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Enhancing Student Learning of ERP and Business Process Knowledge through Hands-On ERP Exercises in an Introductory Management of Information Systems Course

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ABSTRACT

Organizations are in need of business graduates who understand how enterprise systems and integrated business processes work. Business schools are increasingly incorporating Enterprise Resource Planning (ERP) Systems into their programs to address this need. Using hands-on ERP exercises is one initiative that could enhance student learning of these vital topics. How can business schools integrate hands-on exercises to ensure all business graduates have the opportunity to develop this knowledge? This paper investigates using hands-on ERP exercises in an Introductory Management of Information Systems (IS) course to enhance student learning of ERP and business process concepts. Data will be collected using a pre and post survey designed to measure ERP and business process knowledge. Then t-tests will be utilized to determine if differences exist after exposure to the course material and the hands-on exercises.

Keywords

ERP, Business Processes, Hands-On Learning

INTRODUCTION

ERP systems are defined as integrated IS that optimize business processes and transactions in a corporation by incorporating best practices in a single database design (Alshare & Lane, 2011). ERP implementations were initially dominated by large organizations, but now small and mid-size organizations are also adopting them. As implementations increase throughout organizations of all sizes in many different industries, the demand for students who understand business process integration and know how to work in an ERP system is increasing (Cronan et al., 2011; Hustad & Olsen, 2013).

As a result, there is an increasing demand for business graduates who understand of the concepts of ERP systems and cross functional business processes (Cronan & Douglas, 2012; Seethamraju, 2011). The demand for ERP knowledge and skills is reflected in higher salaries (on average $4,056.00 more) for business graduates who receive ERP training during their undergraduate studies as compared to their peers who did not (Andrea et al., 2008). This demand creates new challenges for business schools to produce students who possess enterprise integration knowledge and understand the complexity of working through business processes in an ERP system. As a result, it is important for business schools to consider how and where to integrate ERP systems into their curriculum.

Advances in pedagogical approaches place emphasis on active learning or learning by doing (Pridmore et al., 2010; Mykytyn et al., 2008). IS courses are uniquely posed to utilize technology such as ERP systems and to teach integration of business processes. Given that most business programs require an Introductory IS course as part of their business core curriculum, we put forth that hands-on ERP exercises integrated into the core Introductory IS course could be an effective way to ensure that all business graduates would have ERP and business process knowledge. This paper studies the effectiveness of using hands-on ERP exercises in an Introductory IS course to improve student knowledge of ERP and business processes. First we will present a review of the literature and hypotheses. Next, we will discuss the methods and experiments used.

LITERATURE REVIEW

Business processes are critical to the way organizations operate and how employees interact with each other. Organizations of all sizes have and are still achieving significant organizational improvements by focusing on redesigning their internal processes to create effective business processes which are now considered valuable corporate assets (Gartner, 2006). ERP systems are complex and utilize an integrated database to support integrated business processes. Today, business schools are facing dual challenges. First to make their courses relevant by incorporating industry relevant skills and knowledge for all

business graduates, and second, to design and implement innovative learning methods and pedagogy to facilitate learning (Mortais et al., 2006; Seethamraju, 2011; Ayyagari, 2011). Business schools have traditionally structured their educational programs with functional-based courses and majors such as marketing, operations, finance, accounting, and IS (Cronan et al., 2011). This structure can make it difficult for students to understand and appreciate cross functional and integrated business processes. In addition, advances in pedagogical approaches place an emphasis on active learning or learning-by-doing.

Pedagogical approaches based solely on lectures are criticized as approaches that make students passive learners (Bok, 1986). Not only has active learning gained prominence among educators and researchers, it is also argued that students seek opportunities where they can apply their knowledge to simulate realistic situations (Auster and Wylie, 2006). SAP, Oracle, Microsoft, and other ERP providers have developed and offered academic material for higher education integration. More than 400 universities around the world have integrated SAP ERP systems into their programs in some way (Cronan & Douglas, 2012). Additionally, previous studies have shown that students find value exposure to an industry ERP system such as SAP (Seethamraju, 2011).

The integration of hands-on ERP exercises and case studies help teach ERP concepts and the integration of business processes. By presenting and having students complete hands-on cross-functional process exercises, educators could possibly teach more effectively cross-functional business process knowledge. However, hands-on activities with systems such as SAP are usually not incorporated into all business courses or even into the curriculum in a way that ensures all business majors would have an opportunity to experience. Business students would have to take very specific courses to have access to these hands-on activities and knowledge (Hustad, E. and Olsen, 2013; Zarei, & Nagaraju, 2013).

Where and how should business schools incorporate hands-on ERP exercises to make sure that all business majors have the opportunity to improve their knowledge of ERP and business process concepts as well as gain ERP system skills? One could argue that IS courses are uniquely positioned in the business curriculum to effectively use systems such as SAP to teach ERP concepts and integration of business processes. Most IS courses are technical by nature and are only taken by IS majors. However, business schools typically require all business majors to take an Introductory IS course. This course is usually designed as a survey class that briefly covers all the major topics in the IS field including strategy, major IS business initiatives, enterprise systems, database, telecommunication, etc. We propose that incorporating hands-on ERP exercises in the core Introductory IS core business course after lecturing on enterprise systems would allow all business majors the opportunity to enhance their ERP and business process knowledge. We posit this will positively impact ERP knowledge, business process knowledge, and ERP skills for all business majors. We put forth the following hypotheses.

Hypothesis 1: Enterprise Resource Planning Knowledge will improve as a result of completing hands-on ERP and business process management exercises in an Introductory Information Systems Course.

Hypothesis 2: Business and Process Knowledge will improve as a result of completing hands-on ERP business process management exercises in an Introductory Information Systems Course.

Hypothesis 3: SAP Transaction Skills will improve as a result of completing SAP business process management exercises in an Introductory Information Systems Course.

RESEARCH METHODS AND MEASURES

This research utilizes pre and post surveys to examine what the students perceived they learned by completing two hands-on SAP business process management exercises, Sales and Distribution (S&D), and Materials Management (MM). The instrument items used in this study were developed based on previous SAP curriculum research (Seethamraju, 2011; 2007; Cronan & Douglas, 2012). The items were reviewed for content as well as readability, and modified accordingly. Eleven items were developed to assess the above hypotheses. The individual instrument items used in this study to test the hypotheses can be summarized into three learning objectives, enterprise systems knowledge (ESK), business and process knowledge (BPK), and SAP skills. The survey consisted of demographic questions (gender, class year, and major), three questions to measure ESK, five questions to measure BPK, and three questions regarding SAP transaction skills (STS). Each question used a seven-point likert with 4 being neither/nor, 1 being the most negative response, and 7 being the most positive response. The questions and respective categories are displayed in Table 1.

Measure	Instrument Item
ESK	How would you rate your ability to understand the impact of integrated information in a business on decision making?
ESK	How would you rate your understanding of the impact an individual employee has on the operation in other functional areas?
ESK	How would you rate your understanding of the role and complexity of technology in enterprise resource planning

	systems?
BPK	How would you rate your knowledge of business terminology in Sales and Distribution such as sales order, discounts, freight, transfer goods, goods issues, etc.?
BPK	How would you rate your knowledge of the business processes included in Sales and Distribution?
BPK	How would you rate your knowledge of business terminology in Materials Management such as purchasing, purchase order number, vendor, material number, request for quote, etc.?
BPK	How would you rate your knowledge of the business processes included in Materials Management?
BPK	How would you rate your knowledge of the interrelationships and inter-dependencies of various business functions such as accounting, marketing, productions, etc?
STS	What is your confidence level that you will be able to complete a transaction in an ERP system?
STS	What is your confidence level that you will be able to become skilled at using an ERP system?
STS	What is your confidence level that you will be able to easily learn how to operate in an ERP system?

Table 1: Pre/Post SAP Comparison Questions

ESK is defined as the knowledge an individual has on the impact ERP systems and their integrated information provides an organization. This included the individual's knowledge of how employees utilize ERP system impact on an organization. BPK is defined as the extent of knowledge an individual has of business terminology, key operations processes, and their relationships. BPK includes understanding key business activities within and between functional areas such as sales, procurement, finance, accounting, and manufacturing. STS represents the extent to which an individual has the skills required to utilize the SAP ERP system and to perform transactions supporting business operations such as creating master data, requesting a quote, and posting payments. In addition, in the pre-survey the students were asked to report if they had any previous experience with using an ERP systems like SAP. In the post-survey, the students were also asked eight questions to measure their attitude and feelings in completing the S&D and the MM hands-on SAP exercises. Each question used a seven point likert with 4 being neither/nor, 1 being the most negative response, and 7 being the most positive response. The questions are displayed in Table 2.

My experience with SAP was: dissatisfied/satisfied
My experience with SAP was: displeased/pleased
My experience with SAP was: frustrating/content
My experience with SAP was: miserable/delightful
S&D was a worthwhile learning experience: disagree/agree
I learned about ERP from S&D: disagree/agree
MM was a worthwhile learning experience: disagree/agree
I learned about ERP from MM: disagree/agree

Table 2: Post SAP Questions

DATA COLLECTION

The surveys were administered to all students who were enrolled in six sections of the core Introduction to Management (IS) course at a medium sized public university. The six sections were taught by three different professors who used similar methods, teaching materials, and syllabi created together. The courses were very similar, included lectures on ERP concepts, and two hands-on ERP exercises in SAP, S&D and MM. The hands-on exercises led the students step-by-step through completing business processes in a fictitious company using SAP's ERP system. In the S&D exercise, the students completed pre-sales activities, order entry, checked availability of product, picked the materials, post goods issue, invoice the customer, and receipt of customer payment. In the MM exercise, the students completed a purchase requisition, vendor selection; complete a purchase order, vendor notification, vendor shipment, goods receipt, invoice receipt, and payment to vendor.

The pre-survey was administered after each section lectured on ERP and before SAP was introduced to the students. The post survey was administered after the completion of both SAP exercises. The surveys were not required and did not impact their grades. Figure 1 displays the schedule used for the lectures, the survey, and the SAP hands-on exercises.

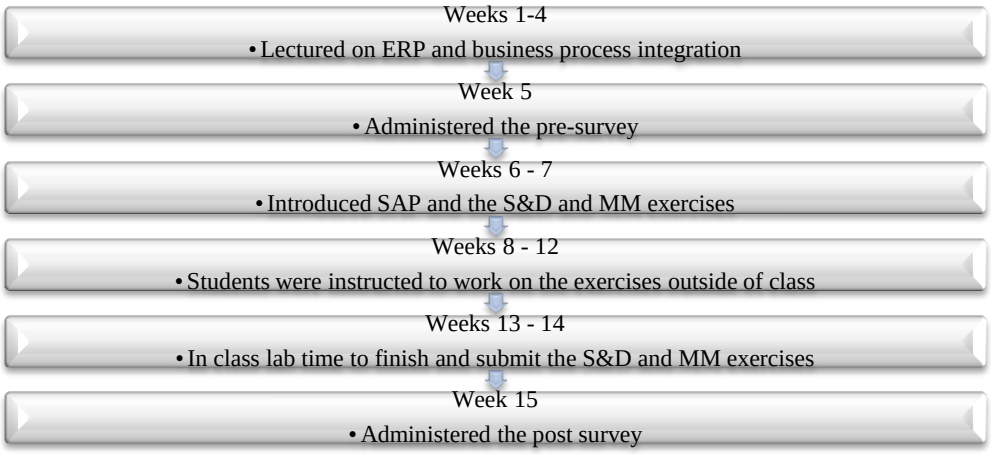

Figure 1: Schedule and Structure of the Hands-On SAP Exercises

DATA ANALYSIS

The total number of usable observations obtained from each of the pre and post surveys is 137. The participants' demographics are seen in Table 3. T-tests are utilized to determine if there are differences between the pre and post surveys and demographics will be evaluated to see if they impact the results.

Pre	Gender	Male	Female					
		62%	38%					
	Year	Sophomore	Junior	Senior				
		8%	64%	27%				
	Major	Marketing	Management	Info System	Accounting	Finance	Economics	Other
		21%	33%	10%	20%	9%	4%	3%
Post	Gender	Male	Female					
		54%	46%					
	Year	Sophomore	Junior	Senior				
		8%	63%	29%				
	Major	Marketing	Management	Info Systems	Accounting	Finance	Economics	Other
		21%	32%	11%	16%	11%	4%	4%

Table 3: Demographics from Pre/Post SAP Survey

Most of the students had no prior experience with any ERP system (Mean=1.31, STDEV=0.70), and the prior experience with ERP systems was found to have no influence on survey responses (P=0.40). Before the T-tests were performed, a dummy grouping variable was created to categorize the pre-survey and post-survey responses into two separate groups (Group 0 and Group 1). Table 4 contains the 2-sample t-tests results from the questions on the pre and post SAP surveys. The participants showed significant gains (P<0.05) from the pre survey to the post survey on almost all the items except for one STS item, which pertains to the level of confidence to become skilled at using an ERP system (P=0.249). Although not significant, the post-survey mean score (5.23) on the STS item was still higher than the pre-survey mean score (5.04). A MANOVA test was also conducted using the dummy grouping variable and the students' demographics (gender, year, and major) as the independent variables and their survey responses as the dependent variables. Consistent with the results of the T-tests, the MANOVA test revealed a significant effect of the grouping variable (P<0.001) on the students' survey responses. The students' demographics, such as gender (P=0.534), year (P=0.615), and major (P=0.305), did not impact their survey responses. The results of the T-tests and the MANOVA test provide support for all the three hypotheses and suggest that completing SAP business process management exercises can improve students' ESK, BPK, and STS.

Measure	Pre/Post SAP Comparison Questions	Pre	Post	P-Value
ESK	How would you rate your ability to understand the impact of integrated information in a business on decision making?	4.63	5.23	0.000
ESK	How would you rate your understanding of the impact an individual employee has on the operation in other functional areas?	4.74	5.404	0.000

ESK	How would you rate your understanding of the role and complexity of technology in enterprise resource planning systems?	4.41	5.36	0.000
BPK	How would you rate your knowledge of business terminology in Sales and Distribution such as sales order, discounts, freight, transfer goods, goods issues, etc.?	4.48	5.29	0.000
BPK	How would you rate your knowledge of the business processes included in Sales and Distribution?	4.46	5.13	0.000
BPK	How would you rate your knowledge of business terminology in Materials Management such as purchasing, purchase order number, vendor, material number, request for quote, etc.?	4.47	5.15	0.000
BPK	How would you rate your knowledge of the business processes included in Materials Management?	4.2	5.03	0.000
BPK	How would you rate your knowledge of the interrelationships and inter-dependencies of various business functions such as accounting, marketing, productions, etc?	4.23	5.12	0.000
STS	What is your confidence level that you will be able to complete a transaction in an ERP system?	4.11	4.92	0.000
STS	What is your confidence level that you will be able to become skilled at using an ERP system?	5.04	5.23	0.249
STS	What is your confidence level that you will be able to easily learn how to operate in an ERP system?	5.02	5.34	0.048

Table 4: Pre/Post SAP Comparison Questions

Table 5 contains the questions that were only asked on the post SAP survey, the mean scores and standard deviations of the responses, and the percentages of people who responded with a 5 or higher.

Post SAP Questions (no pre question to compare)	Mean	St. Dev.	% of 5, 6, & 7
My experience with SAP was: dissatisfied/satisfied	5.269	1.42	81%
My experience with SAP was: displeased/pleased	5.306	1.44	82%
My experience with SAP was: frustrating/content	5.138	1.47	74%
My experience with SAP was: miserable/delightful	4.963	1.39	62%
S&D was a worthwhile learning experience: disagree/agree	5.558	1.64	86%
I learned about ERP from S&D: disagree/agree	5.725	1.47	90%
MM was a worthwhile learning experience: disagree/agree	5.635	1.47	88%
I learned about ERP from MM: disagree/agree	5.659	1.39	87%

Table 5: Post SAP Questions

These questions asked the students about their SAP usage and learning experiences through S&D and MM exercises. The responses were on a 7-point likert scale with 4 being neither/nor, 1 being the most negative response, and 7 being the most positive response. The mean scores of all the responses exceeded 5 or were close to 5. It seems that most students enjoyed the use of the SAP system and found the S&D and MM exercises worthwhile and beneficial learning experiences.

CONCLUSION

In conclusion, this paper demonstrates the benefits of incorporating hands-on ERP exercises in a core Introductory IS business course. Hands-on experiential learning gets students actively involved the learning process. By completing hands-on ERP activities in SAP, students can not only develop SAP skills but also better understand ERP systems and business process integration. Incorporating hands-on ERP exercises in SAP after the lectures on enterprise systems seems to be an effective teaching approach that allows business students to acquire solid ERP knowledge, business process knowledge, and SAP skills. Thus, this paper emphasizes the importance of incorporating hands-on ERP exercises in the teaching of ERP systems and business processes so that students understand how EPR systems actually work to streamline business processes and facilitate cross-departmental communication and information sharing.

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