



The Determinants of Web-based Instructional Systems' Outcome and Satisfaction: A Causal Model

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INTRODUCTION

The landscape of distance education is changing. This change is being driven by the growing acceptance and popularity of online course offerings at universities, and in some extreme cases, complete online programs are being offered. *U.S. News and World Report* recently reported that "70 percent of American universities have put at least one course online, and by 2005 that may grow to 90 percent" (Shea & Boser, 2001, p. 44). Further, the growth of 'distance learning' programs gives students a wider choice of schools without regard to location. The trend towards more online offerings may not, and will not, remain only unique to the United States, but is being exhibited internationally.

The primary objective of this study will be to determine what are the primary factors (independent variables) that influence learning outcomes and user satisfaction of online courses (dependent variables). The study aims at determining the level of correlation of those relationships, thus allowing us to make recommendations to online instructors about which factors, if focused on, will yield the greatest results in terms of user satisfaction and perceived learning outcomes. Therefore, this research helps educators manage the critical factors, by maximizing factors with the greatest positive relationship to learning outcomes and user satisfaction. This will help to increase the learning outcome while simultaneously increasing user satisfaction. Ideally, this will allow online instructors, faculty members, department chairs, and computer service departments in learning and teaching institutions, to design, implement, and facilitate online courses in a style that enhances these positive factors.

Furthermore, class surveys and instructor survey assessments could be created around the identified factors where applicable. Thus, creating an assessment tool more closely aligned with the factors that must be positively managed in order to most efficiently implement effective online classes that enhance user satisfaction while delivering quality learning outcomes. Such feedback would be most beneficial to instructors seeking to improve the overall satisfaction and learning outcomes for their online students' semester over semester.

DATA COLLECTION

In an effort to survey students using technology enhanced teaching tools, we focused on students enrolled in online (Web-based courses). An online course can be defined most simply as being a distance education course with no or limited on campus meetings. We collected the email addresses from the student data file archived with every online courses delivered through the online program of a university in the Southeast Missouri area. We used email addresses from all courses taught from fall 1999 through and including the spring 2002 semester. From these, we generated 2,131 unique email addresses. These addresses were the original target group. Valid unduplicated responses numbered 408.

RESEARCH METHOD

This study uses structural equation modeling (SEM), which will allow us to determine if our theoretical model successfully accounts for the actual relationships observed in the survey data. If not, we will reassess the model

and make the necessary adjustments to get the data to fit a given model. SEM is generally applied to latent factors (unobserved) to discover their linear, causal relationships. Each of our latent factors is measured by multiple indicator variables (individual survey question responses) with the general rule being that at least two variables must load on each latent factor. However, most researchers prefer three to four indicator variables, with some believing that the more the better (Marcoulides, 1998).

We attempt to illustrate the casual relationships between the eight latent variables as well as making a determination as to which exogenous factors (independent) influence the endogenous factors and to what degree. For example, the original model has student satisfaction and perceived learning outcome as the endogenous, non-recursive factors. On the other hand, our original model has content, feedback, integration, self-motivation, and learning style as exogenous factors. These are variables that we make no predictions about what influences them, nor are these factors affected by other factors in the model (see Figure 1).

The initial research model is constructed based on the review of the literature (Arbaugh, 2001; Graham & Scarborough, 2001; Jiang & Ting, 2000; Piccoli, Ahmad, & Ives, 2001; Saltzberg & Polysen, 1995)

Model Assessment and Modification

We have specified a tentative initial model. Our goal was to not only find a model that fit the data set well from a statistical point of view, but also had the property that every parameter of the model can be given a substantively meaningful interpretation. The re-specification of each model may be theory-driven or data-driven. We chose the data-driven method to redesign the model. We use the generally weighted least squares (WLS) method as this is the method implemented by LISREL. We examine the correlation matrix to assess possible future model changes and to draw general conclusions.

The correlation matrix is show below.

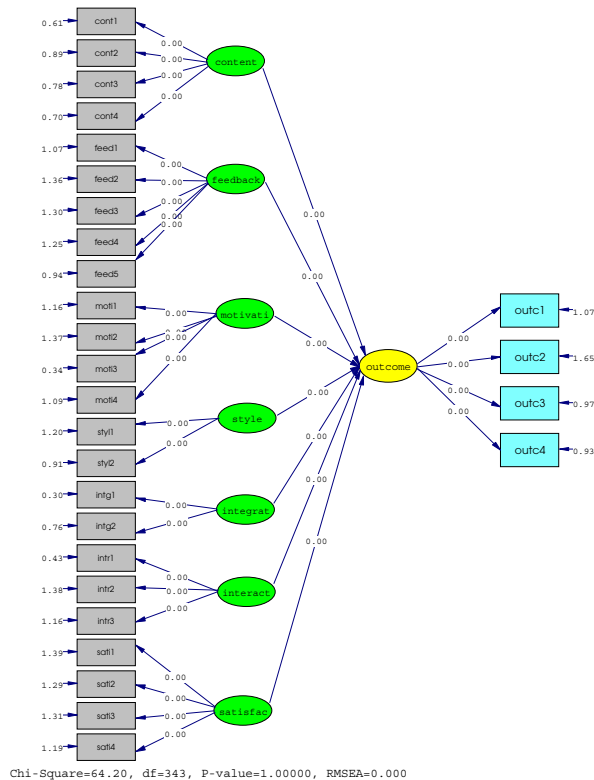
CONCLUSIONS

We are still in the process of refining our model. The better results will be presented at the conference. Several intermediate findings so far will be briefly discussed here. First, several known latent constructs were reaffirmed as being pivotal in the online education process such as content, feedback, interaction,

Table 1. Correlation matrix

| | Satisfaction | Outcome | Interaction | Content | Feedback | Instructor | Motivation | Style |
|--------------|--------------|---------|-------------|---------|----------|------------|------------|-------|
| Satisfaction | 1.000 | | | | | | | |
| Outcome | .885 | 1.000 | | | | | | |
| Interaction | .925 | .716 | 1.000 | | | | | |
| Content | .903 | .735 | .945 | 1.000 | | | | |
| Feedback | .902 | .649 | .985 | .863 | 1.000 | | | |
| Instructor | .954 | .730 | 1.017 | .846 | 1.008 | 1.000 | | |
| Motivation | .997 | .922 | .965 | .861 | .802 | .874 | 1.000 | |

Figure 1. Research model



and motivation. Of these four latent factors, motivation quite possibly was our most underrated factor as we discovered motivation to be the common thread throughout the model as it was significantly correlated to all other factors in our study. In other words, we can draw the conclusion that if all other constructs are in place, but motivation is lacking, then learning outcomes and satisfaction will be adversely affected. Therefore, future research in developing an online education casual model will want to clearly define motivation, possibly into two parts: intrinsic and extrinsic. Furthermore, motivation load upon all other defined factors will need to be examined as we have hypothesized that it will have a significant, direct path loading on all other factors.

Second, the importance of interaction in the learning process needs to be analyzed. The correlations matrix exemplified high levels of correlation between interaction and three other factors: content, instructor input, and feedback. We believe that the interaction factor is the process factor. In other words, all other factors, except satisfaction and outcome, flow through interaction. As many researchers before have proven, we will reaffirm that interaction is a necessary component for online learning just as it is in traditional face-to-face learning environment. Successful online learning has to be more than an individual completing assignments alone and reading materials assigned daily/weekly in a silo setting. Interaction is the pivotal process that facilitates students learning and understanding into a deeper level. Third, we have not conclusively proved that a student's personality and learning style should not be included in future causal models, but we have our doubts. None of our data suggested strong correlations between this factor with any other factors in our model. Furthermore, significant path loadings did not materialize. Our conclusion is that an online student with sufficient motivation will learn regardless of their personality or learning style.

And finally, the construct of instructor input, which became evident late in the research process, appears to bear relevance in the online education process. The premise that the instructor's role decreases in an online environment appears to bear no weight. We believe that strong possibilities exist for the instructor's input to significantly affect motivation and interaction, which are necessary for online learning to occur. It is our final conclusion that the importance of the instructor is as important to online education as it is for traditional classroom settings.

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