Market Power of ERP Education – An Investigative Analysis

James Sager
James Mensching
Gail Corbitt
James Connolly
Department of Accounting and Management Information Systems
California State University, Chico
Chico, California, USA
JSager1@csuchico.edu JMensching@csuchico.edu

ABSTRACT

This study tracks the marketability of the graduates from the College of Business at California State University Chico (CSUC), a leader in ERP education in the U.S., and compares the salaries obtained by students who graduated with and without extensive ERP skills. Our findings indicate that students graduating with an extensive ERP background have consistently obtained higher salaries than students without this background. This effect was somewhat more pronounced before the bursting of the E-commerce bubble, but remained in effect after the bubble burst. A curious finding from this study is that, for students having extensive ERP skills and both before and after the bursting of the bubble, those with lower GPA's actually received marginally higher salary offers than those with considerably better GPA's. This was not the case for students without extensive ERP skills. Our conclusion is that at CSU Chico there is significant market power which accrues to students graduating with extensive ERP skills. Hence, from a student employment or market power perspective, the ERP curriculum has been a success.

Keywords: ERP Systems, ERP Education, SAP R/3 Instruction, Salaries

1. INTRODUCTION

ERP systems have been used in the academic world for almost a decade and many stories have been told about the early success of ERP education at the university level. However, little objective evidence has been presented to support these claims. The extension of ERP systems beyond the boundaries of the company (termed ERP II) makes the expansion of ERP to include ERP II in university education a natural progression of the present curriculum. This extension demands a substantial investment of resources. The question of the effectiveness of the present ERP curriculum needs to be answered in order to justify the move to even more sophisticated systems. This is particularly true in light of the dramatic changes in the IT employment landscape that have occurred since the bursting of the E-commerce bubble a few years ago.

There have been numerous articles describing the use of ERP systems in the business and academic environments (Watson & Schneider 1999; Corbitt & Mensching 2000; Becerra-Fernandez, Murphy & Simon 2000; Hawking, Ramp & Shackleton 2001; Joseph & George 2002). The authors of these articles cite the success of the programs that use ERP systems and the benefits to the students. With one notable exception, however, these works are primarily descriptive in nature and do not present quantitative evidence as to that success.

In this paper we track the students at one university from the introduction of ERP into the curriculum in 1996 and analyze the differences between the salary offers made to students with a substantial ERP background versus students lacking an in-depth ERP education. Depth of ERP background was determined by the coursework that a student successfully completed. If the student participated in at least one course which presented an in-depth, as opposed to introductory, use of SAP, the student was deemed to have an extensive or deep ERP background. (This is defined further in section 7, 'The Research Study')

2. BRIEF HISTORICAL VIEW OF ERP EDUCATION

Historically, the organization of business school curriculum has reflected the organization of work in commercial

enterprises (Porter & McKibben, 1988). By and large, corporations have organized work around functional areas or "silos" (Manufacturing, Sales, Accounting, Finance, Service, etc.) based on an assumption that focusing attention on the performance of each functional area will lead to the highest level of performance in the overall organization. Unfortunately, the individual silos rarely share common goals, performance measures, or criteria for managing their activities. Thus, local optimization in each functional area can easily lead to suboptimal performance for the organization as a whole.

Over the past several decades, many theories of business and organizational management have been developed that acknowledge the role of technology in organizational activity. As early as 1961, Forrester (1961:46) proposed that computers could be applied to "the design of policies to integrate the separate functions of the business." In 1967, the concepts of business process reengineering (BPR) through functional process and data integration were introduced (Head, 1967). Although process and data integration was theoretically possible, the computer hardware and software of the time was simply not capable of handling the data storage and information processing demands required to implement the theory in real-world organizations.

Over the past two decades, however, developments in database technology and the rise of client-server computing have provided a platform upon which to build integrated, enterprise-wide, Enterprise Resource Planning (ERP) systems that "enable the integration of transaction-oriented data and business processes throughout an organization" (Markus, et al. 2001). For most companies, the transition from legacy to ERP environments has indeed delivered many of the promised benefits of BPR and process/data integration (Hernandez 2000; Somer & Nelson 2004, Holland & Light 2001).

The commercial success of ERP systems is well established (e.g. Kumar & Hillegersberg, 2000; Haag, et al., 2006) yet business schools have been slow to adopt a comparable approach to their curricula. One reason behind this resistance to change is that most business school faculty members were trained in an environment which demands specialization and in which interdisciplinary knowledge is rarely valued or rewarded. It is natural for those faculty members to propagate business curricula which are organized around functional specialties. However, if businesses use ERP systems to provide integration, perhaps these same tools can be employed for a similar purpose in an academic setting (Corbitt & Mensching 2000). Instead of confronting a difficult and politically sensitive restructuring of an entire curriculum (Joseph & George 2002; Corbitt & Mensching 2000), some academics have decided to simply follow the lead of business and introduce ERP systems into their courses.

3. INTRODUCTION OF ERP SYSTEMS INTO THE ACADEMIC REALM

While academics were contemplating the use of ERP systems, ERP vendors were also thinking about the introduction of their systems into the academic world. At that time, there was a critical lack of personnel having ERP skills. The ERP vendors believed that a melding of academic theory and ERP practice would be beneficial to the further development of their products. SAP was the first company to offer their ERP system to universities for use in the classroom. In 1996, SAP introduced their Academic Alliance Program. In that year, only two universities joined the alliance and introduced ERP into their curriculums. The first of these two schools was CSU, Chico, the university discussed in this study. However, this was just the beginning of the trend towards schools using ERP systems in their academic programs. Table 1 shows the growth of U.S. colleges and universities in the SAP Academic Alliance Program. While other ERP vendors have similar academic programs, SAP has been the leader in this area.

Year Joined	New Members	Cumulative Members
1996	2	2
1997	6	8
1998	24	32
1999	33	65
2000	5	70
2001	6	76
2002	9	85
2003	12	97
2004	13	110
Source: SAP Academic Alliance Program		

Table 1. SAP Academic Alliance Membership

The growth of membership in the Academic Alliance can be partially attributed to lowered barriers to entry since the first years. Early adopters of ERP education needed to supply all of the technical resources to operate the ERP systems as well as train the faculty and revise curriculum. For later adopters, however, the Academic Alliance provided both a hosted environment and canned curricular materials. At the time of this writing, the fee to join the alliance and access hosted systems is a modest $8,000 USD per year.

SAP's goals for the Academic Alliance Program (as stated by SAP at the October 2004 meeting of the Academic Advisory Board) were to (1) provide value through an influential and expanding program that presents a positive corporate image for SAP AG, (2) provide job-ready graduates to SAP, SAP customers and partners, (3) create and maintain a good corporate citizen image with the business community at large, (4) get faculty involved in what SAP calls the mind share for corporate research, and (5) increase their customers base over the long run. While the goals of educational institutions are substantially different from those of ERP vendors, these two sets of goals are not incompatible. The introduction of ERP into the curriculum allows colleges and universities to use ERP systems as hands-on, practical applications of the business process flow

and data and process integration concepts that many students struggle to comprehend.

4. EXPANDING THE CURRICULUM BEYOND ERP

While these early efforts to introduce ERP into the curriculum have generally been deemed a success (Watson & Schneider 1999; Corbitt & Mensching 2000; Becerra-Fernandez, et al. 2000; Hawking, et al. 2001; Joseph & George 2002), the process is far from mature (Hawking, McCarthy & Stein 2004, Antonucci, et al. 2004). Industry has expanded their ERP systems both upstream with supply chain management systems and downstream with customer relationship management systems. This is termed ERP II (Bond, et al. 2000; Parker 2001) and the academic community is pressing to also expand their curriculum in this same direction.

The expansion of systems that go beyond the boundaries of a single company, as ERP II systems do, is a challenge not only for industry, but also for the academic world (Hawking, McCarthy & Stein 2004; Antonucci, et al. 2004). For example, two or more universities may collaborate through simulation of a global supply chain. Not only are the infrastructure demands of such an academic partnership intimidating, but the economic and technical support requirements are beyond the capabilities of many universities. In addition, the required investment in faculty training and course development can be an even bigger hurdle.

The SAP Academic Alliance Program has approached the infrastructure problem with a remote hosting solution. There are now a small number of universities that have been designated by SAP as University Competency Centers (UCCs). These schools host the infrastructure for other universities to use. This brings economies of scale and concentrates the technical expertise in a few schools. Schools hosted by the UCCs are charged a modest fee (the above mentioned $8,000 USD) for these services. As of this writing, there are five UCCs located in the United States and a total of ten world-wide.

The second problem of faculty training and class preparation is a more complex issue. The SAP Alliance has helped to mediate this problem with faculty workshops and classroom materials that are made available to all schools in the alliance. This leverages the work of the early adopters, making the introduction of ERP materials into schools entering the alliance much easier.

However, before most schools expend the resources necessary to expand their ERP programs, the natural question to ask is one concerning the success of the base ERP programs. Numerous articles have presented descriptions of the success and the benefits of individual ERP curriculums at specific institutions (Watson & Schneider 1999; Becerra-Fernandez, et al. 2000; Hawking, et al. 2001; Joseph & George 2002). However, only one of the earliest studies presents empirical data to illustrate the success of the program (Corbitt & Mensching 2000) and this study presented only descriptive statistics.

5. ANALYSIS OF ONE ERP PROGRAM

The first university in the United States to join the SAP Academic Alliance Program and the first school in the U.S. to offer UCC services is California State University, Chico. ERP was introduced into the curriculum in 1996. An article about this program that was published in 2000 (Corbitt & Mensching 2000) provided salary data for the first three years of the program and showed that graduates with ERP-intensive educational backgrounds were significantly more marketable. The current paper is a follow-up study that tracks all graduates of the MIS and Accounting programs since the inception of the ERP initiative at CSUC and compares the market power of students with an ERP-intensive background to students without that background.

The following data illustrate the degree to which ERP has penetrated the academic curriculum at CSU Chico. In the Spring 2004 semester, 1000 SAP accounts were established for 585 individual students using the SAP system in their classes. The difference between the number of accounts and number of students is due to students enrolled in multiple SAP-based classes during the semester. These numbers continue to grow. In the Fall 2004 semester, 1100 SAP accounts were set up for 700 individual students. Currently, fifteen faculty members (27% of total) participate in delivering 21 individual courses that include an ERP component; 6 in MIS, 6 in Accounting, 6 in Supply Chain Management, and 1 each in Finance, Marketing, and Management.

The scope of the UCC hosting service at CSU Chico is also expanding. For the 2003-2004 school year, 12 external U.S. universities with a total of 1081 external student accounts were hosted. For the present (2004-2005) school year, 14 external U.S. universities with 1820 external student accounts are being hosted. In addition, the UCC began hosting 9 non-U.S. universities this year – 5 located in India and 4 in Mexico and South America. Finally, the CSU Chico UCC hosts the SAP Academic Alliance help desk which supports 150 Alliance universities. As the above data illustrate, interest in ERP systems is not only growing at CSU Chico, but the demand by external schools for this service is also growing. While it is common wisdom that success breeds more success, evidence for the success of ERP in the curriculum is not irrefutable based on these statistics alone.

Hence, in the remainder of this paper we investigate the effectiveness of ERP education from the perspective of the graduates seeking employment and the salaries they command upon graduation.

6. FOLLOW-ON STUDY OF ERP SKILLS AND MARKET POWER

The original CSU Chico graduate salary study was done under very different economic and market conditions. The period of that study - from 1996 to the end of 1998 - was a

period of phenomenal demand for information system professionals. That study showed that the students having deep ERP skills commanded a salary base premium of about $10,000 over the students not having these skills. The ERP skills were thus deemed to have substantial market power.

The economic downturn which accompanied the bursting of the E-commerce bubble dramatically changed the information systems employment market (Martinson & Elliott 2000, Baertlein 2000). Students struggled to get job offers and the number of employers recruiting graduates dropped precipitously. Also, highly-paid, experienced ERP consultants and employees were being laid-off during this time.

The primary research question we address in this study is whether or not the graduates with significant ERP skills have maintained the differential in market power that was demonstrated in the earlier study. This is an important research question since it affects student recruitment and may also influence the direction of curriculum development. In this study we test the following hypotheses:

H1: Graduates with an ERP-intensive education receive higher salary offers than those without.

H2: There is no significant difference in the salary differential offered to students with an ERP-intensive education who graduated in years 1997-2000 (pre-bubble) and those who graduated in 2001-2005 (post-bubble).

Numerous studies have established a significant correlation between performance in post-secondary education, as measured by grade point average (GPA), and the earnings of graduates. The Jones and Jackson (1990) study found that each full point increase in GPA was associated with an 8.9 percent increase in earnings where the Thomas (2000) study reported a 6 percent increase. In order to control for the anticipated effect of GPA on salary offers, GPA was included as an independent variable in our research model. In addition to the above hypotheses, we also tested the hypothesis that GPA was positively correlated with salary.

H3: Higher GPA's are positively associated with higher salary offers.

In addition to GPA, the positive relationship between participation in cooperative education programs and starting salaries is similarly well established (Gardner, et al., 1992; Blair, 2004). It is commonly acknowledged that compensation levels are partially determined by experience (Medhoff & Abraham, 1980), thus organizations that hire their own (or other organizations') co-op students or interns are likely to offer a premium based on the students' work experience. The current study does not control for co-op or internship participation. At CSU Chico, approximately 30% of MIS and 22.5% percent of Accounting students report having had at least one internship prior to graduation. Students who have completed ERP-intensive coursework become very attractive candidates for and do receive internships appointments. It is therefore likely that the population of students who aggressively pursue ERP education largely overlaps the population of internship recipients. It would be informative to examine the relationship between ERP coursework, co-op or internship assignments, and starting salaries; however, the present study does not do so.

7. THE RESEARCH STUDY

Our study covers the period from the graduation of the first ERP-trained students from our program (Spring 1997) to the most recent set of graduates (Spring 2004). A portion of the data used in the study was originally solicited by the career planning and placement (CPP) office at CSU, Chico and is self-reported. The CPP office requests that graduates provide information on the offers they receive, including the names of companies making offers and the salaries offered. Not all graduates use the CPP office to procure employment and not all students who use placement services provide the requested information. However, a large proportion of the students do use placement and also report their salary offers.

The validity of self-reported data is always a question of interest. Since the salary offers made by companies are confidential, absolute verification of this data is problematic. However, as many of the faculty members were directly involved with firms' placement efforts (i.e. the firms contacted the faculty members directly in order to recruit students), many of the reported offers are known to be valid. In addition, company representatives often discuss starting salary ranges with the faculty and these ranges are in general agreement with the self-reported data.

These self-reported employment data were next merged with transcript data designating what courses a student completed. The course data was used to determine which students had what we defined as an "ERP-intensive" background. At CSU Chico all graduates from the College of Business are exposed to ERP systems in the Introduction to Information systems course. Students work a series of exercises that show how a large enterprise system such as SAP supports integrated end-to-end business processes such as order to cash, order to pay, production planning and execution and HR recruitment to hire.

In addition, however, some students opt to take one or more elective ERP (SAP) related classes that have more depth. For example, we have courses in 1) SAP configuration where students configure plain vanilla SAP to support a fictitious global business, 2) SAP systems administration where students support a large system from the database and basis perspectives, and 3) enterprise application integration where students connect multiple SAP systems to work together. Hence, if a student completed one of these more in-depth courses, then that student was designated as having an "ERP-intensive" background.

Our definition of an ERP-intensive class can be considered subjective. However, when recruiters come to Chico looking for SAP graduates they look for students who have one or more of these elective classes. The ERP-intensive classes

involve substantial work on the SAP system and require a deep understanding of the business configuration or the technical inner-workings of SAP. Other classes that use SAP to illustrate specific points of business functionality, such as how journal entries are posted or how goods are ordered, etc, are not considered ERP-intensive.

7.1 Descriptive Statistics

There are a total of 421 students involved in our study. Descriptive statistics by semester of graduation are shown in Table 2. The number of graduates for the MIS program in Business is included so there can be a comparison of the number of students in the study with the potential number of students. Unfortunately participation in placement center activities is voluntary and students can belong to the placement center up to one year after graduation. Thus the percentages are only presented primarily to provide an estimate of the sample size for those students who got offers. When the job market was poor (as with post 2001), the number of students who got offers dropped. There are no data available to determine the number of students who used the placement center compared to the total number of graduates.

A casual analysis of the salary data in Table 2 reveals that there is a distinct change in the salary structure between the Fall 2000 semester and the Spring 2001 semester. Prior to the Spring 2001, there is a steady increase in all salaries, both for those students with and those without extensive ERP experience. This dramatic drop in salaries is not a surprise since this is the point in time when companies recruiting our students experienced the effects of the E-commerce bubble bursting. Figure 1 illustrates the precipitous collapse of some of the star E-commerce companies during this period.

This leads to the conjecture that the salary data may exhibit two different trends, a pre-bubble trend and a post-bubble trend. The present study is concerned with the overall relationship of ERP education to salary data. Hence, if the ERP effect is constant over this period, then normalization of the salary data should disclose the ERP relationship. However, if the ERP relationship is significantly different pre and post-bubble, then there is a need to split the data into two groups.

7.2 Regression Analysis

Our initial regression model tested a prediction equation with salary offer as the dependant variable and GPA, ERP skills (SAP), and pre- and post-bubble status (Bubble) as independent variables. Both SAP and Bubble were coded as categorical variables with +1/-1 indicating lack/presence of significant ERP skills and graduation in the pre/post-bubble timeframe. The results of this analysis are presented in Table 3. In our dataset, the average salary across all 421 observations was $47,000 (std. dev. = 9,950) and the average GPA was 3.00 (std. dev. = 0.40).

Both SAP and Bubble exhibit significant correlation with salary. Hypothesis H1, that graduates with an ERP-intensive education receive higher salary offers than those without, is strongly supported. Because the GPA predictor approaches significance at the $p<.05$ level, there is only weak (if any) support for hypotheses H3, that higher GPA's are positively correlated with higher salary offers. Our second hypothesis (H2), that the salary differential paid to students with an ERP-intensive education remained essentially unchanged between pre and post-bubble periods, is not addressed in this analysis.

Although Bubble is quite significant, this simply indicates that the average salary offer made prior to the e-commerce bubble differed significantly from the average of offers which followed. In fact, the analysis indicates that salary offers before the bubble burst were, on average, $4,215 higher.

To adequately test hypothesis H2, we need to examine whether there is a significant effect in the interaction of SAP and Bubble on Salary when controlling for GPA. We performed this analysis using a 2x2 between-subjects analysis of variance with SAP and Bubble as our fixed factors and GPA as a covariate. The results of the ANOVA are presented in Table 4. Because the SAP*Bubble interaction is non-significant, we are unable to disconfirm hypothesis H2. Thus we are confident in concluding that the SAP salary differential remained essentially unchanged between the two time periods.

Because time period by itself was significant in our original analysis, we next performed three individual regressions: one with data before the bubble, one with data after the bubble, and one with all periods of data. To get a finer grained picture of the effect of students' semester of graduation on salary, a continuous variable, Period, was substituted for Bubble. In coding Period, the value 1 represents Spring 1997, 2 represents Fall 1997, 3 represents Spring 1998, and so on through 15 representing Spring 2004. Table 5 shows the results of the three regressions.

This third set of results again indicates that extensive ERP skills command significant market value. Before the bubble burst, the value of ERP-intensive studies was approximately $5,450 per student. During this period salaries were increasing at the astonishing rate of $1,732 per semester and each point of GPA was, on average, worth $1,534. Since the Dot Com crash, the value of ERP-intensive skills has been approximately $5,250 per student (only $200 less than the pre-bubble salary differential) and remains statistically significant. During this later time period, average salaries were declining at the rate of $812 per semester and student grade point average had a greater affect on salary offers with each additional point in GPA being worth $2,515. Across all periods, students with extensive ERP skills were rewarded with salary offers that were, on average, roughly $5,750 higher than those tendered to their non-ERP skilled peers.

Although GPA was correlated at the $p<0.05$ level in the combined data, one surprising result is that GPA was not reliably correlated with salary in either of the separate pre or post-bubble subsets of the data. This begs additional analysis and thus we ran additional regression models after first dividing the data set along our primary dimensions of interest; (1) students with ERP-intensive skills and those without, and (2) students graduating prior to the e-commerce

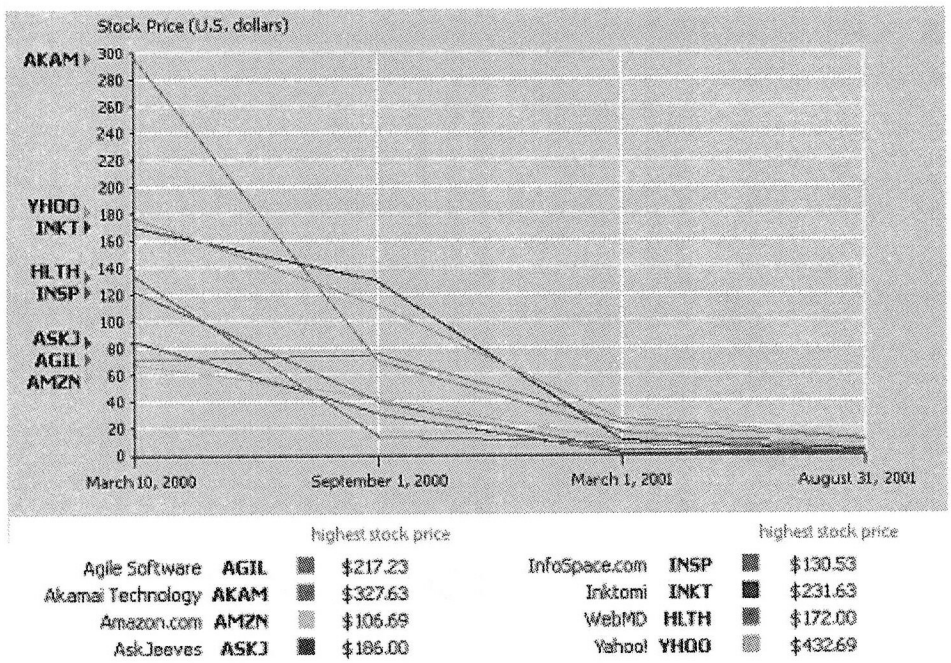
	ERP-Intensive?							
	No		Yes		Total			
Period (a)	Salary (b)	n	Salary	n	Salary	n	MIS Grads	Percent Placed (c)
S97	$38,065	35	$52,000	8	$40,657	43	43	100.00%
F97	$44,455	11	$51,600	18	$48,890	29	33	87.90%
S98	$41,368	19	$52,650	8	$44,711	27	59	45.80%
F98	$45,425	13	$50,143	21	$48,339	34	48	70.80%
S99	$40,513	9	$48,776	18	$46,022	27	65	41.50%
F99	$52,125	16	$55,372	14	$53,640	30	63	47.60%
S00	$51,349	30	$54,564	16	$52,468	46	86	53.50%
F00	$56,435	17	$54,860	10	$55,852	27	53	50.90%
S01	$44,036	15	$53,317	18	$49,098	33	96	34.40%
F01	$41,667	14	$55,100	5	$45,202	19	53	35.80%
S02	$41,503	16	$45,057	14	$43,162	30	90	33.30%
F02	$38,000	4	$50,333	3	$43,286	7	58	12.10%
S03	$37,329	17	$42,500	13	$39,570	30	59	50.80%
F03	$44,444	9	$42,500	6	$43,667	15	48	31.30%
S04	$43,856	18	$47,750	6	$44,829	24	55	43.60%
Total:	$44,363	243	$50,589	178	$46,995	421	909	46.30%

(a) Summer graduates are included in the subsequent Fall number.

(b) Salary figures are the mean of the highest offer for each graduate in $USD

(c) Percent Placed is the percentage of students in the study who reported getting employment offers through the job placement center.

Table 2. Descriptive Statistics by Semester of Graduation



Source: Microsoft® Encarta® - "The Internet Bubble"

Figure 1. Bursting of the E-Commerce Bubble

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
N=421	(Constant)	40589.67	3339.05		12.156	.000
F=26.061	GPA	2103.16	1095.78	0.089	1.919	.056
Sig.=.000	SAP	2867.96	447.18	0.297	6.413	.000
	Bubble	-2107.75	442.77	-0.214	-4.76	.000

Table 3. Regression Analysis: Initial Model, All Data

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	(a) 6047221027.2	4	1511805257	19.499	.000
Intercept	11425677422.0	1	11425677422	147.365	.000
GPA	284769104.0	1	284769104	3.673	.056
SAP	2995813827.9	1	2995813828	38.639	.000
Bubble	1705122339.3	1	1705122339	21.992	.000
SAP * Bubble	1276.3	1	1276.3	.000	.997
Error	32253883111.9	416	77533372.9		
Total	968103805470.0	421			
Corrected Total	38301104139.1	420			
(a) R Squared = .158 (Adjusted R Squared = .150)					

Table 4. Univariate Analysis of Variance: Tests of Between-Subjects Effects

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1997-2000	(Constant)	33,951.12	3,748.16		9.058	.000
N=263	GPA	1,534.71	1,257.77	.065	1.220	.224
F=44.053	SAP	5,454.94	947.84	.303	5.755	.000
Sig.=.000	Period	1,732.08	191.26	.460	9.056	.000
2001-2004	(Constant)	44,129.55	6,084.97		7.252	.000
N=158	GPA	2,515.91	1,746.57	.113	1.440	.152
F=7.275	SAP	5,258.86	1,570.38	.260	3.349	.001
Sig.=.000	Period	-812.56	371.14	-.170	-2.189	.030
Combined	(Constant)	38,709.66	3,379.49		11.454	.000
N=421	GPA	2,290.33	1,124.34	.097	2.037	.042
F=18.256	SAP	5,746.54	916.78	.298	6.268	.000
Sig.=.000	Period	-142.94	104.47	-.063	-1.368	.172

Table 5. Regression Analysis: Pre-Bubble, Post-Bubble, All Data

bubble bursting and those graduating afterwards. Table 6 shows the results of these regressions.

Again, these statistics are illuminating. Both sets of data for students with ERP-intensive backgrounds show little, if any correlation between GPA and salary. If anything, GPA is weakly negatively correlated after the bubble burst. However, for students lacking extensive ERP backgrounds, GPA is significant at the <0.05 level before the bubble burst and significant at the <0.01 level after the bubble burst.

In order to compare the salary data across all periods, a final set of regressions was performed which attempt to predict normalized salaries from GPA and ERP experience. Because salary offers for each recruiting period vary markedly in regards to both central tendency and dispersion, a normalized salary was computed for each observation by starting with the overall salary mean ($47,004) then adding an amount

equal to the overall standard deviation ($9,565) multiplied by a z-score computed for each individual salary based on within period means and standard deviations. Table 7 displays the results of regressing GPA on the normalized salary data. The following salary prediction equations result from the regression analysis outlined in table 7:

(ERP=Yes) expSal = 55,865 + (gpa * -1,740)
(ERP=No) expSal = 30,269 + (gpa * 4,877)

Using these formulas, we computed expected salary figures and an SAP differential for GPAs at quarter point increments from 2.00 to 4.00. These calculations are presented graphically as Figure 2 and outlined in Table 8.

8. INTERPRETATION OF THE STATISTICS

The above analyses show that there is a salary benefit that accrues to students with an ERP-intensive background. To date, the market power of an ERP education has proven to be significant. While this market power was slightly more significant prior to the E-commerce collapse, it still remains statistically significant after the collapse.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1997-2000 ERP=Yes	(Constant)	52,257.87	6,596.71		7.922	.000
F=0.000, Sig.=.988, N=113	GPA	-32.01	2,092.59	-.001	-.015	.988
1997-2000 ERP=No	(Constant)	34,603.18	5,723.32		6.046	.000
F=4.015, Sig.=.047, N=150	GPA	3,892.40	1,942.64	.163	2.004	.047
2001-2004 ERP=Yes	(Constant)	57,242.99	7,605.84		7.526	.000
F=1.558, Sig.=.217, N=65	GPA	-3,031.31	2,428.19	-.155	-1.248	.217
2001-2004 ERP=No	(Constant)	23,121.51	6,974.28		3.315	.001
F=7.282, Sig.=.008, N=93	GPA	6,374.20	2,362.16	.272	2.698	.008

Table 6. Analysis of GPA by Category and Time Period

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1997-2004 ERP=Yes	(Constant)	55,865.18	5,550.13		10.066	.000
F=0.975 Sig.=.325	GPA	-1,740.03	1,762.50	-.075	-.987	.325
1997-2004 ERP=No	(Constant)	30,269.97	4,180.25		7.241	.000
F=11.834 Sig.=.001	GPA	4,876.97	1,417.71	.216	3.440	.001

Table 7. Analysis of GPA by Category on Normalized Salary Data

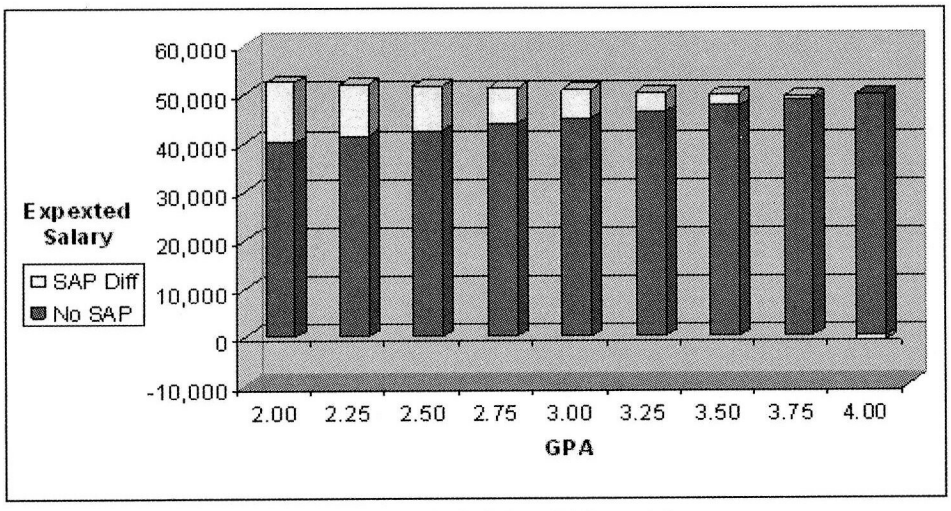


Figure 2. The SAP Salary Differential

	Expected Salary		SAP
GPA	Non-SAP	SAP	Differential
2.00	40,023	52,385	$12,362
2.25	41,242	51,950	$10,708
2.50	42,462	51,515	$9,054
2.75	43,681	51,080	$7,399
3.00	44,900	50,645	$5,745
3.25	46,119	50,210	$4,091
3.50	47,339	49,775	$2,437
3.75	48,558	49,340	$782
4.00	49,777	48,905	-$872

Table 8. Expected Salaries for SAP Trained and Non-SAP Trained Graduates

At first glance the results concerning the relationship between market power and GPA are puzzling. For the period prior to the E-commerce collapse this may be understandable. At that time, many companies were very aggressive in recruiting students, some almost to the point of recklessness. In some instances, recruiters appeared willing to offer whatever salary was necessary to recruit an individual student. This was particularly true for the students with significant ERP skills.

Students without substantial ERP skills did not experience the anomalous GPA behavior. For these students, GPA has been highly correlated with salary since the e-Commerce crash but was also significantly correlated with salary prior to the collapse.

What needs explaining is that for students with ERP-intensive backgrounds, both before and after the E-commerce collapse, GPA does not correlate with salaries. This runs contrary to what a rational person might assume. There may be other factors involved that were not available for this study. For example, the size of the company making the offer, the geographic location of the company, the past work experience (including internships) of the student, degree of introversion or extroversion, interviewing savvy and negotiation skills, and other possible variables. For the most part, the recruiting companies at CSUC have been from the same geographic region and are dominated by large multi-nationals. One conjecture that we have not substantiated is that both the recruiting companies and the students regard our ERP-intensive courses as extremely difficult. Indeed, some describe these courses as being "Darwinian" in the sense that weak performers do not survive. Over time, our ERP program has built up a form of brand loyalty with employers who return semester after semester to recruit our students. These companies have often waived their stated minimum GPA requirements in order to interview and hire our lower-GPA students who, based on prior hiring outcomes, are likely to make excellent employees nonetheless.

9. FUTURE RESEARCH

The results of this analysis present an interesting look at the success of ERP systems in the university environment. This study, however, was limited to salary and grade point data from one university. One question that immediately comes to mind is whether this same phenomenon exists at other universities. If data can be gathered from multiple universities this would necessitate a comparison of the maturity of ERP programs at each of the schools. Attempting to aggregate data across various schools mandates that only those schools which are at a similar level of ERP maturity should be compared. Hence, there needs to be a rational way to measure the level of maturity of programs before the data can be analyzed. At that point it would be possible to determine if there is a statistical correlation between maturity of an ERP academic program and the market power of the program's graduates.

Another very interesting question deals with the measurable value of ERP graduates to the companies that hire them. Many firms that are hiring employees for ERP-intensive positions have stated that the amount of money spent on training of newly hired employees and the amount of time that it takes for these employees to be fully productive is substantially less for students who have an extensive ERP educational background. It would be interesting to evaluate the economic value of ERP graduates to the companies that hire them. It would also be interesting to determine if particular types of ERP coursework backgrounds have more economic value to hiring companies.

Gathering empirical data on the value of ERP students from both the student and company points of view can be extremely useful to both the universities and the companies. For the university, this information can be used to cost justify programs and to also analyze the appropriate allocation of resources. In addition, the information can be used to recruit and advise students.

This information can also be beneficial for recruiting companies. The allocation of recruiting resources and determination of salary offers could be influenced by these findings. In fact, several of the companies that recruit at Chico, such as Chevron-Texaco, HP, SAP Labs, etc. have requested these results.

Lastly, this type of information helps build tighter bonds between the academic and business worlds. Most companies are more than willing to support university programs that provide them a measurable benefit.

10. CONCLUSION

Our data supports the contention that graduates possessing extensive ERP skills have significant market power. This market power was marginally greater prior to the bursting of the E-commerce bubble, but still remained significant afterward. This helps confirm the success of the ERP curriculum at CSU Chico and indicates that building on this

success by further developing the curriculum to embrace ERP II concepts should be a reasonable undertaking.

The authors feel that even though these are results from a single university, since the curricular approach to ERP education in other universities is similar, those schools should exhibit similar success. It is also a strong indicator that employers value ERP skills and are willing to compensate students for these skills. For universities not imbedding ERP learning in their curriculum, this study may indicate the value to the graduates of adopting such an approach.

11. REFERENCES

Amoako-Gyampah, K and Salam, A. F. (2004), "An Extension of the Technology Acceptance Model in an ERP Implementation Environment." Information and Management, Vol. 41, No. 6, pp. 731-745.

Antonucci, Y, Corbitt, G, Stewart, G and Harris A (2004), "Enterprise Systems Education: Where are we? Where are we going?" Journal of Information Systems Education, Vol. 15, No. 3, pp. 227-234.

Baertlein, L (2000), "Take my high-tech job, please As Internet workers ride out the layoffs the repertoire of gallows humor grows." Seattle Times, Seattle, Wash., Dec 29, 2000, pg. C2.

Becerra-Fernandez, I., Murphy, K. E. and Simon, S. J. (2000), "Integrating ERP in the Business School Curriculum." Communications of the ACM, Vol. 43, No. 4, pp. 39-41.

Blair, B. F. (2004), "The Impact of Cooperative Education on Academic Performance and Compensation of Engineering Majors." Journal of Engineering Education, Vol. 93, No. 4, available at http://www.findarticles.com/p/articles/mi_qa3886/is_200410/ai_n9470229.

Bond B., Genowese Y., Miklovic D., Wood N., Zrimsek B. and Rayner N. (2000), "ERP Is Dead – Long Live ERP II." *GartnerGroup Research Note*, 4 October 2000, available at http://idatar.com/services/longliveerp2.pdf.

Clark, J.G., Walz, D.B. and Wynekoop, J.L. (2003), "Identifying Exceptional Application Software Developers: A Comparison of Students and Professionals." Communications of Association for Information Systems, Vol. 11, Article 8, pp 137-154.

Corbitt, G. and Mensching, J. (2000), "Integrating SAP into a COB Curriculum: Lessons Learned." Information and Technology Management, Vol 1, No. 4, pp. 247-258.

Davenport, T. H., Harris, J. G. and Cantrell, S. (2004), "Enterprise Systems and Ongoing Process Change." Business Process Management Journal, Vol.10, No. 1, pp. 16-26.

Forrester, J. W. (1961), Industrial Dynamics, MIT Press, Cambridge MA.

Gardner, P.D., Nixon, D. and Motschenbacker, G. (1992), "Starting Salary Outcomes of Cooperative Education Graduates," Journal of Cooperative Education, Vol. 27, No. 3, pp. 16-26.

Haag, S., Baltzan, P. and Phillips, A. (2006), Business Driven Technology, McGraw-Hill Irwin, New York, NY.

Hawking, P., McCarthy, B. and Stein, A. (2004), "Second Wave ERP Education." Journal of Information Systems Education, Vol. 15, No. 3, pp. 327-332.

Hawking, P., Ramp, A. and Shakleton, P. (2001), "IS'97 Model Curriculum and Enterprise Resource Planning Systems." Business Process Management Journal, Vol. 7. No. 3, pp. 225-233.

Head, R. V. (1967), "Management Information Systems: A Critical Appraisal." Datamation, May 1967, pp. 22-27.

Hernandez, J. (2000), SAP R/3 Handbook, 2nd Edition, McGraw Hill, New York.

Hill, S., Jr. (2004), "The Big Three [SAP, Oracle, and PeopleSoft]: market powers, distinctly different." MSI, Vol. 22, no. 5, pp. 46-48.

Holland, C. and Light, B. (2001), "A Stage Maturity Model for Enterprise Resource Planning Systems Use." ACM SIGMIS Database, Vol. 32, No. 2, pp. 34-45.

Jones, E. B. and Jackson, J. D. (1990), "College Grades and Labor Market Rewards." Journal of Human Resources. Vol. 25, No. 2, pp. 253-266.

Jones, M. C. and Price, R. L. (2004), "Organizational knowledge sharing in ERP implementation: Lessons for industry." Journal of End User Computing, Vol.16, No.1, pp. 21-40.

Joseph, G. and George, A. (2002), "ERP, Learning Communities, and Curriculum Integration." Journal of Information Systems Education, Vol. 13, No. 1, pp. 51-58.

Kumar, K., and Hillegersberg, J. V. (2000), "ERP experiences and evolution." Communications of the ACM, Vol. 43, No. 4, pp. 23-26.

Martinson, J. and Elliott, L. (2000) "Bubble bursts: The year dot.com turned into dot.bomb: Iron laws of the market bring a sharp dose of reality to the virtual business world." The Guardian, Manchester (UK), 30 December 2000, pg. 23.

Medoff, J. L. and Abraham, K. G. (1980), "Experience, Performance, and Earnings." The Quarterly Journal of Economics, MIT Press, Vol. 95, No. 4, pp. 703-36.

Parker, B. (2001), "Enterprise Commerce Management: The Blueprint for the Next Generation of Enterprise Systems." AMR Research, 1 July 2001.

Porter, L. and McKibben, L. (1988), Management Education and Development: Drift or Thrust into the 21st Century, McGraw-Hill, New York, NY.

Selen, W. (2001), "Learning in the New Business School Setting: A Collaborative Model." The Learning Organization: An International Journal, Vol. 8, No. 3, pp. 106-113.

Somer, T. and Nelson, K. (2004), "A Taxonomy of Players and Activities Across the ERP Project Life Cycle." Information and Management, Vol. 41, No. 3, pp. 257-278.

Stewart, G. and Rosemann, M. (2001) "Industry-oriented Design of ERP-related Curriculum – an Australian Initiative." Business Process Management Journal, Vol. 7, No. 3, pp. 234-242.

"The Internet Bubble", Microsoft® Encarta® Online Encyclopedia (2005), http://encarta.msn.com/media_701610607/The_Internet_Bubble.html#rev.

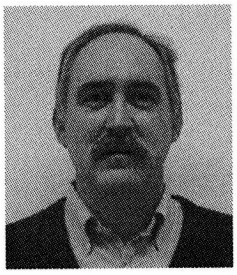
Thomas, S. L. (2000), "Deferred Costs and Economic Returns to College Major, Quality, and Performance." Research in Higher Education, Vol. 41, No. 3, pp. 281-313.

Watson, E. W. and Schneider, H. (1999), "Using ERP Systems in Education." Communications of the Association for Information Systems, Vol. 1, Article 9, pp. 1-44.

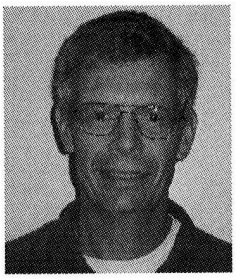
Weston, F. D. (2003), "ERP II: The Extended Enterprise System." Business Horizons, Vol. 46, No. 6, pp. 49-55.

AUTHOR BIOGRAPHIES

James Sager is an Associate Professor of Management Information Systems at California State University, Chico. Prior to completing his doctorate and joining the faculty at Chico State in 2002, James worked in industry as a financial applications developer, robotic systems software engineer, software engineering manager, and MIS manager. His current research interests include networked virtual reality, process modeling and simulation, and information retrieval.

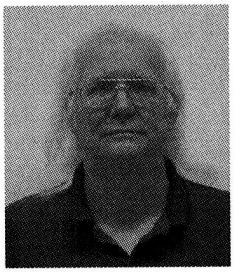


Jim Mensching, Ph.D., C.P.A., is a Professor of Accounting and Management Information Systems at California State University, Chico. He has taught MIS and accounting for over 35 years and has been involved with ERP systems since 1996 Presently, his teaching and research emphasis is on information assurance and I.T. auditing.



Gail Corbitt is a Professor and Department Chair of Accounting and Management Information Systems at California State University, Chico. Her teaching specialty is software development and ERP systems. Her areas of research and consulting include SAP/ERP implementation, Business Process Redesign, and collaborative group technology. Gail has had faculty internships at both Chevron (1997, 2002) and Hewlett Packard (10 months in 1999-2000) where she worked on SAP implementation projects. She was an SAP Distinguished Scholar for 3 years and currently serves on the Advisory Boards for the SAP Academic Alliance in the Americas and for International Programs.

James Connolly, is a Professor of Management Information Systems at California State University, Chico. His research interests are in the areas of systems analysis and design, particularly the cognitive processes of system development groups, as well as in issues surrounding Enterprise Application Integration. His current teaching areas are Java Enterprise Programming, ERP Administration, and Systems Development.



Information Systems & Computing
Academic Professionals

STATEMENT OF PEER REVIEW INTEGRITY

All papers published in the Journal of Information Systems Education have undergone rigorous peer review. This includes an initial editor screening and double-blind refereeing by three or more expert referees.

ISSN 1055-3096