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# INTEGRATING PERSONAL COMPUTERS A INTO COURSE AS A DECISION SUPPORT TOOL

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## ABSTRACT

A study was conducted testing student attitudes regarding the use of personal computers and financial spreadsheet software (Lotus 1-2-3) as a decision support tool. Results showed exposure to the PC and a spreadsheet model improved student perception of the usefulness of these tools and help them to more realistically assess the strengths and weaknesses of the model.

## INTRODUCTION

Pedagogical techniques for introducing students to personal computers and particular software packages are many and varied. Methods range from courses designed specifically for the purpose of exposing students to personal computers and PC software to adding course modules dealing with personal computers to integrating the use of PCs into the course as a decision-support tool. (X2)(3) This paper reports on a study testing student attitudes regarding personal computers and financial spreadsheet software following their use as a decision-support tool.

## RESEARCH DESIGN

The study was conducted at a large private midwestern college. Subjects for the study were seniors majoring in Business Administration, enrolled in two sections of the "capstone" Policy and Strategy Formulation course. Both sections were taught by the same instructor using the same pedagogy. A questionnaire was used to collect data on student attitudes both prior to and after use of the personal computer and financial spreadsheet software. All PCs used were IBM's. The software used was Lotus 1-2-3.

One component of the course was a computer-based management simulation exercise (Tempomatic IV) using a main frame computer (PRIME) to process the decisions. A total of twelve decision sets were made over the life of the simulation. Each decision represented one quarter (3 months) of an operating year. A Lotus model which emulates the simulation was developed for student use and integrated into the course. Students were instructed to use the Lotus model as an aid for making decisions regarding the operation of their firm in the simulation exercise. To use the model, students had to input data which updated the model to their current quarter of operation. They then could input their current decision. The output generated by the model was nearly identical in format to that of the main-frame model. The Lotus model was designed and instructions were developed so that no prior experience or knowledge of Lotus was necessary to be able to utilize the model.

## RESULTS OF THE STUDY

Students reported little prior working knowledge of either personal computers or financial spreadsheets. Eighty-four percent reported limited or no prior knowledge of personal computers and 80% reported limited or no prior knowledge of financial spreadsheets (Table #1). Over one-half had worked with Lotus one hour or less prior to its use as part of the simulation exercise, with almost 90% having used it for five or fewer hours. In short, the subjects were novices in dealing with personal computers and Lotus software. At the conclusion of the simulation exercise, their experience level had risen sharply. Two-thirds of the students reported using the Lotus model for 16 or more hours, one-half for 20 or more hours (Table #2).

While most students entered the study with only limited working knowledge of personal computers and financial spreadsheets, their "natural" inclination for using a financial spreadsheet as a decision making aid was high (average = 3.51 on a five-point scale). Their attitude toward specifically using Lotus was even more positive, averaging 4.20 on a five-point scale (see Table #3). The more positive orientation toward Lotus, specifically, versus financial spreadsheets, in general, appears to result from the visibility Lotus has received and the perception that it is the industry standard regarding spreadsheets. As college seniors, interested in improving their marketability, acquiring a working knowledge of Lotus was an attractive feature of the simulation exercise. Despite their strong initial positive orientation, student attitudes improved significantly following the use of the Lotus model, averaging 4.47 on the five-point scale. A paired pre/post t-test yielded a significance level of .057 (Table #3).

### Perceived Usefulness

Table #4 shows student perceptions of the usefulness of financial spreadsheet planning models both prior to and after using the Lotus model in the simulation exercise. Even before using the model, the students generally had a reasonably realistic picture of where financial spreadsheet planning models would be most useful and least useful. They expected it to be beneficial for testing alternatives and assessing financial results. They expected it to be less useful for setting objectives, determining critical marketing variables, or producing team consensus.

Perceptions of the benefits of using spreadsheet models generally improved following their use. However, there was little change between those items seen as most beneficial and least beneficial, with a few noteworthy exceptions. The rank order position of "Seeing the 'Total Picture" moved from 11th to 4th, while both "Reduce Decision Making Errors" and "Make Marketing Forecasts" fell in their rank order position from 5th to 9th and 7th to 14th, respectively. While there were changes in rank order position, it should be noted that all but one of the sixteen items were viewed more favorably following exposure to the model. Five of these changes were significant beyond .05. two more beyond .10. Those not reaching significance fell into two groups. Four of the measures were perceived so positively before students worked with the spreadsheet, that, even though perceptions of them improved, there was little room to allow for significant improvement. The second group consisted of variables not perceived to receive much benefit from the use of spreadsheets. This perception did not change following use of the spreadsheet model The first group was composed of financially based issues, the second group was generally marketing based (Table #4). The lone exception to the positive change in perceptions was the model's usefulness for making marketing forecasts. Although students were clearly instructed that they, and not the model, had to determine their marketing forecasts, it was not until they used the model that this became clear

to them. Once recognized, a more realistic assessment of the model's contribution to marketing issues was made. The perception that changed the most following exposure to the model was usefulness of spreadsheets to "see the total picture." In the same way that the simulation exercise pushes students to see the interrelationships between parts of an organization, the spreadsheet model of the simulation allows them to test alternatives and see the consequences for all parts of the organization.

**Perceived Problems**

Table #5 shows the student perceptions of the potential problems encountered when working with financial spreadsheets. Overall they did not see any particular problem that detracted from using a spreadsheet model, either before or after having worked with the model. Students were asked to agree or disagree with a series of statements describing potential problems associated with using computers or spreadsheets. In all cases, students disagreed with the statements indicating that none of these problems were seen as being serious obstacles to using the computer or the model.

Even with this initially positive orientation, students saw the potential problems as less likely to occur after using the model. The overall mean at the beginning of the study was 2.578 and at the end was 2.354. While all variables moved in a positive direction, only one showed significant change. The initial concern that the program would not work as explained in the manual decreased significantly, although it was still perceived as a key problem area.

There was no change in the rank order of the problems after students used the spreadsheet model. Those ranking highest focused on actual running of the software. Those ranking lowest focused on time issues (learning time, access time, and time spent using the model. It would appear that the students were willing to commit the time necessary to make the model useful, but then expected it should run "hassle free."

## DISCUSSION

Results from the study indicate students approach the use of personal computers and financial spreadsheet software, particularly Lotus 1-2-3, with a positive attitude. Even when their experience with either personal computers or spreadsheets is minimal it does not detract from their willingness to utilize them.

Even students with little exposure to financial spreadsheet planning models hold realistic views of where the models can be most useful. They recognize that the model is strongest in its ability to test alternatives and "crunch" numbers regarding financial issues. They also perceive it to be less beneficial in its ability to aid decisions regarding marketing variables (e.g., making sales estimates).

The students perceive problems relating to demands on their time as less troublesome than those connected with inadequate performance of either equipment or software. However, they generally do not perceive any particular problems as great enough to inhibit their use of personal computers or spreadsheet models. Exposure to the personal computer and the spreadsheet model tends to lessen student concern regarding potential problems.

Exposure to the personal computer and the spreadsheet model also improves student perceptions of the usefulness of these tools. This exposure helps students to more realistically assess the strengths and weaknesses of the model (e.g., it can help to "see the total picture," but is not very useful for making marketing forecasts). Exposure also improves attitudes toward PCs and spreadsheet models as decision making tools. In this case exposure took already positive attitudes and made them even more positive.

It is interesting to speculate as to why the spreadsheet model is so positively received by students. A partial answer may be that students believe knowledge of computers and spreadsheets will be useful upon graduation, either in job seeking or on the job itself. It also seems likely that use of these tools to support decision making in a simulation exercise contributes to its positive reception. Unlike some situations where learning about computers and spreadsheets may be an end in itself, here the model has immediate application for improving performance in their simulation exercise. With such a direct and obvious benefit, there is a strong incentive for students to learn the model, plus there is immediate reinforcement for using it. Students are also likely to develop an understanding and appreciation for the computer and the model that is impossible in a tenon. application" oriented exposure to these tools. As one student stated, "1 think I've learned more about computers and computer models in this course than in my computer course -- but maybe that's because I learn more about what they can do for me in this course."

Given the mushrooming use of computers in today's business world, the need to educate students in the use of personal computers and related software is apparent. The results of this study would indicate that integrating these elements into an existing course structure is an effective means for introducing or confirming the benefits of these tools to the students. It also serves to enhance the students' positive orientation toward utilizing software decision-making aids. However, it should be pointed out that some findings of this study may not be universally applicable. In situations where access to computers is very limited or instructions for using the model are unclear, it can be anticipated that student frustrations will result in less positive reactions to personal computers and spreadsheet models.

While courses specifically oriented toward computers and computer software are essential elements of the educational curriculum, the full educational burden should not rest on these courses alone. Integrating computer based models as decision making aids into multiple courses throughout the curriculum may well accomplish educational goals that would be difficult if not impossible to achieve in other settings.

## REFERENCES

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[2] Collins, Robert H. and Shane, Barry, "using Microcomputers to Support the Analysis of Complex Cases: As Easy as 1-2-3," National ABSEL Conference Proceedings, 1984, pp. 267-269.

[3] Gold, Steven C. and Strang, Daniel R., "The Success of a Computerized Simulation in Microeconomic Pedagogy," National ABSEL Conference Proceedings, 198, pp. 95-98.

**TABLE #1**

**PRIOR WORKING KNOWLEDGE OF PERSONAL COMPUTERS AND SPREADSHEETS**

| | | PCs | SPREADSHEETS |
|---|---|---|---|
| AMOUNT OF KNOWLEDGE | None 1 | 1 (2.0%) | 4 (8.2%) |
| | 2 | 13 (26.5%) | 12 (24.5%) |
| | Limited 3 | 27 (55.1%) | 23 (46.9%) |
| | 4 | 6 (12.2%) | 7 (14.3%) |
| | Extensive 5 | 2 (4.1%) | 3 (6.1%) |
| | Mean: | 2.90 | 2.86 |
| | Median: | 3.00 | 3.00 |

**TABLE #2**

**HOURS WORKED WITH LOTUS 1-2-3**

| | | Before Simulation | After Simulation |
|---|---|---|---|
| NUMBER OF HOURS | 0-1 | 27 (55.1%) | 3 (6.3%) |
| | 2-5 | 16 (32.7%) | 2 (4.2%) |
| | 6-10 | 1 (2.0%) | 3 (6.3%) |
| | 11-15 | 2 (4.1%) | 8 (16.7%) |
| | 16-20 | 0 | 7 (14.6%) |
| | 21-25 | 0 | 16 (33.3%) |
| | 26-30 | 0 | 4 (8.3%) |
| | 30+ | 3 (6.1%) | 5 (10.4%) |

**TABLE #3**

**ATTITUDE TOWARD USING LOTUS 1-2-3**

| | | Before | | After | |
|---|---|---|---|---|---|
| ATTITUDE TOWARDS LOTUS | Very Negative 1 | 0 | | 0 | |
| | 2 | 0 | | 2 | (4.1%) |
| | Neutral 3 | 9 | (18.4%) | 4 | (8.2%) |
| | 4 | 21 | (42.9%) | 12 | (24.5%) |
| | Very Positive 5 | 19 | (38.8%) | 31 | (63.3%) |
| | Mean: | 4.20 | | 4.47 | |

Level of Significance = .057

**TABLE #4**

**USEFULNESS OF FINANCIAL SPREADSHEET PLANNING MODELS**

A five-point scale was used: 1 = Not Useful; 5 = Very Useful)

| | ITEM | * | MEANS Before | MEANS After | SIGNIFICANCE Level | |
|---|---|---|---|---|---|---|
| | 1. Test Alternative Plans & Strategies | (1) | 4.469 | 4.542 | .719 | |
| | 2. Ask "What If" Questions | (3) | 4.245 | 4.542 | .077 | *** |
| | 3. Assess Possible Financial Results | (2) | 4.429 | 4.521 | .607 | |
| + | 4. See the "Total Picture" | (11) | 3.816 | 4.417 | .000 | ** |
| | 5. Make Financial Forecasts | (4) | 4.204 | 4.388 | .162 | |
| | 6. Determine Financing Options | (6) | 3.980 | 4.306 | .055 | *** |
| | 7. Make Plant Utilization Decisions | (8) | 3.878 | 4.286 | .015 | ** |
| | 8. Identify Problems in Advance | (10) | 3.837 | 4.286 | .001 | ** |
| - | 9. Reduce Decision Making Errors | (5) | 4.020 | 4.229 | .176 | |
| | 10. Evaluate Existing Strategy | (12) | 3.729 | 4.163 | .012 | ** |
| | 11. Make Pricing Decisions | (9) | 3.857 | 4.102 | .141 | |
| | 12. Produce Team Consensus | (14) | 3.510 | 3.939 | .018 | ** |
| | 13. Make Sales Estimates | (13) | 3.592 | 3.688 | .628 | |
| - | 14. Make Marketing Forecasts | (7) | 3.898 | 3.551 | .074 | *** |
| | 15. Determine Critical Marketing Variables | (15) | 3.306 | 3.510 | .236 | |
| | 16. Determine Objectives | (15) | 3.306 | 3.354 | .673 | |
| | GRAND MEAN | | 3.880 | 4.114 | | |

* indicates rank order before use of Lotus model
** indicates change between before and after was significant at ≥ .05
*** indicates change between before and after was significant at ≥ .10
\+ indicates significant upward change in ranking position
\- indicates significant downward change in ranking position

**TABLE #5**

**PROBLEMS OF FINANCIAL SPREADSHEET PLANNING MODEL**

(A five-point scale was used: 1 = Strongly Disagree; 5 = Strongly Agree)

| ITEM | * | MEANS Before | MEANS After | SIGNIFICANCE Level | |
|---|---|---|---|---|---|
| 1. Penalties for Minor Errors Too Severe | (1) | 2.878 | 2.592 | .109 | |
| 2. Program Doesn't Work As Manual States | (2) | 2.816 | 2.510 | .046 | ** |
| 3. Computer Mechanical Problems | (2) | 2.816 | 2.490 | .073 | *** |
| 4. Access to PCs Too Limited | (4) | 2.388 | 2.327 | .731 | |
| 5. Learning Time too Great for Benefits Gained | (5) | 2.347 | 2.224 | .466 | |
| 6. "Gut Feel" Decisions Yield Equal Results | (6) | 2.224 | 1.980 | .135 | |
| GRAND MEAN | | 2.578 | 2.354 | | |

* indicates rank order before use of Lotus model
** indicates change between before and after was significant at ≥ .05
*** indicates change between before and after was significant at ≥ .10