

2006

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### Recommended Citation

Lee, Huei; Chen, Kuo Lane; and Yang, Jiaqin (2006) "Teaching Enterprise Resource Planning (ERP) Systems in the Supply Chain Management Course," *Communications of the IIMA*: Vol. 6 : Iss. 3 , Article 8. Available at: <https://scholarworks.lib.csusb.edu/ciima/vol6/iss3/8>

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## **Teaching Enterprise Resource Planning (ERP) Systems in the Supply Chain Management Course**

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### **ABSTRACT**

*The major purpose of this paper is to investigate the issues of teaching ERP systems in a supply chain management course. The secondary purpose of the paper is to evaluate the effectiveness of students' perception of learning ERP systems in a supply chain management course.*

### **INTRODUCTION**

Supply chain management (SCM) refers to an information system that integrates all the business processes throughout the supply chain from suppliers to customers. (Turban, Rainer, & Potter, 2003). Supply chain management can be divided into two parts: Supply chain planning systems and supply chain execution systems. Supply chain executive systems are quite similar to the enterprise resource planning (ERP) systems because they both focus on the operational level. The basic philosophy of ERP is to incorporate order entry, purchasing, production, and direct interfaces with customers and suppliers such as customer relationship management (CRM) and business information warehouse (BW). An important feature of an ERP system is its global supply chain network. A company may use a full integrated ERP system to receive an electronic order from a customer in Italy, issue the necessary purchase orders for parts to suppliers in Mexico, plan for assembly, and notify shippers on both ends of the transactions. ERP in general provides a broad range of general benefits such as efficiency, increased quality, improved customer relationship, and enhanced vendor relations. (Lee & Chen, 2005)

Supply chain management is one of the rising fields in the business schools today. In term of software, ERP and SCM have many similar modules. Many people think that ERP is an important subject for the SCM course since it affects the concept of supply chain management (Becerra-Fernandez, et al., 2000). ERP evolved from the Material Requirements Planning II (MRP II) system. For more than two decades MRP II was the major software for production planning and control in the industry. MRP II, however, is obsolete with Internet, new global competition, multi-plant international sites, and new supply-chain management (Lee & Chen, 2005).

Many universities today offer a course or a program in supply chain management and ERP courses. Therefore, the major purpose of this paper is to study the issues of teaching ERP systems in a supply chain management course. The secondary purpose of this paper is to evaluate the effectiveness of the ERP modules for teaching supply chain management courses. This is an important area of study because the outcome of this research could lead to the development of a teaching model for other business courses such as Marketing Information Systems and Production/Operations Management.

## **RESEARCH DESIGN**

The purpose of this study is to investigate teaching Enterprise Resource Planning system in a supply chain management course. Five SAP models were used for in explaining the concept of supply chain management in a SCM course offered by the College of Business at an AACSB accredited university in Michigan. In this study, the remote access system developed by the SAP University Alliances program was used. The research design was used by authors (Chen and Lee ,2005). This study continues the work in Lee and Chen (2005).

### *Population and Sample Size*

The subjects for this study were students enrolled in a three-credit-hour course, "Information Technology in Supply Chain Management". This course was taught by a CIS professor. There were 20 students in the class. The survey instruments used in this research were a specific survey questionnaire about SAP and student evaluations after the classes.

### *Pre-Testing the Model for Applicability and Completeness*

Prior to the 2004 spring study, the online model was tested for applicability and completeness. A demonstration of the completed model was given for several different classes during the Winter/Fall 2003 semesters. These students were all given a short survey to gather information on their attitude and evaluation of the application after seeing it in a demonstration mode. The classes which participated in this survey were two sections of the Information Resource Management class and one section of the 200 level of Business Information System class.

### *Research Hypotheses*

For the purpose of this research, four hypotheses were tested in this study. These hypotheses are previous developed by Lee and Chen (2005). These hypotheses are stated as follows:

- H1:      From students' opinion, this course improves their knowledge and skills in supply chain management and SAP covered in this course.
- H2:      From the students' opinion, the instructor stimulates interest in the course.
- H3:      Use of the SAP on-line access system helps me understand the relationship between the subject (Supply Chain Management) and the ERP system."

## **RESEARCH RESULTS AND DATA ANALYSIS**

The primary subjects of this study were given a post-test for the five different modules selected for the experiment out of the on line access system. For each module, students attended two sessions of classes. In the first session, the professor explained the basic principal of supply chain management and special terminologies used in the SAP R/3 system. In the second session, students followed the instructions on the handout and accessed the online system to SAP server at California State University at Chico. The students were given a test about supply chain management and SAP for every two weeks. Student evaluations were used to gather information on their expectations about this course at the end of the semester. After one month students finished the course, they were given a survey to gather information on their opinions about SAP systems.

Twenty students in the course of "Information Technology for Supply Chain Management" (600 level class) in the college of business of a regional university in the Midwest comprised the sample of this study completed in June 2004. One of the purposes of the student evaluations and survey were to use this sample as a pilot study for a further national survey. These graduate students, ranging from IS major to MBA, were chosen for the survey. Three of the 20 students did not complete student evaluations, resulting in a response rate of 85%. A survey questionnaire was sent out month later, but only nine students returned the survey.

All of these results were compiled for analysis using SPSS/PC+. Frequency distributions were calculated for each question on the questionnaire. In the final survey, students were asked nine questions related to degree of satisfaction of the online access systems. The measurement tools in this project are: 1) post written tests which represent objective performance measure about students' achievement, and 2) a questionnaire survey which represents subjective opinions

opinions from students. Scores for the final exam (multiple-choice questions and short problems) ranges from 68 to 100 with a mean score of 86. Table 1 shows the results for all the student evaluations. Table 2 shows the results of the survey. The following paragraphs further discuss the Hypotheses One to Four.

Question	Mean	Standard Deviation	n	Minimum	Maximum
I improved my knowledge and skills in areas covered in this course	4.47	0.513	19	4	5
The instructor covered at least 80% of the material outlined in the course syllabus.	4.68	0.478	19	4	5
My instructor is accessible to students during posted office hours as specified in the course syllabus.	4.42	0.838	19	2	5
A typical student who exerts a high level of effort will obtain a grade reflective of his/her true ability in this course.	4.68	0.749	19	2	5
My instructor showed respect for students in this course.	4.74	0.452	19	4	5
My instructor has an effective style of presentation	4.37	0.597	19	3	5
My instructor seems well-prepared for class.	4.42	0.961	18	1	5
My instructor stimulates interest in the course.	4.5	0.514	17	4	5
My instructor displays enthusiasm when teaching.	4.71	0.47	17	4	5
My instructor is actively helpful when students have problems.	4.71	0.47	17	4	5
I understand what is expected of me in this course.	4.53	0.624	17	3	5
Overall, evaluation methods (exams, papers, etc.) are fair.	4.59	0.795	17	2	5
Grades are assigned fairly and impartially in this course.	4.53	0.624	17	3	5
I learned a lot in this course.	4.12	0.928	17	2	5
My instructor presents this course in a well-organized manner.	4.24	0.903	17	2	5
My instructor presents material clearly.	4.47	0.624	17	3	5
The goals of this course are clearly stated and consistently pursued.	4.47	0.717	17	3	5
For this course, the assignments are reasonable.	4.59	0.507	17	4	5

What is your overall rating of the teaching effectiveness of this instructor?	4.47	0.624	17	3	5
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**Table 1 Student Evaluation Results for Each Question**

Question	Mean	Standard Deviation	n	Minimum	Maximum
1. Use of the SAP on-line access in the class (online login) helps me understand what ERP and SAP are.	4.22	0.667	9	3	5
2. Use of the SAP on-line access helps me understand the relationship between the subject (Supply Chain Management) and the ERP (SAP).	4.11	0.782	9	3	5
3. The step-by-step handouts help me understand how SAP or ERP works.	4.67	0.5	9	4	5
4. One of the drawbacks of the SAP on-line access is that it is not very flexible (i.e. you have to follow the steps on the handouts, otherwise it will not work).	4.56	0.726	9	3	5
5. One of the drawbacks of the SAP on-line access is that the steps described in the handouts are not working.	2.67	0.707	9	2	4
6. I like to learn more about the SAP on-line access systems.	4.33	0.866	9	3	5

**Table 2: Results of Survey**

#### *Hypothesis I-IV*

H1: In students' opinion, this course improved their knowledge and skills in supply chain management and SAP covered in this course.

The purpose of the first hypothesis is to test whether the course improves their knowledge and skills in the supply chain management and SAP. The null and alternative hypotheses are expressed as:

Ho1:  $\mu \leq 3$

Ha1:  $\mu > 3$

Where  $\mu$  is the students' opinion whether the course improves their knowledge in supply chain management and SAP. Table 3 shows the results of the t test. The absolute t-value of 12.522 is greater than the criterion acceptance t for approximately 18 degrees of freedom and  $\alpha = .05$ ,  $t = 1.734$ . Therefore, with  $t > 1.734$  the null hypothesis that the  $\mu \leq 3$  is rejected.

## One-Sample Test

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Question 1	12.522	18	.000	1.47	1.23	1.72

Table 3: T Test for Hypothesis One

H2: From the students' opinion, the instructor stimulates interest in the course.

The purpose of the second hypothesis is also to assess students' opinion to see whether this course stimulate their interest in supply chain management and SAP. The null and alternative hypotheses are expressed as:

Ho2:  $\mu \leq 3$

Ha2:  $\mu > 3$

Where  $\mu$  is the students' opinion about whether the instructor stimulates their interest in supply chain management and SAP.

Table 4 shows the results of the t test. The absolute t-value of 12.369 is greater than the criterion acceptance t for approximately 17 degrees of freedom and  $\alpha = .05$ ,  $t = 1.74$ . Therefore, with  $t > 1.74$  the null hypothesis that the  $\mu \leq 3$  is rejected

## One-Sample Test

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Question 8	12.369	17	.000	1.50	1.24	1.76

Table 4. T Test for Hypothesis Two

H3: Use of the SAP on-line access system helps me understand the relationship between the subject (SCM) and the ERP (SAP).

The purpose of the fourth hypothesis is to determine whether the SAP online access system can help students understand the relationship between the subject (Supply Chain Management) and the ERP (SAP). The null and alternative hypotheses are expressed as:

Ho3:  $\mu \leq 2.5$

Ha3:  $\mu > 2.5$

This hypothesis is based on the second question on the student survey (See Table 2). The sample size is less than 10 which is not appropriate for statistical test. However, the means score for that question is 4.11 which is above 3.0. It appears that SAP online access system can help students understand the relationship between the subject (SCM) and the SAP (ERP).

## CONCLUSIONS AND FUTURE RESEARCH

The purpose of this paper is to evaluate the effectiveness of using an ERP system in a supply chain management course.

Both student evaluations and survey show that students in general like this course. Based on the written comments, the major advantages of using an ERP system are: 1) Students learn a popular ERP software package. Students can 'experience' it through hands-on exercises and 2) Students can understand the relationship between ERP and SCM. However, this study has several limitations: 1) the students involved in the experiment were relative small. 2) there is no

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there is no benchmark for the ERP teaching evaluation. 3) there is no control group. Future study should improve the research design of the study.

In order to teach ERP, many faculty members have to spend tremendous time and effort to prepare handouts and practice. Lee and Chen (2005) mentioned that the quality of the handout is a critical factor for learning for SAP and SCM concept. However, research results cannot approve it.

In this study, we did not require students to use Advanced Planner and Optimizer (APO), one of the important components in SCM. APO is a set of advanced planning tools that helps companies their supply chain on global basis. However, APO is a separate package from SAP R/3 basic modules. The online access for APO was not available to the instructors and students at the time we conducted the experiment. The APO package contains several useful modules such as Supply Chain Cockpit (SCC), which provides visualization capabilities for planning and controlling both intra- and inter-organizational logistical networks (Knolmayer, Mertens, and Zeier, 2002). These important packages shall be taught in the future experiment.

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## APPENDIX A

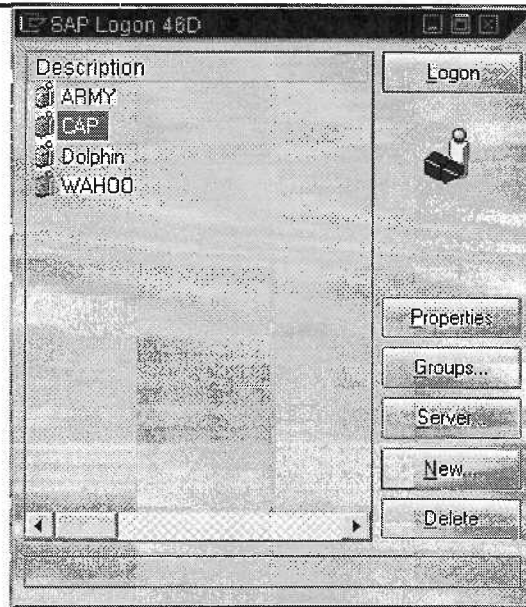
### On-line Access Procedures to the SAP Server under the SAP University Alliances Program

1. Install the SAP Portal GUI 6.2. Make sure to setup the right IP address and system number. A SAPlogon icon should appear on the screen as follows:

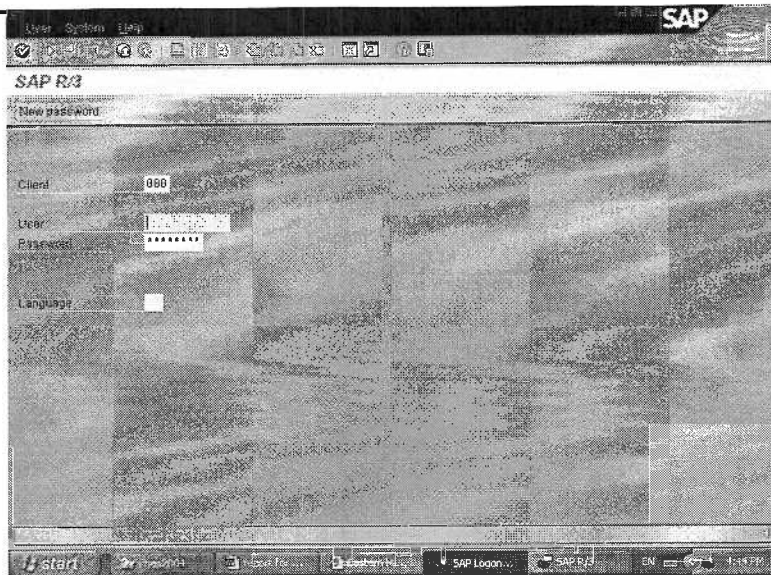


2. The following Logon ID should appear, choose one of the items (such as CAP) and click Logon:





3. Enter the Client number, user id, and password.



4. The SAP Easy Access menu should appear as follows. This is the primary menu of SAP program.

