and to collect data about the computer industry in USA, and also about some selected computer companies. Sources like Standard & Poor's Industry Surveys, Standard & Poor's Corporation Records, Moody's Industry Review, U.S. Industrial Outlook and others were used by the groups.

2) LOTUS 123 & DBASE III: the groups were required to create a spreadsheet with LOTUS 123 and a database with DBASE III using the data created in the first step.

3) Importing the data into SAS/PC: The groups were asked to import the data from the spreadsheet and from the database into SAS/PC. An easy way to accomplish this task is to save the database and the spreadsheet in ASCII format. To read data from an external ASCII file into SAS is a trivial operation. Another way to convert a Lotus spreadsheet into SAS system file is via DIF (Data Interchange Format) file. Once your spreadsheet has been translated to a DIF file, you may use PROC DIF to convert the DIF file into a SAS system file. Converting DBASE III files into SAS system files is accomplished the same way we convert Lotus into SAS via DBF format. We can use PROC DBF to translate the DBF file into a SAS system file.

4) Uploading the data into SAS/mainframe: the groups were asked to transfer the files from their microcomputers to the IBM 4381 where we run SAS version 6.07 under VM/CMS. Some groups decided to upload ASCII files directly from the spreadsheet and the database using their own communication program. Many groups used Kermit for file transfer. Other groups decided to use TELNET/FTP to transfer the files to the IBM mainframe. To read an external ASCII file is a trivial operation in SAS.

5) Statistical Analysis: the groups were asked to perform tasks involving descriptive statistics, correlation analysis, regression analysis among others. The groups had to choose the SAS procedures to be used for each of the required tasks.

6) Downloading files: the groups were asked to download the SAS listing files with the results from the various SAS procedures to their microcomputers. Some groups used Kermit, or any other communication packages, Other groups used TELNET/FTP to accomplish the same task. The results, tables and graphs from the SAS procedures had to become available to be used by a word processor.

7) Importing the files from SAS/mainframe into a word processor: the groups were asked to import the ASCII files from SAS into their
favorite word processor. Most of the groups decided to use Word Perfect 5.1 for DOS, or Word Perfect for Windows 3.1 available in the College of Business microlab.

8) Producing the research paper: each individual student was asked to choose a topic related with the computer industry to produce their own research paper. The requirement was that they had to use data from the SAS results and that the papers had to use graphs like pie charts, histograms, or others. They were told that contents and appearance were important items in the final evaluation. The subjects had a laser printer available for the final version of their research papers.

Population and Sample Description

The population for this study was formed by all students in the College of Business enrolled in the introductory course in business information systems during 1992. All the students were involved in the group project and in the individual research paper. The sample of business students was selected from different sections of that course. The students were selected at random. They were informed that there was no obligation to complete the survey at the end of the course, and that it would not affect their grades in the final evaluation. The data for this study came directly from that survey. Only the students that wanted to participate in this experiment completed the survey form. The sample had 132 students. The distribution of subjects by major or area of specialization is described by the following pie chart (see Figure 4).

The distribution of respondents by sex is given by the pie chart in Figure 5. The age distribution of the subjects in the sample is described by Figure 7. The status of the respondents in the study plan is found in Figure 8. The students were grouped by grade point average (gpa) as indicated in Figure 6. About 44.3% of the students are not full time and maintain some type of part time employment (less than 20 hours per week) working on campus or in nearby companies.

The graphs presented here provide a good description of our sample. The readers can establish some comparisons with the student population in their own campuses and adapt the findings of our study to their own environments. We had more tables and graphs but space limitations do not allow us to include it. The students should take this course in the beginning of their study plan but we observed that this does not happen for all the students. There was a relative high percentage of seniors taking this course. This course should be required for all students in their first college year. The skills learned in this type of course can be very valuable in more advanced courses. Students can use the skills and methods learned in this type of course in projects, papers and other assignments to improve their performance in more advanced courses in their own areas of specialization. A relative large percentage of students said that they were not familiar with nor had used mainframes as shown in Figure 9. About 60% of the students stated that they used a mainframe before this course, but they were not prepared to use mainframes again. The reasons why the students use microcomputers at home, campus, work place or elsewhere are indicated in Figure 10.

RESULTS AND DISCUSSION

The results, after applying the chi-square goodness-of-fit test to the hypothesis just described, are summarized in the following table:

The first column indicates the hypothesis number being considered. The second column indicates the frequency of respondents that answered "yes" to the survey question. The third column indicates...
the frequency of "no" as a response. The fourth column indicates the frequency of answers "do not know". The fifth column indicates the computed chi-square for the respective hypothesis. Column six indicates the probability of getting a higher chi-square value or the p-value. If the p-value is less than the alpha level, you can reject the null hypothesis. This is the same as comparing your computed chi-square against the tabulated chi-square and rejecting the null hypothesis if the computed chi-square is larger than the critical or the tabulated chi-square. In all the five hypothesis the null hypothesis (H0) is that there is no difference among the answers for "yes", "no" and "do not know", or that the probability of each answer is equal to 1/3. The number of degrees of freedom for each hypothesis is df=(3-1)x2. Considering df=2 and assuming a value for α we can find the corresponding value of the critical chi-square from a chi-square table. The critical values are the following:

<table>
<thead>
<tr>
<th>Hyp</th>
<th>YES</th>
<th>NO</th>
<th>DON'T KNOW</th>
<th>Computed Chi-square</th>
<th>Prob. p-value</th>
<th>Reject H0?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81</td>
<td>40</td>
<td>10</td>
<td>52.12</td>
<td>&lt;.0005</td>
<td>YES</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>68</td>
<td>44</td>
<td>26.18</td>
<td>&lt;.0005</td>
<td>YES</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>100</td>
<td>16</td>
<td>120.57</td>
<td>&lt;.0005</td>
<td>YES</td>
</tr>
<tr>
<td>4</td>
<td>67</td>
<td>20</td>
<td>43</td>
<td>17.33</td>
<td>&lt;.0005</td>
<td>YES</td>
</tr>
<tr>
<td>5</td>
<td>93</td>
<td>19</td>
<td>18</td>
<td>86.07</td>
<td>&lt;.0005</td>
<td>YES</td>
</tr>
</tbody>
</table>

Hypothesis #4 testing indicates that undergraduate business students are more interested in using computers after this experiment. Informally a large percentage of the students indicated that they would like to work for a company where they would have computer access. Some students even changed their majors and became MIS students.

Hypothesis #5 testing indicates that undergraduate business students consider that it is very important to own a PC in their majors. About 60% of the students indicated that they owned a PC, and about 35% indicated that they intended to acquire a PC in the short term.

It seems that the motivation to use computers is present in undergraduate business students. We may need to adjust our courses to take more advantage of mainframes and PCs. SAS seems to be an excellent teaching tool, even at the introductory level. Our experiment indicates that the students were very satisfied with their projects, and with the use of SAS in microcomputers and in our IBM 4381 mainframe. I intend to repeat the experiment and incorporate SAS as an integral part of my introduction to business information systems courses. I strongly believe that we can provide a great service to our students and to their potential employers if we provide mainframe and microcomputer exposure in business courses. SAS seems to be a great teaching tool for undergraduate business students.

CONCLUSIONS AND RECOMMENDATIONS

This study deals with the issue of how we can improve undergraduate business education. We were particularly interested in investigating if SAS was a proper teaching tool for undergraduate business students. Because SAS runs on microcomputers an in mainframes it seemed to be a good choice. We conducted an experiment in 1992 in several sections of the introductory course to business information systems. We divided the students in groups. They were assigned group projects and individual research papers. To complete their work they needed to use word processing, spreadsheets, databases, and SAS. Some tasks were in PCs and other tasks were mainframe oriented. They were asked to upload and download files. Some exposure to file transfer using communications programs or TELNET/FTP was necessary. At the end of the course there was a survey. The data was analyzed and some hypothesis were tested. The major findings of our study were:

1) Undergraduate business students do not have sufficient mainframe exposure to mainframes in business courses.
2) Undergraduate business students do not have experience with statistical packages like SAS.
3) Undergraduate business students prefer to work with microcomputers, since they do not have sufficient knowledge about mainframes.
4) Undergraduate business students are interested in using computers if we provide them with meaningful opportunities in projects and papers, and if we provide them with the necessary training and supervision.
5) Undergraduate business students consider that it is very important to own a PC in their area of specialization.

These findings were consistent with our preliminary ideas about the status of undergraduate business education. The feedback about SAS from the students was very positive. The experience of working with mainframes and PCs in the SAS environment was rewarding for the subjects in this experiment. We used the SAS book by Cody and Smith called "Applied Statistics and the SAS..."
Programming Language, supplemented by some business examples and readings in finance, marketing, accounting, production, management and in MIS. The respondents appreciated that SAS book. Hopefully some writers will produce new SAS books dedicated to undergraduate business students, with examples in different functional areas. This would further enhance the chances of SAS becoming very popular among undergraduate business students.

BIBLIOGRAPHY


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Business School Computerization Life Cycle

Business Students by Sex

Business Students by Major

Business Students by GPA
Business Students by Age

Figure 7: Sample size = 132

Business Students by Status

Figure 8: Sample size = 132

Business Students Mainframe Prior usage

Figure 9: Sample size = 132

Business Students Interests In Computer usage

Figure 10: Sample Size = 132
Description of the Experiment

LIBRARY DATA COLLECTION → LOTUS 123 DBASE III+ → PROC DIF PROC DBF → UPLOAD FILES

SAS RESULTS → STATISTICAL ANALYSIS PROC MEANS/CORR/REG/... → SAS DATA STEP

DOWNLOAD FILES → WORD PROCESSOR → RESEARCH PAPER

Figure 3