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Abstract:

The purpose of this research is to investigate the influence of WebCT Information Technology, students' perceived computer self-efficacy, students' motivation to learn and the degree of course structure on students' academic performance in a totally online class. Web-based teaching becomes increasingly important to institutions of higher education as they strive for a high quality education. An understanding of the factors which drive student success in a web based teaching environment will help future efforts of educators to provide the tools and apply methodologies to further improve student performance. The data for this study is collected from graduate and undergraduate students enrolled in web based Business Computer Information Systems, Decision Sciences and Management courses. The results confirm the positive influence of WebCT Information Technology and the degree of course structure on students' academic performance.

I) *Introduction*:

The past fifteen years have witnessed a dramatic increase in the development of technology-based teaching. Alavi and Leidner (2001) urge researchers to focus on how technology mediated learning environments influence student psychological learning processes and learning outcomes. This will help people in academia to design the most favorable technology mediated learning environments for students' performance and learning. Alavi and Leidner (2001) also state that the number of universities offering distance education programs has increased by thirty-three percent between 1998 and 2001. They suggest that greater breadth and depth of research is needed for problems, which examine any aspect of students' learning mediated by a given technology. The purpose of this research is to investigate how WebCT information technology, the perceived computer self-efficacy of the students, their motivation to learn and the structure of online classes provided by instructors influence students' academic outcomes.

II) *Literature Review:*

Alavi and Leidner (2001) believe that the research question which investigators need to be exploring is how different technology mediated environments influence students' learning outcomes and their psychological learning processes rather than whether a given technology mediated environment improves students' learning outcomes. They propose a framework which creates the need to explore how information technology features and instructional strategy affect indirectly students' learning outcomes mediated by students' psychological learning processes required for knowledge acquisition in a given learning context (see fig.1 in Appendix). Alavi and Leidner (2001) define technology mediated learning as an environment in which the learner's interactions with learning materials, peers and instructors are mediated through advanced information technologies. Alavi (1994) states that the rapidly growing amount of information and knowledge affects all levels of education. At the college level, instructors need to prepare students for continuous learning instead of just transmitting fixed bodies of information. Instructors need to shift their focus to more active forms of instruction, which would lead to challenging students to solve more difficult problems and apply higher order mental skills in the academic environment. Alavi et.al., (1995) compare student performance in a virtual learning environment to that of students in a face-to-face environment. The results show that the two different environments are equally effective for students' knowledge acquisition and that students are equally satisfied with their learning outcomes but students report that the virtual learning environment requires the application of higher critical thinking skills. Alavi (1994) claims that one of the major reasons for failing to actively engage students in the learning process has been the over reliance on the lecture method as a mode of instruction. Syler et.al., (2006) believe that technology

and teaching can be combined for the benefit of students. Hiltz (1996, 1997) found that encouraging collaboration in a virtual environment is key to success and also that only informed and motivated learners can benefit from increased learner control that a class in a virtual environment provides. Hiltz also found that levels of maturity, degree of effort, levels of academic ability and motivation all correlate positively with learning outcomes. Syler et.al. (2006) refer extensively to the study of Alavi and Leidner (2001) as a seminal work in technology-mediated learning research and emphasize that there has not been any study to statistically confirm the positive influence of a specific information technology on students learning outcomes. Syler et.al. (2006) believe that this is a major gap in technology mediated learning research.

II.1) *WebCT Information Technology*

WebCT Inc. is one of the world's leading providers of electronic learning systems. Thousands of colleges and universities in more than seventy countries worldwide are currently utilizing this technology driving teaching and learning away from face-to-face lecture mode (www.webct.com). Gartner Research report (2003) shows that seventy-three percent of the US campuses surveyed, have adopted a standardized electronic learning system and that of those, thirty-eight percent have selected WebCT as their standard electronic learning system. WebCT was the only electronic learning system implemented at the southwestern university at the time data was collected for this study.

II.2) *Structure of Instruction*

Alavi and Leidner (2001) define instructional strategy as the methods and models applied for presenting, sequencing and synthesizing specific academic material content. The authors believe that the more structure is provided by an instructor, the higher the amount of perceived knowledge by students. Alavi and Leidner classify the methods and models which instructors use in two categories. The first category comprises of the more structured methods and models and the second category comprises of the less structured methods and models. Reigeluth et al. (1994) define presentation as the selection, display mode and format of content information. They assert that sequencing is order in which different concepts are presented to learners. Gagne and Briggs (1979) present a comprehensive model for teaching intellectual skills. One of the key characteristics of the model is the perception of a set of structured instructional events by learners, which are designed to elicit their relevant psychological processes.

II.3) *Motivation to Learn*

Yair (2000) finds that students are academically stimulated in instructional units that are authentic, choice driven and demand application of more intense mental skills. These characteristics drive the intrinsic motivation of students to learn. Instructors should motivate students by creating learning environments, which are relevant to students' personal goals and thus are authentic and learning environments, which are challenging and place greater demands on students' skills utilization. Yair (2000) also reports that the structure of instruction is highly correlated to students' intrinsic motivation to learn. Chen and Willits (1998) find that motivation plays a

significant role in the learning outcome. Hiltz and Turoff (1993) claim that students who possess a higher level of intrinsic motivation are more likely to learn in virtual environments than students with lower level of intrinsic motivation.

II.4) *Perceived Self-Efficacy*

Bandura (1986) defines perceived self-efficacy as:

"People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is concerned not with the skills but with the judgments of what one can do with whatever skills one possesses" (p.391).

Bandura (1986) states that perceived self-efficacy has three dimensions- magnitude, strength and generalizability. Compeau and Higgins (1995) find that computer self-efficacy has a significant impact on individuals' expectations of the outcomes of using computers. They define computer self-efficacy as a judgment of one's capability to use a computer. The authors state that the construct of computer self-efficacy is concerned not with past actions of individuals but with judgments of what could be done in the future. The computer self-efficacy construct has the same three dimensions as the construct of perceived self-efficacy as defined by Bandura (1986).

II.5) *Academic Outcomes*

Alavi and Leidner (2001) define academic outcomes as the successful acquisition of knowledge and the capability to take action or perform. The researchers suggest that besides academic outcomes, satisfaction outcomes with the technology mediated learning experience need to be studied. The author of this study has operationalized students learning outcomes as the students' academic performance in an online class compared to their performance in a face-to-face class and as their perceived satisfaction with the knowledge acquired in an online class.

The constructs of this research fit into the proposed framework of Alavi and Leidner (2001- see figure 1 in Appendix). The construct of students' motivation to learn fits into the psychological learning processes discussed in their framework (pp.4-6). The constructs of WebCT information technology and structure of instruction fit into the information technology and instructional strategy boxes of that framework (p.6). Syler et.al. (2006) discuss the construct of perceived self-efficacy as an important antecedent of student learning outcomes and usage of web tools. The researchers suggest that computer self-efficacy is a relevant construct to be studied in a virtual learning context (p.55). This research study addresses the suggestion for greater depth of technology mediated learning research by Alavi and Leidner (2001) via posing the question of how WebCT information technology influences students' learning in a totally web based environment. This paper also addresses the suggestion for greater breadth of technology mediated learning research by Alavi and Leidner (2001) by investigating how WebCT information technology affects students' learning processes at different academic levels -- both undergraduate and graduate students are subjects of this study.

III) *Research Objectives and Hypotheses*:

The major research objective of this study is to investigate the influence of WebCT information technology, structure of course instruction, students' perceived computer self-efficacy and students' motivation to learn on students actual performance in a web based class. The construct of perceived computer self-efficacy is not explicitly recommended in the research framework of Alavi and Leidner (2001- see fig.1 in Appendix) but Syler et.al (2006) suggest that it can enrich our understanding of students' academic performance in a web based learning environment.

III.1) *Research Hypotheses*

Following the suggestion of the research framework of Alavi and Leidner (2001- see fig.1 in Appendix) and the recommendations of Syler et.al (2006), the following research hypotheses are stated:

Hypotheses:

H1: There is a direct and positive relationship between level of course structure and students' academic performance in a fully web based course.

H2: There is an indirect and positive relationship between level of course structure and students' academic performance in a fully web based course.

H3: There is a direct and positive relationship between students' motivation to learn and students' academic outcomes in a fully web based course.

H4: There is a direct and positive relationship between students' perceived computer self-efficacy with WebCT information technology and students' academic outcomes in a fully web based course.

Compeau and Higgins (1995) hypothesize and confirm that the higher the computer self-efficacy of an individual the higher his or her outcome expectations. Their subjects are Canadian managers and professionals.

H5: There is a direct and positive relationship between level of course structure and students' motivation to learn.

Yair (2000) finds in his study of the influence of structure of instruction on students' learning experiences that the motivation of the subjects to learn, is significantly correlated to the structure of instruction provided to them.

IV) *Research Design*:

The research methodology of this study is an online questionnaire. Students can access a link posted on their respective course website that leads them to the online questionnaire, which consists of 34 items. The author of this study used Web Surveyor software to collect the data online. The online questionnaire was created in Web Surveyor and students completed the questionnaire using the Web Surveyor

software. Both undergraduate and graduate students were included as subjects in this study and they were different majors and were taking online classes in different departments at the College of Business Administration of a southwestern university. Thus the author of this study follows the recommendations of Alavi and Leidner (2001) for selecting an appropriate sample for technology-mediated learning research.

IV.1) *Subjects*

At this point of time the total number of subjects, who are undergraduate and graduate students in a business computer information systems class, a decision science class and a management class, is 111. There were 109 valid responses received for a response rate of 98.18%. The author used students as a convenience sample but also he spent additional efforts to secure responses from students from different departments from the College of Business Administration. The courses were taught by different instructors.

IV.2) *Measures*

The construct of computer self-efficacy is measured by a ten-item instrument borrowed from Compeau and Higgins (1995). It is modified and tailored to WebCT technology in particular since the influence of this advanced information technology on students' learning outcomes is of major interest to the authors of this study. Compeau and Higgins (1995) find that the ten-item instrument measuring computer self-efficacy satisfies the major conditions for discriminant and nomological validity. The construct of motivation to learn is measured by a six-item questionnaire borrowed from Yair (2000). The construct of course structure is measured by a seven-item, self- developed instrument, which attempts to follow the suggestions of Alavi and Leidner (2001, p.6) for the instructional strategy construct. The items measure students' perceptions of the instructors' methods to present, create sequence and synthesize subject matter content.

Finally, the dependent measure which is the construct of students' learning outcomes is measured by a three-item self developed instrument which incorporates the recommendations of Alavi and Leidner (2001, p.6) that students affective reactions towards technology mediated learning, their knowledge acquisition and their actual course performance are important dimensions of the learning outcomes construct.

V) *Data Analysis* :

The author used multiple regression procedure to test the simultaneous influence of the hypothesized independent variables on students' academic outcomes and to validate the stated hypotheses. The authors tested the mediating roles of perceived computer self- efficacy and students' motivation to learn on the relationship between level of course structure and students' academic outcomes with the procedure recommended by Baron and Kenny (1986). The following results were obtained after analysis of the 109 subjects:

Table 1
Results:

Hypotheses	Standardized Beta Coefficients	Significance	R Square	Results
H1	0.399	0.0001	.073	Confirmed
H2	0.17	0.022	.615	Confirmed
H3	0.76	0.0001	.615	Confirmed
H4	0.63	0.0001	.615	Confirmed
H5	0.674	0.0001	.260	Confirmed

From the above table, it can be noted that all five hypotheses were confirmed. This supports the findings of Compeau and Higgins (1995) and Yair (2000) concerning the positive influence of perceived computer self-efficacy and level of course structure on students' learning outcomes and their motivation to learn respectively. One of the major contributions of this study is that it confirms the mediating role of perceived computer self-efficacy with WebCT technology and student motivation to learn on the relationship between WebCT course structure and student learning outcomes thus confirming the relationships and their respective causality of the theoretical framework of Aalvi and Leidner (2001- fig.1) . Another major contribution of this study is the statistical confirmation of the positive influence of a specific technology on students' academic performance in a web based learning environment which is cited as a major gap in technology-mediated learning research (Syler et.al., 2006). This finding is consistent with the research framework of this paper (see fig.2 in appendix) derived from the model of Alavi and Leidner (2001). The subjects are undergraduate and graduate college students from different departments within the College of Business Administration. Thus, this paper addresses the recommendations of Alavi and Leidner about breadth and depth of technology mediated learning research. The findings also determine the positive influence of the students' motivation to learn in a fully web-based course on their academic outcomes.

Table 2:
Reliability Analysis:

Factor	Number of items	Cronbach's Alpha
Course Structure	7	0.903
Perceived Computer Self-Efficacy with WebCT	11	0.864
Student Motivation	6	0.864
Student Academic Outcomes	3	0.760

The reliability analysis table demonstrates that all constructs have a sufficiently high reliability since their Cronbach's Alpha values are above the critical cutoff value for being acceptable of 0.7 as stated by Nunnaly (1978).

Table 3:
Cronbach's Alpha if Item Deleted:

Course Structure Items	Cronbach's Alpha if Item Deleted	Perceived Computer Self-Efficacy with WebCT Items	Cronbach's Alpha if Item Deleted
CS1	.888	CSE1	.852
CS2	.884	CSE2	.861
CS3	.885	CSE3	.842
CS4	.893	CSE4	.850
CS5	.866	CSE5	.836
CS6	.871	CSE6	.863
CS7	.895	CSE7	.841
		CSE8	.846
		CSE9	.853
		CSE10	.839
		CSE11	.849
Student Learning Outcome Items	Cronbach's Alpha if Item Deleted	Student Motivation to Learn Items	Cronbach's Alpha if Item Deleted
SAO1	.687	SM1	.843
SAO2	.649	SM2	.829
SAO3	.730	SM3	.815
		SM4	.814
		SM5	*.881*
		SM6	.850

The cronbach's alpha if item deleted table demonstrates that all items are reliable measures of the course structure construct, the perceived computer self-efficacy with WebCT construct, the student academic outcome construct and the student motivation construct. All the values in the cronbach's alpha if item deleted are lower than the cronbach's alpha for the construct they measure and therefore it can be concluded that all items measure their respective construct. The only item that needs to be dropped is SM5 which cronbach's alpha if item deleted value is higher than the cronbach's alpha for the student motivation dimension. The multiple regression procedure excluded that item from the analysis.

The correlation matrix analysis (figure 3 in appendix) shows that the intra-item correlations are higher than the inter-item correlations for all independent variables and the dependent variable in the model. This evidence affirms the convergent and discriminant validity among all constructs in the research framework of this paper.

VI) Limitations:

The findings of this study are limited by the use of cross-sectional survey data. This limitation can be resolved by future longitudinal and experimental studies. The cross-sectional survey data limits our ability to make conclusive statements about causality among constructs in this study since alternative explanations may be deemed plausible. This kind of limitation is discussed by Compeau and Higgins (1995, p.205). The authors intend to address the aforementioned limitation by continuing to collect data via refined online questionnaires in future academic semesters at the southwest public university. Data collected at different points of time will address this limitation.

VII) Conclusion:

The major purpose of this research is to study the influence of WebCT information technology, structure of instruction, students' motivation to learn and perceived students' computer self-efficacy with WebCT information technology on the students academic outcomes in a fully web-based learning environment. The final results support belief that WebCT information technology, the level of course structure provided by the instructor and students' motivation to learn has positive influence on actual students academic outcomes. The intent of the author is to follow the research suggestions of Alavi and Leidner (2001) for attaining greater depth and breadth in studying students academic outcomes in technology mediated learning environments by continuing to collect data from undergraduate and graduate students from different departments which will allow a structural equation modeling test in the future that can give further validity to the results in this study derived by multiple regression testing procedure.

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Figure 1:
Framework for Technology Mediated Learning Research:

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┌──────────────┐
│ Instructional│
│ Strategy     │──────┐
└──────────────┘      │      ┌──────────────┐         ┌──────────────┐
      ↕                └────→ │ Psychological│         │ Learning     │
┌──────────────┐             │ Learning     │───────→ │ Outcomes     │
│ Information  │──────────→  │ Processes    │         │              │
│ Technology   │             └──────────────┘         └──────────────┘
└──────────────┘
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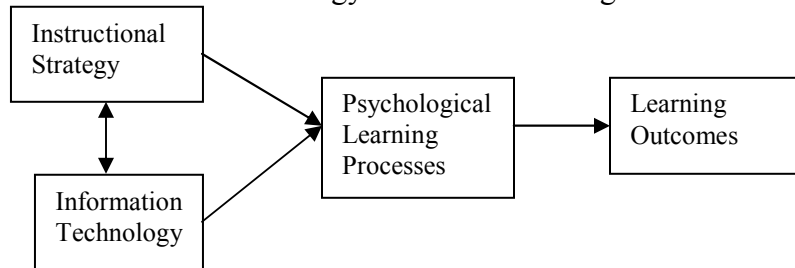
Alavi and Leidner (2001)

Figure 2: Research Framework:

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                        ┌──────────────┐
                        │ Students     │
                        │ Motivation to│
                        │ Learn        │
┌──────────────┐   ┌──→ └──────────────┘ ──┐      ┌──────────────┐
│ Course       │   │                        └───→ │ Learning     │
│ Structure    │──→┤                              │ Outcomes     │
│ provided by  │   │                        ┌───→ │              │
│ the Instructor│  └──→                      │    └──────────────┘
└──────────────┘        ┌──────────────────┐│
                        │ Students Perceived││
                        │ Computer Self-    ││
                        │ Efficacy with WebCT│
                        │ Information        │
                        │ Technology         │
                        └──────────────────┘
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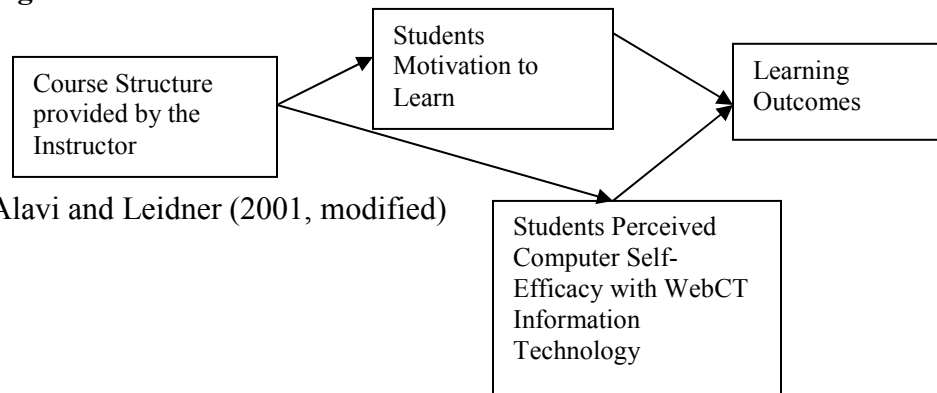
Alavi and Leidner (2001, modified)

Figure 3: Correlation Matrix of Independent and Dependent Variables:

	CS1	CS2	CS3	CS4	CS5	CS6	CS7	SM1	SM2	SM3	SM4	SM5	SM6	CSE1	CSE2	CSE3	CSE4	CSE5	CSE6	CSE7	CSE8	CSE9	CSE10	CSE11	SAO1	SAO2	SAO3
CS1	1.00																										
CS2	0.62	1.00																									
CS3	0.53	0.51	1.00																								
CS4	0.58	0.49	0.60	1.00																							
CS5	0.62	0.70	0.62	0.66	1.00																						
CS6	0.55	0.65	0.62	0.51	0.74	1.00																					
CS7	0.41	0.51	0.44	0.25	0.63	0.73	1.00																				
SM1	0.52	0.59	0.43	0.48	0.73	0.55	0.50	1.00																			
SM2	0.45	0.50	0.35	0.36	0.61	0.48	0.38	0.74	1.00																		
SM3	0.24	0.19	0.16	0.22	0.43	0.37	0.26	0.53	0.61	1.00																	
SM4	0.24	0.14	0.12	0.20	0.40	0.32	0.24	0.51	0.60	0.92	1.00																
SM5	0.11	0.10	0.13	0.03	0.09	0.01	0.03	0.20	0.23	0.40	0.47	1.00															
SM6	0.32	0.56	0.33	0.40	0.56	0.45	0.31	0.66	0.68	0.43	0.44	0.31	1.00														
CSE1	0.35	0.31	0.15	0.22	0.44	0.33	0.30	0.54	0.42	0.55	0.60	0.37	0.40	1.00													
CSE2	0.31	0.21	0.12	0.15	0.39	0.35	0.36	0.55	0.41	0.55	0.59	0.34	0.32	0.74	1.00												
CSE3	0.24	0.23	0.13	0.11	0.27	0.20	0.15	0.42	0.28	0.38	0.43	0.23	0.23	0.59	0.69	1.00											
CSE4	0.11	0.19	0.10	0.04	0.04	0.12	-0.02	0.26	0.16	0.21	0.20	0.18	0.08	0.24	0.15	0.42	1.00										
CSE5	0.21	0.24	0.14	0.14	0.19	0.23	0.08	0.30	0.13	0.09	0.18	0.17	0.25	0.37	0.19	0.34	0.33	1.00									
CSE6	0.09	-0.03	-0.03	-0.17	-0.11	-0.04	-0.01	-0.02	-0.12	-0.08	-0.06	-0.05	-0.17	-0.04	-0.18	0.04	0.48	0.42	1.00								
CSE7	0.18	0.15	0.08	-0.01	0.09	0.18	0.10	0.22	0.08	0.19	0.26	0.06	0.18	0.33	0.24	0.49	0.23	0.67	0.34	1.00							
CSE8	0.21	0.05	0.05	-0.01	0.00	0.07	0.00	0.25	0.24	0.12	0.18	0.08	0.14	0.33	0.45	0.51	0.23	0.44	0.14	0.55	1.00						
CSE9	0.10	0.03	0.09	-0.02	-0.02	0.03	0.08	0.05	-0.07	0.01	-0.03	0.08	-0.10	0.00	-0.15	0.14	0.54	0.48	0.75	0.43	0.27	1.00					
CSE10	0.22	0.20	0.26	0.08	0.09	0.22	0.12	0.33	0.23	0.20	0.18	0.04	0.21	0.30	0.08	0.36	0.50	0.77	0.43	0.55	0.53	0.61	1.00				
CSE11	0.06	0.07	0.05	0.04	0.15	0.25	0.10	0.31	0.28	0.58	0.61	0.23	0.26	0.42	0.49	0.56	0.28	0.38	0.15	0.40	0.42	0.17	0.33	1.00			
SAO1	0.09	0.14	0.02	0.11	0.10	0.14	0.03	0.38	0.41	0.57	0.61	0.25	0.24	0.28	0.33	0.39	0.27	0.43	0.23	0.41	0.41	0.26	0.37	0.60	1.00		
SAO2	0.39	0.46	0.25	0.30	0.42	0.49	0.27	0.64	0.68	0.59	0.59	0.15	0.56	0.57	0.40	0.55	0.39	0.52	0.10	0.47	0.34	0.22	0.56	0.58	0.60	1.00	
SAO3	0.16	0.00	0.03	0.02	0.10	0.07	0.10	0.30	0.34	0.32	0.40	0.12	0.22	0.40	0.34	0.41	0.15	0.45	0.23	0.33	0.39	0.28	0.36	0.43	0.49	0.53	1.00

CS- Course Structure; SM- Student Motivation to Learn; CSE- Computer Self-Efficacy with WebCT; SAO- Student Academic Outcomes