Student Perceptions of Importance and Usefulness of Enterprise Resource Planning Systems in Industry: An Exploratory Study.

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Abstract

Enterprise Resource Planning (ERP) systems are critical to large businesses; they are a defacto standard. This importance is realized by academia; post-secondary education institutions have actively incorporated ERP concepts into new courses and as a component of IS curricula. Research has found that ERP course work can dramatically improve a student’s job options and starting salary. Yet research has not investigated why students take ERP course work. Do students value its importance to industry? Is it considered a useful skill? This study explores student perceptions of the importance and usefulness of ERP related course work; and shows that these factors do positively influence student desire for ERP enabled course work. Our findings confirm that the importance of ERP to industry is a driving force in student’s desire for ERP coursework. We also find that the student’s appreciation of ERP’s usefulness is less of a factor.

Introduction

Organizations expend a great deal of time and resources implementing Enterprise Resource Planning (ERP) Systems. For large organizations these systems are a defacto norm (Kumar and van Hillegersberg, 2000). The inherent size and scope of these systems require that employees within the organization understand how, when and why ERP should be used. ERP systems help to organize and streamline business across the entire organization (Jessup and Valacich 2003). They are the instantiation of the organization’s business processes.
Indeed, ERP is so important to organizations that it has quickly become common course material in Colleges of Business (Hayen & Andera, 2005; Rosemann, 2004; Bradford et al., 2003; Sager et al., 2006). Post-secondary education recognizes the value that ERP exposure can have for students (Fedorowicz et al. 2004). Studies of recent graduates confirm that students with ERP-related course work garner higher starting salaries than their peers without such coursework (Andera, 2004; Sager et al., 2006).

While industry and post secondary institutions see its value, little research has investigated student perceptions of ERP. Literature does address the after-effects of ERP coursework, but is silent regarding why students select ERP course work in the first place. Was it simply a convenient elective course? Was it a required course that that addressed an explicit degree requirement, or was it a concerted effort by the student to gain ERP skills?

Actively seeking out ERP course work presupposes that students have an understanding of what ERP is and perhaps its relative value to industry. In an academic environment where ERP-related instruction is available but not mandated, students that are unaware of ERP may not seek out ERP course work; these students may enter the workforce ignorant of ERP concepts. Similarly, students who perceive that ERP is not important to industry may also avoid it, while students who believe that ERP is important to industry may seek to gain ERP knowledge and experience.

Research Problem

In this study, we investigate students’ perceptions of ERP. Do students understand the importance of ERP to industry? Similarly, do students realize the usefulness of ERP knowledge, and experience? Does this perception of understanding and importance
translate into a desire to study ERP? The answers to these questions could have lasting value to educators, practitioners, and students. The understanding of why students are taking ERP course work will benefit educators, and can provide context and direction for the educator’s ERP coursework. Institutions that market their programs to emphasize ERP could attract more students. Businesses will benefit if incoming employees require less orientation and training to become productive in an ERP environment. Students will benefit if they acquire an additional skill set and knowledge base that allows them to appear more valuable to an employer during job interviews. This will allow them to quickly integrate into an employer’s operational culture after being hired.

Literature Review

Since the mid-1990s, a great deal of ERP research has been published. Hundreds of journal articles and conference proceedings have been dedicated to this topic (Esteves and Bohorquez, 2007). Much of this literature has been focused on the selection and implementation of these important information systems. More recently, literature has taken a longer term view of ERP, and begun to research post-implementation phenomena (Esteves 2007). Some research has also focused on the use of ERP in post secondary institutions. There are three research streams that exist in ERP education literature: ERP implementation by universities, ERP course development, and ERP Curricula (Esteves and Bohorquez, 2007).

As with any other business entity, universities require an Information Systems infrastructure that supports their business process needs. These needs can be unique when compared to practitioner organizations (Oliver and Romm, 2002). This research steam
addresses the potential political issues universities can encounter (Allen and Kern 2001). It circumscribes the implementation process and its critical success factors (Dyke and Sinclair, 2003; Furumo and Pearsons 2004). This stream also provides insight into the value proposition that universities need to address in order to gain a positive return on their investment (Oliver and Romm 2002).

The second research stream addresses how ERP course material is developed and executed in the classroom. Collaborative environments and faculty workshops are discussed to help ease the development effort required for these courses (nelson 2002). This research is focused on the creation and delivery of the content, not necessarily its integration with IS curricula, that is the domain of the third research stream.

IS Curricular research is centered on the integration of ERP focused coursework into the overall discipline course work (Esteves and Bohorquez, 2007). The literature suggests a strong influence by business to include ERP course work in undergraduate education (Sager et al. 2006). Industry places a premium on this knowledge by offering higher wages to students who have taken ERP course work (Andrea, 2004; Fedorowicz et al., 2004). Additionally, the credibility of universities teaching ERP is enhanced in the eyes of business that hire students with ERP experience (Bradford et al., 2003).

Conspicuously absent from these research streams is the student perspective of desired ERP course work. No research was found that identified why students wish to take ERP courses (or IS courses in general for that matter). For the student, the course selection process can be viewed in a similar manner as their university selection process; it is a purchasing decision. Students identify 1) a problem, in this case, which course to take. 2)
Students search for information, 3) evaluate alternatives and then 4) ‘purchase’ the solution (Brown, Varley and Paul, 2008). This purchase step may be the selection of a specific university, selection of a major, or selection of their course work.

For our purposes, step 1 - problem identification is influenced by student’s views of the labor market. The problem is not simply to select a course. Research has shown that students are sensitive to the job market. They will select courses that will improve their ability to gain fruitful employment (Maringe 2006). Step 2, the search for information, is not the purview of this paper. While a number of information sources are available to students (industry press, parents, peers, instructors, etc...) it is the relative understanding of this information that is important. This understanding is relevant to step 3 - the evaluation of alternatives. Step 4 – ‘purchase’ is simply the registration process for the course. So our focus is on the perceived understanding of ERP in relation to industry.

Hypothesis

This being an exploratory study, we propose to view step 3 – the evaluation of alternatives as two parts. First is the evaluation of desire for a particular course. Second is the comparison of that desire with other potential courses. In actual practice, students will first evaluate the merits for a given course. They then compare those various courses in relation to each other. We only address the first evaluation; we want to measure the student’s desire for ERP course work.

Based on the assumption that students will focus on courses that improve their job potential (Maringe, 2006), we posit that the evaluation for a given course will focus on its two factors. First, do the students view ERP skills as useful in industry? Thus, using desire
for ERP course work as our dependent variable and our two perception views as independent variables, our hypotheses are:

\[ H_1: \text{The greater the student’s perception of its importance of ERP to industry the greater the desire to seek ERP coursework.} \]

\[ H_2: \text{The greater the student’s perceived usefulness of ERP the greater the desire to seek ERP coursework.} \]

**Methodology**

The research design is a field study. A survey instrument served as the method of data collection. Because the university where the investigation took place made extensive use of an EIS for student self-administration, the term EIS was used for all ERP-related questions so as not to confuse the students. For the purposes of this study, the terms EIS and ERP are interchangeable.

Items measuring perceived usefulness of ERP skills and perceived importance to industry were loosely adapted from instruments addressing user’s perceptions of their command of a software package (Venkatesh, 2000). Demographic data was also collected: Age, gender, major, academic classification (freshman, sophomore, etc.). In addition to the construct questions, the following ERP data was recorded: ERP software packages/companies they have heard of, frequency at which they utilize the university’s EIS system, and what functionalities they utilize when they access it.

The survey was administered among three information system classes that would typically contain undergraduate students from various majors in the college of business administration. Since students are the target of the research questions, only university students were surveyed in order to maintain a representative sample. The survey was given
during class time as a non-mandatory activity. It was handed out in hardcopy form and retrieved by an attendant when each subject was finished. The three courses selected for the survey provided a sampling frame of 382 students, out of which 115 total surveys were returned (approximately 30 percent). The data was hand-coded into an electronic spreadsheet for storage and eventual analysis. We chose to use Structural Equation Modeling (SEM) to analyze the relationships represented by our hypotheses. SEM is suited for both theory testing and theory development, and is an appropriate choice for an exploratory study (Bollen and Long, 1993). We used LISREL as our SEM tool.

Reliability was measured through internal consistency tests using Cronbach’s alpha. Face validity was obtained through an evaluation of the instrument by an independent ERP researcher.

Results

Compilation of raw data values was accomplished using Excel. SPSS was used for all data analysis functions. The first four questions of the survey examined demographic details of the subjects. Most respondents were juniors (68 percent) majoring in a business discipline (85 percent). A majority of the subjects (65 percent) came from one of four departments: Marketing, Accounting, Finance or Management. The average age of subjects was 21.61 (as would be expected when a majority of respondents were 3rd year students) Minimum value was 18 years of age, maximum was 42. A few older students positively skewed the sample; also, since 74 percent of respondents were between 20 and 22, the distribution is considered leptokurtotic (indicated by a kurtosis coefficient of 24.322). Fifty-six percent of respondents were male and forty-four percent female.
The next three questions examined the subject’s exposure to ERP systems by using the university EIS as a framework. All subjects (100 percent) have used some portion of the functionality provided by the EIS. On average, students accessed the system two to four times per week (41 percent). Almost 18 percent used the system every day. Of the 9 functionality items surveyed, on average students used four different items. The most utilized features were course registration (92.2 percent of respondents) and course grades (84.3). In addition to the EIS, subjects were asked to identify any other ERP software they were familiar with. Seventy percent of subjects were aware of at least one ERP software package. The most recognized software was PeopleSoft (53 percent of respondents) followed by SAP with 21 percent. Details specific to each of the demographic/ overview questions can be found in the Appendix.

The remaining 11 questions measured our three constructs. The ability of the instrument to measure these variables was tested by assessing the construct validity of each variable through exploratory factor analysis (CFA) and Cronbach’s alpha.

The dimensionality of the items was examined using principle component factor analysis with a Varimax rotation. A ratio of five samples for each variable in a single factor analysis is recommended (Hair et al. 1998). With 11 variables the necessary sample size is 55, so the sample size of 112 is sufficient. Items having factor loadings of more than 0.5 on the construct they are expected to load can be considered good measures for that construct. Items having factor loadings of more than 0.45 on constructs other than their expected loading are considered cross-loading items.
The results of the exploratory factor analysis are displayed in table 2. Questions 4, 5 and 8 exhibited significant cross-loading, and after analysis were dropped as poor measures of the targeted constructs. Nunnally and Bernstein (1994) suggest that three measurement items per construct are suggested for reliability. Although removing item 8 left Perception of Importance to Industry with only two items, they loaded strongly.

Table 2 – Exploratory Factor Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>.876</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>.790</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>.843</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q6</td>
<td></td>
<td>.281</td>
<td>.887</td>
</tr>
<tr>
<td>Q7</td>
<td></td>
<td>.844</td>
<td></td>
</tr>
<tr>
<td>Q0</td>
<td>.698</td>
<td></td>
<td>.370</td>
</tr>
<tr>
<td>Q10</td>
<td>.814</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q11</td>
<td>.765</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

As discussed earlier, three question groups were established. Cronbach’s alpha was used as a measure of internal consistency of these question groupings. If consistent, the average response of the groups’ questions was to be used in analysis. Table 3 provides a listing of group, question number, and their initial Cronbach’s Alpha.
Table 3 – Cronbach’s Alpha Values

<table>
<thead>
<tr>
<th>Group #</th>
<th>Group Name</th>
<th>Question #</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Usefulness of ERP</td>
<td>1,2,3</td>
<td>.765</td>
</tr>
<tr>
<td>2</td>
<td>Perceptions of ERP’s importance to industry</td>
<td>6,7</td>
<td>.780</td>
</tr>
<tr>
<td>3</td>
<td>Desire for ERP enabled course work</td>
<td>9,10,11</td>
<td>.709</td>
</tr>
</tbody>
</table>

Table 3 – Initial Cronbach’s alpha values by question group

An alpha value greater than .7 indicates internal consistency reliability of the question group (Peterson, 1994), and all variables met that criteria.

The variables were converted to a covariance matrix and analyzed using the LISREL structural equation modeling tool. The model is shown in Figure 1.

Figure 1 – LISREL Full Model

The LISREL model converged and provided the fit indicators shown in table 4:
Table 4 – Comparative Fit Indices for Full Structural Model

<table>
<thead>
<tr>
<th></th>
<th>Full Model</th>
<th>Recommended</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$/df</td>
<td>1.10</td>
<td>$\leq 3.0$</td>
<td>Bollen, 1989</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.030</td>
<td>$\leq 0.1$</td>
<td>Byrne, 2001</td>
</tr>
<tr>
<td>GFI</td>
<td>0.96</td>
<td>$\geq 0.90$</td>
<td>Gefen et. al, 2000</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.91</td>
<td>$\geq 0.80$</td>
<td>Gefen et. al, 2000</td>
</tr>
<tr>
<td>CFI</td>
<td>0.99</td>
<td>$\geq 0.90$</td>
<td>Simon &amp; Paper, 2007</td>
</tr>
<tr>
<td>NFI</td>
<td>0.94</td>
<td>$\geq 0.90$</td>
<td>Gefen et. al, 2000</td>
</tr>
<tr>
<td>NNFI</td>
<td>0.99</td>
<td>$\geq 0.90$</td>
<td>Simon &amp; Paper, 2007</td>
</tr>
<tr>
<td>IFI</td>
<td>0.99</td>
<td>$\geq 0.90$</td>
<td>Bollen, 1990</td>
</tr>
</tbody>
</table>

All reported fit indicators met or exceeded recommended values, indicating that the model is a good fit.

The results of the LISREL analysis showed that the Perceived Importance (H₁) measure positively influenced Desire to Seek Coursework ($=3.91$, $=0.55$, $p=0.000$), while Perceived Usefulness (H₂) was only significant at the 0.1 level ($=1.34$, $=0.16$, $p=0.091$). Both hypotheses are supported.

Discussion of Results

While both Perceived Importance and Perceived Usefulness were found to be significant, the stronger performance of Perceived Importance supports our contention that students actively seek coursework that will improve their job gaining potential. This finding continues to support previous literature that students in general seek college experiences
that improve their job market potential. It seems clear, that if provided with an ERP option, students will take advantage of the opportunity.

Since students lack industry experience, it likely that their perception of usefulness is limited; students do not yet appreciate the value that ERP can provide to their future employment. This contextual shortfall explains the poorer strength of support for our second hypotheses. It is likely that this is simply a function of experience. As students become better versed in the intricacies of the work place, and better understand their roles and responsibilities, their appreciation for the usefulness of their ERP skill set may change.

**Future Research**

We believe that this research is a precursor to a rich research stream with pertinent findings for our discipline, and that a number of opportunities exist for further study. First, with IS enrollment still well below previous levels, better understanding how students select IS coursework may improve the disciplines ability to communicate relevant information for this critical decision process. Second, the actual information to be presented to students is still an unknown commodity. Refining this criteria information will be of benefit to both students and the discipline. Third, understanding how students receive their information will allow the discipline to better target these information sources. Forth, curricula can be better tuned to meet student needs and leverage institution resources.

**Concerns/Limitations**

While appropriate for this study, the perspective that was reviewed is rather narrow. Focusing on skill usefulness and industry importance is limited, but illustrated that student desire for course work is influenced by job market desires. Scale development is needed for
these constructs as well as broadening the range of desired coursework antecedence. A broader view of ERP and its impact on desired coursework is needed.

Conclusion

While exploratory, this study has highlighted the potential relationships between Perceived Importance of ERP and the desire to seek course work, as well as the Perceived Usefulness of ERP skills and the desire for course work. We’ve shown that students do use Perceived Usefulness of skills and Perceived Importance to industry when identifying desired coursework. This first step to instrument development will hopefully start a broader research stream into the antecedent behavior of IS majors in selecting ERP coursework, and more broadly IS coursework. With low enrollment levels, the IS discipline must look at how our majors (both future and declared) select coursework. IS Educators can leverage these relationships to improve enrollment and improve the job prospects of our students. More research in this area is necessary.
References


Appendix

SURVEY

Participation is completely voluntary, and you may decline to answer any particular question that you are uncomfortable with or feel is not appropriate. Returning the survey back to the study representatives will indicate that you have given your consent for us to use the survey data as described in this paragraph.

A. How old are you? ______ (in years)
B. Gender? (circle one) Male  Female
C. What is your major? (circle one)
   • Accounting
   • Accounting Control Systems
   • BCIS
   • Decision Science
   • Decision Technology
   • Economics
   • Entrepreneurship
   • Finance
   • Information Technology
   • Insurance
   • Logistics and Supply chain management
   • Management
   • Management Science
   • Marketing
   • Production / Operations Management
   • Real estate
   • Other
D. What is your classification? (circle one)
   Freshman  Sophomore  Junior  Senior  Graduate
E. Please circle any of the following software packages that you may have heard of. (circle all that apply)
   Siebel  PeopleSoft  JDEdwards  SAP  Whiteplains  Ariba
F. On average, how often do you use [ERP/ES system name]? (circle one)
   Never  Multiple times  Once a day  2 – 4 times per day
   a week  2 – 4 times a week  2 – 4 times a month  2 – 4 times a semester
G. What functionality do you use on [ERP/ES system name]? (circle all that apply)

- Accessing Grades
- Course registration
- e-mail access
- Financial aid
- Information searching
- Requesting transcripts
- Student accounts
- Student accounts (payments)
- Other

The following questions used a 5-point likert scale. Strongly Agree to Strongly Disagree.

1. Using [ERP/EIS system name] has made the maintenance of my course schedule easier.
2. Using [ERP/EIS system name] has made the maintenance of my student accounts easier.
3. The functionality of [ERP/EIS system name] allows me to be more proactive with my course schedule and student accounts.
4. I have heard/read about ERP/EIS systems in the popular media (e.g. network/cable news, newspapers, periodicals, etc...).
5. I believe that the data I manage via [ERP/EIS system name] is of better quality than if someone else managed/entered it for me.
6. I believe that other organizations besides UNT use ERP/EIS technology to support their employees and business needs.
7. I believe employers value new hires that know and understand ERP/EIS.
8. The ERP/EIS enabled course would look better on my resume.
9. By taking a number of these ERP/EIS enabled courses; I could improve my starting salary for my first job.
10. Academic advising on ERP/EIS related courses would be valuable to me.
11. I would join a student group that discussed and explored ERP/EIS issues.