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Predicting Student-Perceived Learning Outcomes and Satisfaction in ERP Courses: An Empirical Investigation

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Abstract:

This article uses the Unified Theory of Acceptance and Use of Technology model (UTAUT) as the basis for the research framework to examine factors that influence student-perceived learning outcomes and satisfaction in enterprise resource planning (ERP) courses. Antecedent variables considered are student attitude, performance expectancy, effort expectancy, training (hands-on), course structure, and perceived instructor knowledge. A Structural Equation Model (SEM) using LISREL was employed to test the measurement and structural models using a convenience sample of 102 students enrolled in ERP courses. The results showed that student attitude had the largest significant direct impact on student-perceived learning outcomes and satisfaction. Effort expectancy and performance expectancy had significant direct impacts on attitude. Course structure and training (hands-on) had indirect effects on attitude through effort expectancy and performance expectancy. The findings suggest that, in order to impact student attitude and, thus, impact their perceived learning outcomes and satisfaction, instructors should emphasize the importance of learning about ERP systems and should provide clear directions so that students experience a meaningful interaction with ERP systems. Implications for practitioners and educators are reported.

Keywords: enterprise-wide systems, user-based learning, ERP instruction, ERP education

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I. INTRODUCTION

Enterprise Resource Planning (ERP) systems are defined as integrated Information Systems that optimize business processes and transactions in a corporation by incorporating best practices and a single database. While larger enterprises initially led the way with ERP implementations, small to mid-size enterprises (SMEs) are now adopting ERP systems to reap the benefits of best practices and integrated software. With the widespread adoption of ERP systems "in medium and large-sized organizations, there is increasing demand for students who know how to work with such systems" [Strong et al., 2006].

As mentioned, ERP systems are integrated systems. When implemented in their entirety, they can replace most legacy systems and provide one-stop-shopping for customers as well as a unified view of the data for a corporation and its supply chain. No longer will a customer be routed from one department or person to another to receive answers to questions such as "Where is my order?" and "Has my refund been processed?" Because ERP systems use one database for all processes, it is possible for one person in an organization to answer questions about a current order, a past order, a return, a refund, a payment, a discount, a bill, and a production schedule. Through the use of an ERP system that includes supply-chain functionality, suppliers can determine how much of which materials and products they need to send an enterprise without the enterprise placing the order. Large enterprises and SMEs alike are able to realize the benefits of ERP systems.

With more and more organizations implementing ERP systems, it falls to those of us in the academy to prepare our students for working in an ERP environment. The content of an ERP course should include explanation of and hands-on experience with key business processes in the ERP course [Nelson, 2000]. "Regardless of the software used, the course content should be a blend of information about ERP and hands-on experiences" [Lane, 2009]. One of the most fundamental concepts for a student (and employee) to grasp is that implementing ERP is not a technical exercise; it is a business strategy that involves all units in the enterprise. "A successful ERP implementation must be managed as a program of wide-ranging organizational change rather than as a software installation effort" [Hammer, 1999]. If an ERP implementation is handled as a software initiative, there will be disastrous consequences [Hammer, 1999]. The term *joint IT competence* was introduced to suggest that when IT departments and end-users integrate their IT competence, they both have increased user satisfaction [Davis et al., 2009]. It is up to us in the academy to help our students understand such concepts.

Of the 449 ERP articles reviewed by Esteves and Bohorquez [2007], thirty-five were categorized as "Education" articles; of the thirty-five articles, eighteen were devoted to the use of ERP in education, ten on how to change the IS curricula to incorporate ERP systems, and seven on ERP courses. Moon [2007] reviewed 313 ERP articles published between 2000 and May 2006. In his review, he determined that only eighteen of the 313 ERP articles had an education theme. The eighteen articles with an education theme focused on integrating ERP in the curriculum or using ERP to teach another concept. Most of the articles [e.g. Fedorowicz et al., 2004] call for additional research including field and experimental research. One study [Chen et al., 2009] cites the lack of empirical assessment of ERP learning effects and pedagogy differences as motivation for their research that presents and reports a pilot study with twenty usable responses on a model for empirical assessment of ERP learning effects. They examined the relationship of three factors, attitude toward behavior, subjective norm, and perceived behavioral control with the intention to learn ERP and measured for two cognitive styles: intuition and analysis [Chen et al., 2009].

It is important to understand the factors that lead to student learning outcomes and satisfaction in ERP courses so that instructors can facilitate student learning of ERP concepts and systems. Sager et al., [2006] tracked graduates from their College of Business and found that students graduating with an extensive ERP background consistently obtained higher salaries than students without this background. The authors' Information Systems advisory council, shared that graduates with a basic understanding of ERP concepts and systems will have a competitive advantage over those who do not have such an understanding when entering the workforce. Understanding the factors that lead to student learning outcomes and satisfaction in ERP courses will assist instructors in both colleges/universities and enterprises in which ERP implementation projects are taking place. Instructors will use this information as they formulate and refine curriculum that focuses on or includes ERP concepts and systems. Likewise, enterprises will use this information as they prepare training as part of their ERP implementation projects. In this article, a conceptual model that depicts the factors that affect student learning outcomes and satisfaction in ERP courses was developed and tested.

The article is organized as follows: In the next section, we briefly review relevant literature. The hypotheses to be tested are presented with this review. The research methods section addresses the instrument development, data collection, and statistical techniques. This is followed by the data analysis section. The results of the hypotheses are presented next. A discussion of the results and the conclusions reached from this investigation are provided. Finally, the study limitations and future research possibilities are reported in the last section.

II. LITERATURE REVIEW AND HYPOTHESES FORMULATION

A great deal of research has been conducted on the topic of ERP implementation and critical success factors. Of 313 ERP articles published between 2000 and May 2006, 150 articles were about implementation or critical success factors [Moon, 2007]. Since that time numerous other articles [e.g. Wenrich, 2009; Francoise et al., 2009; and Law and Ngai, 2007] have extended the research on these same topics. While these studies are excellent to use as discussion points in the classroom, they do not relate directly to academia and the factors that lead to student learning outcomes and satisfaction in ERP courses. The lack of current empirical studies concerning factors critical to successfully teaching ERP inspired us to explore this subject further. We focused our study on factors that influence student learning outcomes and satisfaction in ERP courses which include a blend of concepts and hands-on exercises.

This study uses two models used in previous research. The primary model used in this study was the Unified Theory of Acceptance and Use of Technology model (UTAUT) adapted from Venkatesh et al. [2003]. The UTAUT model was built on the premise that an individual's attitude/intention toward a behavior influences their actual performance. Since students must use a particular type of ERP system, attitude is the main factor in our model that influences their learning outcomes and satisfaction. As suggested by Venkatesh et al. [2003], we identified external variables to be addressed in our model. Our conceptual model includes variables from the model of Eom et al. [2006] that takes into account human and design components such as instructor knowledge, student learning style, and course structure, which impact student learning outcomes and satisfaction. The following research model depicted in Figure 1 is proposed. The literature review and hypotheses follow the model.

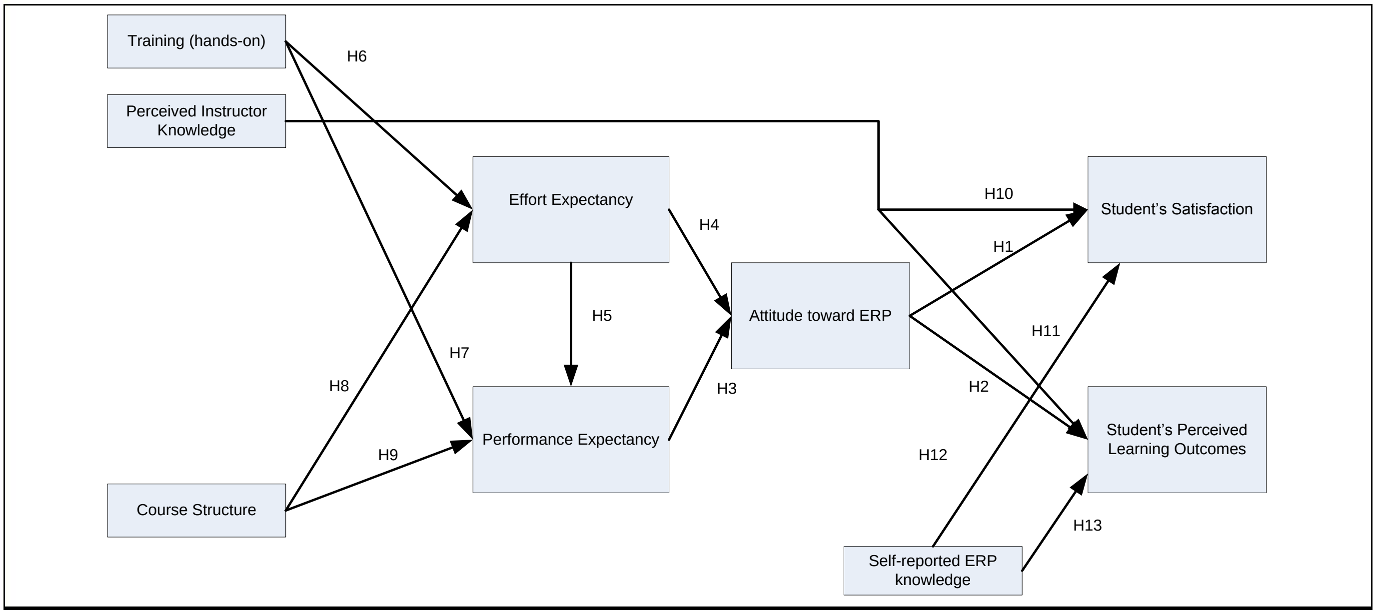

Figure 1. The Proposed Research Model

Student-Perceived Learning Outcomes (LO) and Satisfaction (SS)

If students are successful in a course, they have increased their knowledge. Instructors are also hopeful that they are satisfied with the quality of the learning experience. Both perceived learning outcomes and satisfaction were used as dependent variables in a study about online education [Eom et al., 2006]. In this study, the variable student-perceived learning outcome is based on how well the students expect they have done in the overall ERP course and on their project in the ERP course. Student satisfaction is measured in terms of the perception the students have of the quality of the learning experience in their ERP course, their enjoyment of the course, and if they would recommend the course to other students who want to learn about ERP systems.

Attitude (AT)

Attitude will be the main factor that influences the way a student learns and uses technology in a mandatory setting. It should be realized that attitude is a critical factor because it represents the degree to which users are satisfied with the system [Brown et al., 2002]. Attitude has been shown to correlate strongly with usage behavior [Mathieson, 1991; Brown et al., 2002; and Benedetto et al., 2003].

Ajzen and Fishbein [1980] define *attitude* as "the person's judgment that performing the behavior is good or bad." Venkatesh et al. [2003] state that "attitude toward using technology is defined as an individual's overall affective reaction to using a system," and after examining different constructs, reported they all "tap into an individual's liking, enjoyment, joy, and pleasure associated with technology use." Diminished attitudes can result in destructive behaviors from students, which may affect their learning outcomes and satisfaction with the class. For example, ERP systems can be integrated into class activities, but it may not be used or learned by students if they have a negative attitude toward the system. Thus, it is posited that:

H_1: A student with a positive attitude toward the ERP system will have a higher level of satisfaction.

H_2: A student with a positive attitude toward the ERP system will have a higher level of perceived learning outcomes.

Effort Expectancy (EE) and Performance Expectancy (PE)

The UTAUT model theorizes that effort expectancy (EE), performance expectancy (PE), social influence, and facilitating conditions are the key determinants of intention and usage. Additionally, the model includes the four moderator variables of gender, age, experience, and voluntariness of use. Effort expectancy (EE) is defined as "the degree of ease associated with the use of the system" [Venkatesh et al., 2003]. Performance expectancy (PE) is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" [Venkatesh et al., 2003]. Since the content of the ERP course involves hands-on activities, students who perceive the ERP system as easy to use and helpful in improving their understanding and performance will most likely develop positive attitudes toward the ERP system, perform better, and be more satisfied with the course. It has been suggested by researchers [Davis et al., 1989; Teo et al., 1999; and Venkatesh and Morris, 2000] that EE has an indirect impact on attitude through PE. Therefore, a link was established between EE and PE. In this study, the authors posit the following hypotheses:

H_3: Performance expectancy (PE) has a positive effect on student attitude (AT) toward the ERP system.

H_4: Effort expectancy (EE) has a positive effect on student attitude (AT) toward the ERP system.

H_5: Effort expectancy (EE) has a positive effect on the performance expectancy (PE) of the ERP system.

The Impact of External Variables

The UTAUT model as well as the extended model (known as TAM2) by Venkatesh and Davis [2000] were extensions to the original technology acceptance model (TAM) [Davis, 1989]. These extended models suggest the inclusion of external variables that might directly or indirectly impact the main components of the original technology acceptance model. In this study, training (hands-on), course structure (design and content), and perceived instructor knowledge are considered as external variables.

Training (Hands-On) (TR)

To create a positive attitude about ERP courses, it is important to make sure that students understand how the ERP course is going to help them to be more productive and effective in their education and jobs in the future. This is especially true in a mandatory setting like a classroom, where the usage of a particular system is required. Even if the perceived impacts of performance expectancy and effort expectancy are not significant, the technology must still be used. As a result, negative attitudes develop [Alshare, 2009; Brown et al., 2002]. Proper training (hands-on activities) is a key to overcoming this problem. If the instructor devotes an appropriate amount of time for hands-on exercises and lab sessions, then the ERP system will appear to the students to be more useful and easier to learn. If that is the case, then the students will want to use the software, which will improve their attitudes toward the ERP system. Thus the following hypotheses are proposed:

H_6: Training (hands-on) (TR) has a positive effect on the EE.

H_7: Training (hands-on) (TR) has a positive effect on the PE.

Course Structure (Design and Content) (CS)

The content and the design of the instructions related to the ERP course affect effort expectancy (EE) and performance expectancy (PE). If students feel that instructions are not easy to follow and understand, then they will develop negative attitudes toward the course and, thus, they will not be satisfied, nor will they perform well in the course. On the other hand, if the instructor uses effective ways of delivering instruction by clearly stating course objectives and expectations and by organizing the course content into logical components, then student satisfaction will increase [Eom et al., 2006]. Additionally, the ERP system will appear to be more useful and easier to learn and use by the students, which will improve their attitudes toward the ERP system and the course. The following hypotheses are proposed:

H_8: Students' perception of the course structure (design and content) (CS) has a positive effect on the EE.

H_9: Students' perception of the course structure (design and content) (CS) has a positive effect on the PE.

Perceived Instructor Knowledge (PIK)

Leidner and Jarvenpaa [1995] describe several learning models, including objectivism and its primary competing model, constructivism. The objectivist model of learning is usually the primary method used in the lecture classroom. The goal of the objectivist model of learning is the transfer of knowledge from instructor to students. In the constructivism model of learning, learner-centered instruction is the focus; knowledge is then gained by each learner [Leidner and Jarvenpaa, 1995]. The courses in this study focused on transfer of knowledge from instructor to students when discussing concepts and covering the technical component; the students relied heavily on the instructors' knowledge. Therefore, the courses used in this study primarily used the objectivism method. Accordingly, we suggest that if the instructor is perceived to have a high level of knowledge of the subject, students will be very satisfied and might display a high level of learning outcomes in the course.

H_{10}: Perceived instructor knowledge (PIK) will have a positive effect on student satisfaction.

H_{11}: Perceived instructor knowledge (PIK) will have a positive effect on perceived learning outcomes.

Control Variable

In this study student self-reported knowledge about ERP systems was examined as a control variable that might influence student-perceived learning outcomes and satisfaction. It was found that an individual's intention to use technology could be influenced by their knowledge of and experience with using the technology [Moon and Kim, 2001; Pijpers, 2001]. Thus, students with more knowledge of and experience with ERP systems would be more likely to be satisfied and perform well in ERP courses.

H_{12}: Self-reported ERP knowledge will have a positive effect on student satisfaction.

H_{13}: Self-reported ERP knowledge will have a positive effect on perceived learning outcomes.

III. RESEARCH METHODS

Instrument Development

The survey questionnaire consisted of two sections. The first section requested various types of demographic information, including gender, classification, and discipline, among other variables. The second section included student perception regarding factors that influenced their perceived learning outcomes and satisfaction in their ERP course such as attitude, performance expectancy (PE), effort expectancy (EE), perceived instructor knowledge (PIK), course structure (CS), and training. Items for the student-perceived learning outcomes (LO), PIK variables, self-reported knowledge about ERP systems, and training were developed by the authors. Items for the attitude, PE, and EE variables were adapted and modified from Venkatesh et al. [2003]. Items for the CS, and student satisfaction (SS) variables were adapted and modified from Eom et al. [2006]. The survey instrument was developed, tested, reviewed for content as well as readability, and modified accordingly. Participants responded to statements on a seven-point Likert scale, which ranged from strongly disagree (1) to strongly agree (7). The list of scale items is included in the Appendix.

Data Collection and Statistical Techniques

The survey questionnaire was administered to all students who were enrolled in three different but similar ERP courses at two Midwestern universities in the United States during the spring and fall semesters of 2009. The two instructors in the two universities had team taught together previously and used similar teaching materials and methods in the courses. The courses were similar and included both ERP concepts and hands-on experiences. ERP concepts discussed included the impacts of implementing an ERP system in a company, what it means to implement an integrated system, and change management techniques. The courses were structured to highlight the integrated nature of ERP. Students who took the courses understood that they could eventually be a member of an ERP implementation team sometime in their careers. It was made very clear to the students that ERP implementations that fail are perceived by those implementing them to be Information Systems projects; those that succeed are perceived to be enterprise-wide projects that impact the entire enterprise and require business processes to be examined and usually changed in an organization. Students in the courses also explored ERP implementation failures and discussed the issues involved.

The hands-on component of the courses was required and used SAP as the ERP system. Students were required to use the sales order process, production process, and purchasing process. In all courses, the students ran a fictitious company. Exercises led the students through a series of labs that required them to explore and create various organizational and master data information of the company. The labs also led them through the various processes (sales, production, and purchasing) step-by-step with an example. They then completed a related assignment in SAP. To help with the learning experience, the instructors provided moral support and used the technique of helping the students by asking questions about where they were in the process, what had happened thus far, what had happened that they didn't expect, and so on, to guide the students to solutions. After the material and processes in the SAP modules mentioned above had been covered, the students completed a project in which they performed all of the processes they had used thus far in SAP a third time to solve a make-or-buy business problem.

The survey was distributed to the students during the last week of class. Although completing the survey was optional, all students completed the survey. To ensure anonymity, students returned the surveys to one of the co-authors who did not teach the class. SPSS and LISREL software packages were used to carry out the analysis. SPSS was used to compute frequencies, means, standard deviation, reliability coefficients, and principle component analysis. A confirmatory factor analysis (CFA) approach was taken with LISREL to validate the factor loadings identified in the principle component analysis. This validation was conducted in the form of a measurement model. A structural model was then run to test the research model and hypotheses.

IV. DATA ANALYSIS

All students (102) in the three courses completed the survey. Of the sample, 67 percent were male. About 73 percent were graduate students. Thirty-nine percent were general MBA students, 24 percent were Information Systems majors, and 37 percent were other majors. Approximately 19 percent of the students indicated that they had previously used an ERP system. Additionally, only 4 percent reported that they had taken an ERP course before.

Measure of Constructs' Reliability and Validity

Reliability and validity of the measures were assessed by following these steps from King and Flor [2008].

1. Factor analysis was performed on all items that measure the model constructs. Principle component analysis with varimax was used.

2. Based on the initial factor analysis, constructs with eigenvalues greater than 1 were retained.

3. Only items with loadings of at least 0.50 were retained [Hair et al., 2006].

4. Items with loadings greater than 0.50 on two or more constructs were investigated thoroughly.

5. The above process was repeated until a stable measurement model was reached.

6. The corrected item-total correlation was computed for each item using only the items belonging to the same construct. The minimum acceptable value is 0.5 [Hair et al., 2006].

7. Cronbach's Alphas was computed for each construct. An item was dropped if the deletion of that item significantly increased reliability. Generally, reliability coefficients of 0.70 or higher are considered acceptable [Nunnally, 1978].

8. The SEM package LISREL 8.80 was used for conducting the CFA. Factor loadings were checked against the guidelines provided by Comrey and Lee [1992]. Four fit indices were used to assess the goodness of fit for both the measurement and structural models. The first three indices, the Normed Fit index (NFI), Non-Normed Fit Index (NNFI), and Comparative Fit Index (CFI), were expected to exceed .9 to indicate good fit. The fourth

index, the Root Mean Square Error of Approximation (RMSEA), should be less than .08 [Hu and Bentler, 1999]. At least three of the four fit indices should meet these standards to accept the models.

The results of the assessment of the reliability and validity of measures are reported in Tables 1 and 2. Twenty-three items were submitted to the process in steps 1–7 as described above. As a result three items were dropped either because they loaded on two constructs with loadings above 0.50 or dropping them significantly improved reliability. The results are shown in Table 1. The overall measurement model explains 78.51 percent of the variance. All items demonstrated corrected item-total correlations above the 0.65 level. Cronbach's Alphas for all constructs are above 0.80. The results of the CFA, using SEM for the measurement and structural models, are shown in Table 2.

Table 1: Reliability and Validity

Construct / Items	Loadings							Corrected item-total correlations
	AT	PE	EE	CS	PIK	SS	LO	
AT4	0.90							0.863
AT3	0.94							0.901
AT2	0.85							0.791
PE2		0.93						0.854
PE1		0.92						0.859
PE3		0.78						0.735
EE2			0.75					0.779
EE3			0.91					0.672
CS1				0.82				0.761
CS2				0.90				0.809
CS3				0.84				0.767
PIK4					0.93			0.901
PIK3					0.95			0.892
SS1						0.88		0.805
SS3						0.94		0.863
SS2						0.80		0.773
LO1							0.92	0.834
LO2							0.85	0.800
LO3							0.83	0.782
Eigenvalue	26.84	4.14	3.69	2.10	1.65	1.01	0.98	
Cronbach's Alpha	0.92	0.91	0.84	0.89	0.94	0.91	0.90	
Total variance explained:					78.51%			

Assessing the Measurement and the Structural Models

Confirmation of the measurement model was achieved, since all four of the fit indices met the standards cited. The NFI, NNFI, and CFI all exceeded the .9 level, and the RMSEA was less than the 0.08 level for accepting the model. The standardized factor loading for each construct was above the 0.7 level. Following the guidelines recommended by Comrey and Lee [1992], this represents an excellent fit of the data. The structural model also met the minimum standard of .9 for the NFI, NNFI, and CFI fit indices and 0.08 for the RMSEA. The CFA performed on the structural model indicates that the proposed model is an excellent model to test the hypotheses.

Table 2: SEM Fit

	N	Chi^2	df	RMSEA	NFI	CFI	NNFI
Measurement Model	102	89.63	67	0.058	0.96	0.99	0.98
Structural Model	102	248.95	161	0.074	0.94	0.98	0.97

V. RESULTS

Hypotheses H1, H4, H5, H6, H8, and H10 each achieved a significance level of 0.01. The paths from attitude to student learning outcomes (H2), from PE to attitude (H3), and from training to PE (H7) were significant at the 0.05 level. Only the paths from PIK to LO (H11) and CS to PE (H9) were not significant. The standardized path coefficients and the significance levels for the hypotheses are reported in Figure 2. The control variable (student self-reported knowledge about ERP systems) was not significant and was dropped from further consideration.

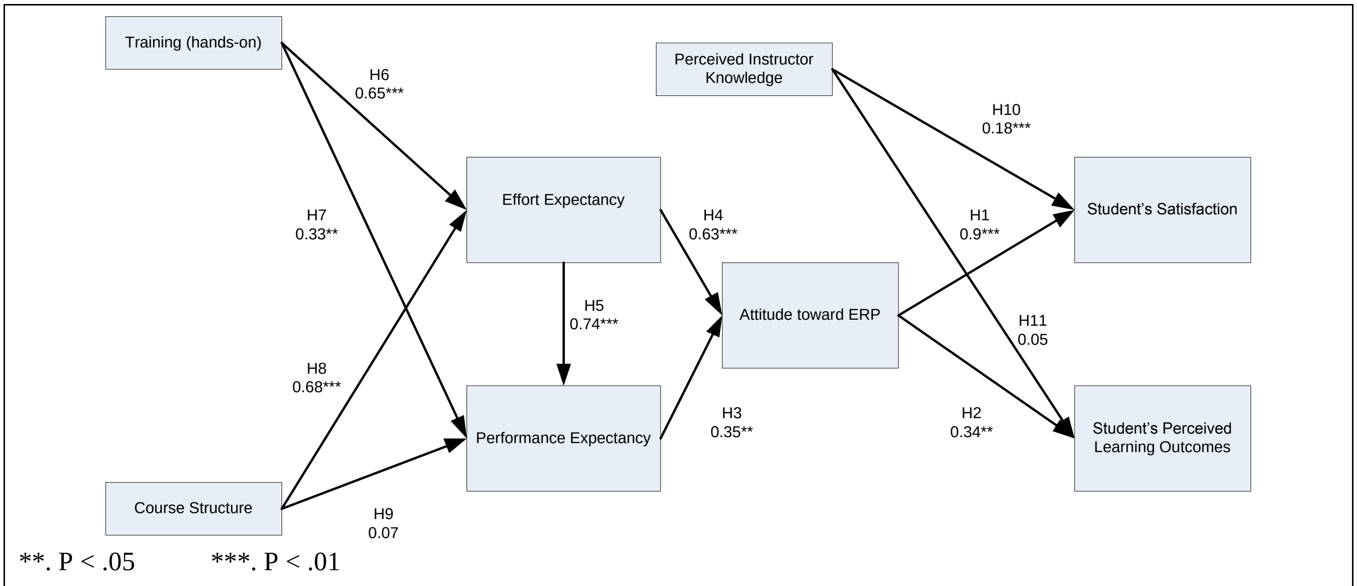

Figure 2. Results of the Structural Model

VI. DISCUSSION AND CONCLUSIONS

Using the UTAUT (Unified Theory of Acceptance and Use of Technology) introduced by Venkatesh et al. [2003], this study attempted to investigate the factors that impact student-perceived learning outcomes and satisfaction in ERP courses. All hypothesized links were significant with the exception of the links between perceived instructor knowledge and student-perceived learning outcomes and between course structure and performance expectancy. The main components of the UTAUT model (Attitude, PE, and EE) were significant in predicting student-perceived learning outcomes and satisfaction. Additionally, perceived instructor knowledge about ERP was a significant factor in predicting student satisfaction. Moreover, performance expectancy and effort expectancy were significant in predicting student attitudes toward ERP. Course structure was a significant factor in predicting effort expectancy. The path coefficient for H1 (attitude to student satisfaction) was the most significant path variable with a t-value of 10.98 and standardized coefficient of 0.90, followed by the path between EE and PE.

For the most part, students lacked prior experience with ERP systems; therefore, they shared similar levels of experience. Self-reported knowledge about ERP systems was not significant in influencing student-perceived learning outcomes and satisfaction. This should not be of surprise, since only 4 percent of the respondents had previously taken an ERP course.

Employing the standardized path coefficients in Figure 2, the relative direct, indirect, and total effects of the antecedent variables EE, PE, AT, TR, CS and PIK were calculated. Indirect effects were computed by multiplying all path-standardized coefficients along an indirect route from an antecedent variable to a certain belief variable. Since more than one indirect path existed between the variables of interest, the total indirect effect was reached by adding the indirect effects along all possible routes. Total effects were computed by adding the direct effects and the indirect effects of the antecedent variable on the belief variable.

As shown in Table 3, the total effects of student attitude had the largest impact on student-perceived learning outcomes and satisfaction among all antecedent variables, followed by EE. The total effects of training (hands-on) had a larger impact than PE, CS, or PIK on student-perceived learning outcomes and satisfaction. The total effects of course structure were greater than the effects of either PE or PIK on student-perceived learning outcomes and satisfaction. Perceived instructor knowledge had the least impact on student-perceived learning outcomes and satisfaction.

The findings of this study confirmed the results of previous UTAUT studies for the main components of PE and EE [Al-Gahtani, 2001; Davis, 1993; Davis et al., 1989; and Mahatanankoon et al., 2005]. In this study, PE and EE were significant in predicting student attitude toward ERP. The total effect of EE on attitude exceeded the total effect of PE on attitude. In order to promote strong positive attitudes, the importance of the perception of ease of use for the ERP system is highlighted.

Table 3: Direct, Indirect, and Total Effects of Antecedent Variables

Factor	EE		PE			AT			SS			LO		
	D	T	D	I	T	D	I	T	D	I	T	D	I	T
EE			.74		.74	.63	.26	.89		.80	.80		.30	.30
PE						.35		.35		.31	.31		.12	.12
AT									.90		.90	.34		.34
TR	.65	.65	.33	.48	.81		.69	.69		.62	.62		.24	.24
CS	.68	.68	.07	.50	.57		.60	.60		.54	.54		.20	.20
PIK									.18		.18		.05	.05

D = Direct Effect
I = Indirect Effect
T = Total Effect

Additionally, EE was significant in predicting PE which is consistent with prior research [Davis, 1993; Davis et al., 1989; Igbaria et al., 1997]. This emphasizes how important it is for the system to be perceived as user friendly and easy to use in order to be perceived useful by users. EE indirectly impacts attitude through PE. Based on these findings, ERP educators and trainers should consider these two factors (PE and EE) when creating and selecting course materials and hands-on exercises. Students need to understand both the benefits of using ERP systems (PE) as well as how to use the ERP system to perform transactions in processes to complete assignments (EE). Speakers from industry, case studies, and articles can be used to assist the students in understanding the benefits of ERP systems. To help manage student effort expectancy, gradually increasing the level of complexity in the hands-on exercises while providing a number of opportunities to practice and apply are good strategies.

The results of this study provide insights to ERP educators, trainers, and developers regarding the factors that influence student/end-user perceived learning outcomes and satisfaction with ERP systems. By knowing the significant factors that influence student-perceived learning outcomes and satisfaction, ERP educators might consider steps to develop positive attitudes toward ERP systems by focusing on the effort expectancy (the ease of use) and performance expectancy (usefulness) aspects of ERP systems. This could be accomplished by convincing students about the importance of the understanding and the ability to use ERP systems for their future and by making the learning process of ERP as clear as possible. Using a blend of concepts and hands-on experiences is important. The hands-on experiences should build the students' confidence and understanding through introducing the concepts, requiring them to apply the concepts to similar but more complex situations and then requiring them to apply the collective concepts to a project that is even more complex and requires a business decision. Additionally, ERP educators should focus on the course structure in such a way that reflects the clarity of the course objectives, assignments, and expectations. Moreover, the course should be organized into logical and understandable components. ERP educators also need to realize the importance of relevant "hands-on" sessions and project assignments related to ERP systems since they are positively related to student perceptions of effort expectancy and performance expectancy.

Student perception of instructor knowledge about ERP systems influenced their satisfaction but not their perceived learning outcomes. A well-prepared and knowledgeable instructor can affect student satisfaction. Learning outcomes depend not only on instructor knowledge, but also on how motivated the students are in contributing to their own learning. Therefore, a knowledgeable instructor is necessary, but maybe not sufficient for improving student-perceived learning outcomes. It takes both a knowledgeable and well-prepared educator on one hand and a dedicated and committed learner on the other hand to positively impact student-perceived learning outcomes.

When integrating ERP in a business curriculum, it is important for faculty to understand the findings from this research. As the plan for integration is created, performance expectancy should be addressed and effort expectancy should be managed. If integration across the curriculum is used, the plan should address which courses/modules will introduce, reinforce, and apply both the concepts and hands-on experiences. Hands-on experiences alone will not address the performance expectancy; likewise, concepts alone will not manage the effort expectancy.

It should be noted that the above findings and suggestions are also applicable to ERP trainers in industry even though the respondents in this study were students. Research suggests that workers and students possess the same values and beliefs [Voich, 1995]. Trainers in enterprises implementing ERP systems as well as ERP vendors who provide training for their clients should consider the above factors in preparing for and conducting training sessions.

VII. LIMITATIONS AND FUTURE RESEARCH

This study had a few limitations that should be recognized. The use of self-reported scales to measure the study variables raises the possibility of common method variance. Furthermore, even though the sample size was relatively small, it met the minimum requirement for this type of analysis [Bollen, 1989; Diamantopoulos and Siguaw, 2007]. Future research could include the investigation of moderating factors such as career relevance, major, student classification, and instruction delivery mode. Conducting a similar study in courses that use ERP systems in an integrated fashion across the curriculum would add to the understanding of what determines actual student learning outcomes and satisfaction with ERP systems and courses. Another plausible future research idea is to test the model across different cultural settings due to the popularity of ERP systems across the globe.

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APPENDIX: LIST OF SCALE ITEMS

Table A1: List of Scale Items

Construct	Item	Description	Mean	Std.
Student Perceived Learning Outcomes	LO1	I expect an excellent grade in this course.	5.53	1.35
	LO2	I performed well in this course.	5.41	1.17
	LO3	I expect an excellent grade on my project.	5.45	1.25
Student Satisfaction	SS1	I would recommend this course to other students to learn about ERP systems.	5.27	1.84
	SS2	I am satisfied with the quality of the learning experience of this course.	4.76	1.64
	SS3	I enjoyed this course.	4.77	1.86
Attitude	**AT1**	**Using the ERP system is a good idea.**	**5.48**	**1.36**
	AT2	The ERP system makes studying the ERP course more interesting.	5.16	1.61
	AT3	Studying the ERP system is fun.	4.19	1.96
	AT4	I like learning about the ERP system.	4.55	2.97
Effort Expectancy	**EE1**	**Learning to use the ERP system was easy for me.**	**4.12**	**1.45**
	EE2	I find the ERP system easy to use.	3.62	1.49
	EE3	My interaction with the ERP system has been clear and understandable.	4.51	1.40
Performance Expectancy	PE1	Understanding the ERP system will be useful in my degree program.	4.66	1.83
	PE2	Understanding the ERP system will be useful in my job.	4.89	1.86
	PE3	Using the ERP system increases my productivity.	4.68	1.69
Course Structure	CS1	The course objectives and procedures of the course were clearly communicate.	5.57	1.29
	CS2	The course material was organized into logical and understandable components.	5.29	1.41
	CS3	The expectations from the course were clearly stated.	5.41	1.23
Perceived Instructor Knowledge	PIK1	My instructor is very knowledgeable about ERP	6.33	0.82
	PIK2	**My instructor is very knowledgeable about the ERP system we use.**	**6.30**	**0.76**
	PIK3	My instructor understands the topics discussed in the course very well.	6.28	0.83
	PIK4	My instructor knows the ERP system very well.	6.28	0.82
Training (Hands-on)	TR	How many times did you go to the computer lab during class time in this course.	10.00	2.36
Self-reported Knowledge	KN	Your knowledge about ERP systems is: Poor 1 2 3 4 5 6 7 Excellent	4.27	1.14

*. Items in bold were dropped.

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