Information Systems Concepts in a Web-based Setting: Two Contrasting Approaches

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Abstract:
As more and more courses are offered in a fully online setting, it becomes increasingly important to determine the best manner of presenting the material. This is especially true in courses that have a fairly high technical content such as the undergraduate management information systems course in a school of business. In trying to determine the best teaching method we need to have some way to compare different approaches. Often that is difficult, but if a situation arises where one can minimize intervening factors it is possible to obtain a fairly clean comparison of two contrasting delivery methods. Then, some conclusions might be drawn about the effectiveness of one method when compared to the other. In this situation there were two sections of the same management information systems course being taught in the same semester by two different faculty members. Two different approaches were used to assist these online students in learning basic information systems concepts.

One approach used a semester long case study including voluntary computer lab oriented learning projects. The other approach relied upon a group project through a local business that included collaborative discussion boards as a primary communication and learning tool. An online survey instrument was developed in order to obtain user attitudes and opinions of the basic delivery methods in order to evaluate differences between the two groups due to the use of the two contrasting approaches.

Since the data was ordinal and a normal distribution could not be assumed, the nonparametric Mann-Whitney test was employed to analyze the data collected from the two approaches. The results of this analysis seemed to indicate that either approach helps students learn the basic information systems concepts. In each case the students were pleased with the structure, the design, and delivery of the course. Both groups were concerned with the issue of cheating or plagiarism. The approach that employed a voluntary lab component seemed to be preferred in regards to the technological aspects of communication. But under this mode of examination there was very little difference between the two approaches in terms of actual effectiveness in learning the information systems concepts. Descriptive statistics appeared to favor Approach 1 but more data would be required before any significance could be attached to this result. An examination of frequency distributions appeared to support that finding as well but that is also tempered with the recommendation for the collection of additional data.

Keywords: Web-based classes, IS concepts, presentation methods
Introduction
The intent of the research was to collect data at the end of the two subject classes and analyze that data to determine if the different projects used in the teaching process had any differences in terms of the effect on student learning. Data was collected from each of two fully Web-based classes. This served the purpose of eliminating most of the personality issues and presentation issues found in a traditional classroom setting since the material was essentially online only. In addition the same textbook was used in both classes, and that was the source for the core material which was essentially identical for the two classes. The primary difference was in the types of projects that were undertaken to enhance learning beyond the textbook based material. Approach 1 used an ongoing case study based on a simulated business that covered many of the concepts of an information system in a small organization. This project had several facets and lasted throughout the semester. Approach 2 utilized a group project including collaborative discussion boards. The project involved student groups working with a local company and becoming involved in actual hands-on exploratory interaction relative to the application of information systems concepts.

It has been demonstrated in previous research that Web-based classes and Web supported classes are relatively equal in effectiveness when you measure total scores, exit exam scores, and other such measures. (Hatcher, 2005/2006) Although this study approached the issue from various topic areas, there was never a clear indication of the effects on student learning when measured by these quantitative means. Consequently the authors decided to use information systems concepts as a means of measuring student learning through their perceptions of outcomes in regard to the primary topics of interest. The concepts under consideration for this study reflect in general the body of knowledge that the researchers felt the student should learn in an upper division management information systems (MIS) course. The two Web-based classes were taught in the spring of 2009 at an AACSB accredited university business program. An online exit survey at the end of the course provided the data collection method.

Literature Review
There has been considerable research regarding Web-based learning, distance learning, e-learning, and most all of the other variations of technology mediated instruction. (Smith, Ferguson, & Aldegonda, 2001) (Chickering & Ehrmann, 1996) Indications are that Web learning tools are effective not only for Web-based courses, and they also have similar positive effects for Web supported instruction in traditional modes of delivery. (Hatcher, 2005/2006) But it was also found that the frequencies of the level of use of the Web learning tools in either mode did not significantly alter exit scores and other major measures of performance. In some instances Web-based classes actually performed better than Web supported classes in earlier research. Using hits in various areas as a measure of the level of use of Web learning tools was found to lack real explanatory power on the performance results for one method of instruction compared to the other.

In general all of the Web-based classes and Web supported classes seem to perform equally well on exit exams and other quantitative measures. (Hatcher, 2007) However these studies did
indicate that there were some statistically significant relationships between the level of activity and total points, on the level of activities and scores on discussion boards, and also on activity levels and final exam scores. In particular it was noted that scores on discussion board topics were positively related to overall performance within the Web supported classes.

Hatcher (2008) also found that accessing the Websites on a regular basis at a fairly high level of activity enhanced learning for both Web-based and Web supported classes. However scores on the discussion boards and scores on group projects did not necessarily relate to students’ overall performance. In either mode the conclusion reached was that the uniqueness of the learning environment and specific activities of a student on the Web were areas that needed to be studied.

**Methodology**

For this study the researchers selected two management information systems (MIS) courses in a traditional 15 week semester in the spring of 2009 which were typical 3 unit courses on a semester basis. Both class sections were completely Web-based and there was no traditional classroom component. However students were welcome to seek assistance via appointments, through e-mail, or during office hours. Both faculty members were on staff full-time so they were frequently available on campus. There was also an open invitation for the online students to sit in on one of the traditional MIS classes if they felt that would be beneficial.

The course content was basically the application of management information systems concepts in a business organization. Topics covered were relatively traditional compared to most other courses of this nature including such things as:

- decision modeling
- databases
- networks
- e-business
- operations management
- supply chain management
- customer relationship management
- project management

The discussion boards and a decision modeling exercise were the two main experiential learning activities that were shared between the two classes.

The learning objectives for each of the two classes sought to increase the student’s understanding of the following information systems concepts:

- Critical success factors;
- The input-process-output model;
- Networking Internet intranet extranet wireless and mobile;
- Competitive advantage;
- Strategies for achieving competitive advantage;
- Competitive Necessity;
• Threats to Competitive Advantage;
• Data dictionaries and critical data;
• Critiques, recommendations, and forecasts for information systems.

Both approaches used various means to enhance the participant’s understanding of each of the specific information concepts outlined above.

A short survey was constructed that could be administered at the end of each of the two selected classes. The 14 questions are shown in Appendix A. The intent of data collection and the subsequent analysis for this study was to determine if differences in treatments (teaching methods) resulted in differences in the perceptions of the participants. To accomplish this analysis a T-Test was considered. However, there was some doubt as to the likelihood of the data conforming to a normal distribution which could provide misleading results in that method. In addition, the data was ordinal in nature. Consequently the nonparametric Mann-Whitney test was utilized. Approach 1 had 42 cases while Approach 2 had 38 cases. In order to facilitate the analysis of the data, the verbal answers were re-coded to integer values to form an ordinal dataset. The groups were identified as approach 1 and approach 2 and this was the grouping variable. There was not any missing data to consider, and the near equality of the sample sizes provided credibility for the analysis. Since the membership in each sample was done through student registrations, it was reasonable to assume that the samples were independent and random. The objective was to determine if the two samples could be considered as belonging to the same population. That is that the two samples have essentially the same distribution. The alternative conclusion would be that the two samples do not have the same distribution and are likely from two different populations.

The results found on questions 3 appeared to warrant further investigation so the first 5 questions were also examined using the Chi-squared test for independence. That led to an interesting result for question 4. Those findings will be discussed later in this paper.

**Hypotheses**

For questions 1 through 5:

Null Hypothesis A: The respondents did not perceive a difference between the two approaches as to the effectiveness for the course design attribute. (Approach 1 and Approach 2 have the same distribution.)

Alternate hypothesis A: The respondents perceived a difference between the two approaches as to the effectiveness for the course design attribute. (Approach 1 and Approach 2 do not have the same distribution.)

For questions 6 through 14:
Null hypothesis B: The respondents did not perceive a difference between the two approaches as to the effectiveness for the specific structure and delivery attribute. (Approach 1 and Approach 2 have the same distribution.)

Alternate hypothesis B: The respondents perceived a difference between the two approaches as to the effectiveness for the specific structure and delivery attribute. (Approach 1 and Approach 2 have the same distribution.)

Data Analysis and Discussions

The re-coded survey data from the two approaches was examined using the nonparametric Mann-Whitney test and the related Wilcoxon test. The results are shown in tables 1, 2, and 3 below. Since the total sample size exceeded 30, the 2-tailed asymptotic significance value was calculated. That value was utilized as the statistic that determined whether to accept or reject the null hypothesis. Based on that determination, the null hypothesis was rejected for questions 1, 2, 4 and 5. In those cases the alternate hypothesis was accepted. For question 3 and questions 6 through 14 the researchers could not reject the null hypothesis.

Table 1: Questions 1 Through 5

<table>
<thead>
<tr>
<th></th>
<th>Q-1</th>
<th>Q-2</th>
<th>Q-3</th>
<th>Q-4</th>
<th>Q-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>602</td>
<td>571</td>
<td>795.5</td>
<td>583</td>
<td>586</td>
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<tr>
<td>Wilcoxon W</td>
<td>1343</td>
<td>1312</td>
<td>1698.5</td>
<td>1324</td>
<td>1327</td>
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<tr>
<td>Z</td>
<td>-2.031</td>
<td>-2.369</td>
<td>-0.027</td>
<td>-2.182</td>
<td>-2.206</td>
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<tr>
<td>Asymp Sig. (2-tailed)</td>
<td>0.042</td>
<td>0.018</td>
<td>0.979</td>
<td>0.029</td>
<td>0.027</td>
</tr>
</tbody>
</table>

Table 2: Questions 6 Through 10

<table>
<thead>
<tr>
<th></th>
<th>Q-6</th>
<th>Q-7</th>
<th>Q-8</th>
<th>Q-9</th>
<th>Q-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>664</td>
<td>761</td>
<td>778</td>
<td>795</td>
<td>789</td>
</tr>
<tr>
<td>Wilcoxon W</td>
<td>1405</td>
<td>1664</td>
<td>1681</td>
<td>1536</td>
<td>1530</td>
</tr>
<tr>
<td>Z</td>
<td>-1.37</td>
<td>-0.389</td>
<td>-0.217</td>
<td>-0.033</td>
<td>-0.095</td>
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<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>0.171</td>
<td>0.697</td>
<td>0.828</td>
<td>0.974</td>
<td>0.924</td>
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</table>

Table 3: Questions 11 Through 14

<table>
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<tr>
<th></th>
<th>Q-11</th>
<th>Q-12</th>
<th>Q-13</th>
<th>Q-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>775</td>
<td>748</td>
<td>725</td>
<td>678.5</td>
</tr>
<tr>
<td>Wilcoxon W</td>
<td>1678</td>
<td>1651</td>
<td>1466</td>
<td>1419.5</td>
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<tr>
<td>Z</td>
<td>-0.239</td>
<td>-0.533</td>
<td>-0.772</td>
<td>-1.316</td>
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<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>0.811</td>
<td>0.594</td>
<td>0.44</td>
<td>0.188</td>
</tr>
</tbody>
</table>
For Questions 1, 2, 4, and 5 the rejection of the null hypothesis would indicate that there is a difference between the perceptions of the students from Approach 1 and those from Approach 2 relative to the course design attributes. In all four of these questions Approach 1 had the higher mean rank, which is to imply that it had a larger number of positive (agree and strongly agree) responses compared to Approach 2. For example the mean rank for question 1 was 45.17 for Approach 1 compared to 35.34 for Approach 2. Similar scores were obtained for the other three questions in this group. Frequency distributions and descriptive statistics also supported this observation where Approach 1 was observed to have a higher mean. Without additional data, this result might be misleading since there is no assurance that the data has a normal distribution.

For question 3 related to safeguards against cheating, the null hypothesis could not be rejected. Consequently, it can be assumed that there is no difference in the two approaches as regards the perceptions of the participants for this question.

In regards to the results from questions 6 through 14, there was no basis to reject the null hypothesis, so the conclusion was that there was no statistical difference in the perceptions of the respondents in Approach 1 from those in Approach 2. These questions were centered on the inclusion of the respective teaching methods and how they were related to the facilitation of learning for the targeted information systems concepts. Examination of the mean ranks seemed to indicate that there were slight preferences for Approach 1 over Approach 2 but not at a statistically significant level. In addition there seemed to be no consistent pattern in the preferences in that Approach 1 was favored slightly in several instances but Approach 2 was ranked higher in others. In several cases the two approaches received an almost identical mean rank. Descriptive statistic supported this observation in a manner similar to the earlier discussions.

**Limitations and Future Research**

A limitation of this study rests in the fact that it was delivered as a component of two fully Web-based courses. Consequently the results cannot be generalized beyond Web-based courses in general and not beyond students at this particular university in the near term. It also cannot be generalized to apply to Web enhanced or Web supported classes and certainly would not apply in comparison to traditional lecture-based classes. The results could be enhanced with additional data collection due to a larger study population. Future plans for the research is to collect data when the schedule permits a similar situation whereby there are two fully Web-based classes by the same two faculty members as presented in this study. Plans are under way to do this as early as schedules permit. Source data, the analytical output, and the assignments from each of the subject approaches are all available upon request.
REFERENCES


**Appendix A:** Survey questions.

1. This course provided me with effective channels for communicating with the professor.
2. The media (e-mail, Blackboard, face-to-face communication, etc.) used in this course for delivering the material were effective.
3. There were sufficient safeguards in administering quizzes and tests to minimize the possibility of cheating and plagiarism.
4. The technological aspects of communication in this course enhanced my learning.
5. The structure and design of this course facilitated my learning of the material.
6. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Critical Success Factors.
7. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of The Input (Controllable, Uncontrollable, and real time), Process, Output, Model.
8. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Networking: Internet, Intranet, Extranet, Wireless and mobile.
9. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Competitive Advantage.
10. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Strategies for achieving competitive advantage.
11. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Competitive Necessity.
12. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Threats to Competitive Advantage.
13. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Data Dictionaries or Critical Data (data, information, and knowledge).
14. The inclusion of any of the following (case study, discussion boards, or group project) enhanced my understanding of Critique, Recommendation and Future of Information Systems.

All the questions were answered as:

<table>
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<tr>
<th>Answers</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>5</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Neutral</td>
<td>3</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1</td>
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</table>