

The Effect of Enterprise Resource Planning (ERP) on the Control Activities, Case Study: Steel Company

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Abstract. In the recent years, using organizational integrated systems has been foremost in organizational projects all over the world. In this respect the most significant available mean is Enterprise Resource Planning (ERP). Competitive business environments, necessity of inter and intra organizational integration and unity, and poor internal control are the key reasons of developing Enterprise Resource Planning (ERP). This paper aims to study the relation between ERP and one of the components of internal control (under the COSO), control activities, and to help the auditors to reduce time and costs of auditing related to the test of controls. It finally results in increasing the reliability of financial reporting and reasonable assurance regarding the achievement of an organization's objectives. The higher the reliability and assurance, the easier it will be for the management to make decisions and plan to reach short-term and long-term goals of the organization. This research mostly tries to focus on the financial parts of an organization and contains two main hypotheses. The first hypothesis tries to see the effectiveness of ERP implementation in an organization, and the second

Received: October 2011 ; Final Revision: July 2012

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one measures these effects on 4 different financial segments, including management accounting, cost accounting, public accounting and financial accounting. This study has been conducted as a case study and by distribution of the questionnaire in four areas of Esfahan Steel Company. In this paper we have used the T-test and ANOVA to analyze the data. According to the conducted tests, it seems clear that the ERP have influenced on control activities in all those 4 parts. However, the impacts are different in each segment.

Keywords: Enterprise Resource Planning, ERP, Internal control, Control Activities, COSO

1. Introduction

In the recent years, using organizational integrated systems has been foremost in organizational projects all over the world. Competition in business environments, necessity of inter and intra organizational unity, widespread revolution in information Technology area are the main reasons of developing Enterprise Resource Planning (ERP). By creating management and operational inter and intra organizational unity and facilitating business processes, these systems have increased operational efficiency and effectiveness of organizations and made them ready to be presented in the competitive market. Capabilities of these systems made the state, and service organizations apply them besides business sectors. This system as Davenport (1998) said, is one of the pioneers in management, the masterpiece of the present century and has been able to improve many organizations productivity and help them to achieve competitive benefits. However, there were lots of organizations who failed and couldn't use this system properly. Hence, to date a great deal of scientific articles have been published to support the necessity of achieving success in establishing these systems. One of the indicators that determines this plan's success and its advertisemental function for the sellers its internal controls. These systems have completely influenced the organization internal control. It is not only used for financial issues but also includes non-financial controls. The main characteristic of ERP systems is using control components in the organization, which reflects the foundation and infrastructure of organizations, completely. In

fact the providers who sell these plans focus on these components and characteristics in their advertisements and marketing (Morris, 2011). Control activities that are one of the components of internal control (under the COSO), are policies that assure the execution of management commands. Examples of such activities are policies that are designed against the risks which threaten reaching the goals of the entity. Being predicted either in computerized systems or in paper-based systems, control activities have various goals that are executed in different layers of an organization. Therefore, management needs to design reliable controlling information systems to run the activities in a favorable way. Furthermore, management needs proper, accurate and in-time information about the conditions of the existing systems in order to do their tasks in controlling and improving internal control systems. In other words, since the quality and efficiency of internal controls of the audited company determines how the auditors do their investigation, reliable internal control systems are important for the auditors who audit financial statements. So if the internal controls are weak, the auditors must dedicate much more time on auditing which will cost more for the company and will in turn confront management with problems in their decisions. All in all, internal control and information systems and the effects of ERP on the components of the internal control have made us measure the intensity of this impact. We should not forget that one of the measurements of the success of ERP implementation is the evaluation of the effect of the ERP on internal controls. So in this case, we would be able to analyze whether ERP is successful or not.

2. Prior Research

The purpose of this chapter is to provide a summary of relevant prior research related to this research. Section one provides an extensive review of prior research related to enterprise resource planning (ERP) systems in general. Section two presents relevant prior research on internal control. Markus et al (2000), complicate this issue further by maintaining that "success depends on the point of view from which you measure it." They conduct an extensive study, under the sponsorship of one of

the major ERP vendors, to assess the problems and outcomes of ERP implementation projects. They combine four research methods in their study, including: (1) a meta-analysis type review of published and in-process research studies and teaching cases of ERP implementations, (2) in-depth case studies of the ERP experience in five ERP-adopting organizations, (3) interviews with 11 additional ERP-adopting organizations, and (4) approximately 20 interviews with ERP implementation consultants and members of the ERP vendor company sponsoring the study. From this study, they conclude that success should be measured at three different points in the implementation process: (1) at the project phase, (2) at the shakedown phase, and (3) at the onward and upward phase. They then use three different subjective measures of success for each of these phases, and conclude that none of the companies in their study could be considered "an unqualified success" at all three stages. They further find that some projects that were considered a failure at one stage could be considered a success at another stage. This held true in both directions. In other words, some projects that were considered a failure at the project phase were rehabilitated and became successes in the later stages. Likewise, some projects that were considered successful in the early stages were later described as failures.

Themistocleous et al (2001), using an internet based survey, identify four major management problems faced by companies during the implementation process: (1) project delays and cost problems, (2) conflicts with external entities, (3) internal conflicts and (4) conflicts with business strategy. They also identified a number of technical issues including customization problems and integration with other systems. Hayes et al. (2001) use a similar event-study methodology directed specifically at announcements about ERP systems, and include contextual factors for firm size, health, and ERP vendor size. Their results, using standardized cumulative abnormal returns (SCAR), indicate that there is an overall favorable reaction to such announcements, with the most positive reaction to announcements by small/healthy firms and a negative reaction to small/unhealthy firms. Reactions to announcements by large/healthy and large/unhealthy firms are positive with mean SCAR results in between the two extremes of the small firms. Additionally, they conclude

that ERP vendor size has an impact, with reaction to announcements using packages from large ERP vendors significantly more positive than those of small vendors.

Hunton et al. (2002) follow the Hayes et al. study with an experimental study that uses forecasted earnings of financial analysts as the dependent variable, rather than stock price. Their results are supportive of Hayes et al, concluding that forecasted earnings by financial analysts post-announcement are significantly higher than their pre-announcement estimates. They also find congruent results with respect to the two contextual factors related to firm size and financial health. That is, the two studies report at least marginally significant interaction terms, which suggest that the combined effect of size and health moderate the influence of ERP announcements on stock price and earnings forecasts. Specifically, they both report a significant difference between small/unhealthy and small/healthy firms. Umble et al (2003), using a case study approach identify ten categories of reasons why ERP implementations fail: (1) strategic goals are not clearly defined, (2) top management is not committed to the system, (3) implementation project management is poor, (4) the organization is not committed to change, (5) a great implementation team is not selected, (6) inadequate education and training, (7) data accuracy is not ensured, (8) performance measures are not adapted to ensure that the organization changes, (9) multi-site issues are not properly resolved, and (10) technical difficulties can lead to implementation failures. Al-Mashari, et al. (2003), using a literature review approach, develop a theoretical taxonomy that demonstrates the linkages between ERP critical success factors, ERP success and ERP benefits. The critical success factors in their model are divided into three categories as follows: (1) Setting-up: management/leadership and visioning/planning, (2) Implementation: ERP package selection, training/education, systems integrations, communications, project management, systems testing, process management, legacy systems management, cultural & structural changes, and (3) Evaluations: performance evaluation & management. Nicolaou and Bhattacharya (2006) in a follow-up to Nicolaou (2004) find that ERP adapting firms that initiate early enhancements in the form of either add-ons or upgrades, may enjoy

superior differential financial performance in comparison to other ERP adopting firms' differential performance. Grabski and Leech (2007) use a theoretical foundation from economics, complementarity, to explain why successful ERP implementations are associated with multiple controls, and that these controls are used in a complementary vs. substitutable fashion. They argue that this theoretically grounded framework provides a much-needed foundation for further understanding the assurance service required during implementation and subsequent upgrades of ERP systems or other complex organization-wide systems. Wier et al. (2007) use two theoretical perspectives, to tie together two streams of research related to: (1) non-financial performance indicators (cybernetic control theory) and (2) ERP systems (agency theory). Their research supports the hypothesis that joint adoption of ERP and use of non-financial performance indicators (NFPI) results in significantly higher short-term and long-term return on assets and stock returns than either ERP-only or NFPI-only firms.

A more recent study by Ho et al. (2008) complements Huton et al. (2002) using archival data from I/B/E/S to show that financial analysts revise their three-year-ahead earnings forecasts significantly upward for firms that announce ERP implementations. They also found that financial analysts react less positively to middle adopters (1998-1999) than to early (1993-1997) and late (2000-2002) adopters. According to Motiwala & Thompson (2008), ERP (Enterprise Resource Planning) systems are a first generation enterprise systems that aim at the integration of data across, in addition to provide support to the organizations main functions. Another definition that sheds more light on ERP systems says that: ERP systems are integrated systems that can be used to manage a wide variety of functions whether it's assets, financial resources, or human resources. In addition, it allows an easy flow of information between all the department and division of a given organization (Bidgoli, 2004).

Nicolaou and Bhattacharya (2008) subsequently found that early post-implementation activities such as project planning, strategic definition and process integration have a positive financial performance differential effect on firms' incremental ROI, return on sales ratio (ROS), the cost of

goods sold over sales ratio, and the employee efficiency ratio. Silvola et al (2010) extend existing research on enterprise resource planning systems by exploring the effects of enterprise system adoption on subsequent non-financial and financial performance of a firm.

Specifically, they investigate the role of formal and informal management control systems as mechanisms which mediate the effect of enterprise resource planning systems adoption on firm performance. Their empirical analyses are based on survey data drawn from 70 Finnish business units. Overall, their findings demonstrate that formal types of management control systems act as intervening variables mediating the positive lagged effect between enterprise systems adoption and non-financial performance. Informal types of management control systems, however, do not show similar mediating effects. They also predict and find a significant relationship between non-financial and financial firm performance. Their results are important because the evidence on the joint roles of enterprise systems and management control system on improving the firm performance is very limited in prior literature. Their results show that the use of enterprise systems results in improved firm performance in the long run, and that more formal than informal types of management controls help firms achieve future performance goals.

Software vendors that market enterprise resource planning (ERP) systems have taken advantage of the increased focus on internal controls that grew out of the Sarbanes-Oxley (SOX) legislation by emphasizing that a key feature of ERP systems is the use of "built-in" controls that mirror a firm's infrastructure. They argue that these built-in controls and other features will help firms improve their internal control over financial reporting as required by SOX. This study tests that assertion by examining SOX Section 404 compliance data for a sample of firms that implemented ERP systems between 1994 and 2003. The results suggest that ERP-implementing firms are less likely to report internal control weaknesses (ICW) than a matched control sample of non-ERP-implementing firms. It also finds that this difference exists for both general (entity-wide), and individual (account-level) controls (Morris 2011).

During the 1980s, several high profile audit failures led to creation of

the Committee of Sponsoring Organizations of the Treadway Commission (COSO) , organized for the purpose of redefining internal control and the criteria for determining the effectiveness of an internal control system (Simmons 1997). They studied the causal factors that can lead to fraudulent financial reporting and developed recommendations for public companies, their independent auditor, educational institutions, the SEC, and other regulators (COSO 1985).

The product of their work is known as the COSO Internal Control-Integrated Framework (the framework), which was first published in 1992 (Simmons 1997).

This framework has become even more important following the corporate scandals at Enron, WorldCom, HealthSouth, etc. and the subsequent passage of the Sarbanes-Oxley Act of 2002 (SOX). SOX includes specific provisions, in Sections 302 and 404, requiring corporations to report on the effectiveness of their internal control over financial reporting (the second of the COSO categories). Section 302 requires the CEO and CFO to certify that their financial statements "present fairly" in all material respects, the financial condition of their company, and that they have evaluated the effectiveness of their internal controls, and disclosed any material weakness and any significant changes in internal control procedures (Ge and McVay 2005). Section 404 is more specific, requiring companies to include in their annual report (Form 10-K), a separate management report on the company's internal control over financial reporting and an attestation report issued by a registered public accounting firm. The internal control report requires specific language including: (1) a statement of management's assessment of the effectiveness of the company's internal control over financial reporting; (2) a statement identifying the framework used by management to evaluate the effectiveness; and (3) a statement that the registered public accounting firm that audited the company's financial statements included in the annual report has issued an attestation report on management's assessment of the company's internal control over financial reporting (SEC 2003). Although other frameworks may be accepted, the SEC has specifically stated that the COSO Framework satisfies SEC criteria and "may be used as an evaluation framework for purposes of management's annual

internal control evaluation and disclosure requirement” by companies listed on U.S. stock exchanges (Gupta and Thomson 2006).

3. Methodology

The method of this research is survey based. One of the most common ways of collecting data in the survey method which has been used in the current study is personal interview and using questionnaires. In data collection we used two methods. First to determine the topic and to research the data were collected via the librarian method. The questionnaire consists of various items and has been organized for 4 different parts of the considered organization. As mentioned in the introduction, control activities are different in different parts of an organization; nevertheless, they have some common characteristics which include management accounting part, cost accounting part, public accounting part and financial accounting part.

In this paper, we used Cronbach’s alpha formula which is calculated by the SPSS software to evaluate the validity and reliability of the questionnaire. The validity coefficient value for questionnaire is 0.926 which reflects the high validity of the above mentioned questionnaire regarding content admissibility. The main part of questionnaire is related to the questions about internal control as said before has been derived of the questions designed by COSO committee and reliable scientific sources such as international magazines. Format admissibility view for the used questionnaire in this paper undertook some changes in the structure by the consulting a professor and 4 experts in the field of (ERP) Enterprise Resource planning and internal controls (internal audit).

4. Research Hypothesis and Variables

The present study aims to test the developed hypothesis and provide the results. The main goal of this research is based on two main hypotheses that are mentioned below.

The first hypothesis is divided into 4 sub-hypotheses.

H1: ”Control activities has improved significantly after performing ERP”.

H1-1: Control activities in management accounting part have improved significantly after performing ERP.

H1-2: Control activities in cost accounting part have improved significantly after performing ERP.

H1-3: Control activities in public accounting part have improved significantly after performing ERP.

H1-4: Control activities in financial accounting part have improved significantly after performing ERP.

H2: "ERP implementation has had different influences on control activities".

The research variables are (1) Performing ERP and (2) internal controls. The latter variable divides to 4 parts: (1)management accounting, (2)cost accounting, (3)public accounting and (4)financial accounting. This paper does not have dependant and independent variables, hence we don't call the two mentioned variables dependents and independents.

5. Statistical Society, Sampling Procedure and Sample Volume

Since this research has been done as a case study and includes the whole considered society, we used the random sampling method. In this research we used the managers of all levels, personnel familiar with ERP and internal controls as well as previous and current procedure of Steel Company. The results generalized to the community with sampling method, we required the sample volume needed for the questionnaire. The sample volume was calculated by the give formula:

$$n = \frac{[\frac{z_d}{2}]^2 \times p \times q \times N}{(N - 1) \times E^2 + [(\frac{z_d}{2})^2 \times p \times q]}$$

Where:

n: number of statistical community

N: amount of sample volume

P: success ration

- q: ratio of not succeeding
- z: standard variable or normal distribution
- e: error of estimation

In this research the error of estimation and reliability interval were considered as 0.8 and 0.7(N) equals to 69. The given sample volume is calculated as follows:

$$n = \frac{(1.96)^2 \times 0.7 \times 0.3 \times 69}{68 \times (8)^2 + [(1.96)^2 \times 0.7 \times 0.3]} = 42$$

$$p = 0.7 \quad q = 0.3 \quad z_{\frac{\alpha}{2}} = z_{25} = 1/96 \quad N = 120$$

Number of questionnaires: 42

6. Descriptive Statistics of Research Variables

Descriptive statistics of this research included gender age (table 1) and field of study (table 2) which are derived by the SPSS software, and the resulted data are briefly discussed.

Table 1: Sex age and job history

	Gender		Age			Job History			
	Male	Female	25-35	35-45	More Than 45	Under 3	3-5	5-7	More Than 7
Frequence(n=43)	37	6	11	25	7	0	1	2	40
Percent (%)	86	14	26	58	16	0	2	5	93

Table 2: Field of study

	Field of study			
	Accounting	Financial Management	Cost Management	Others
Frequence(n=43)	27	1	4	11
Percent (%)	63	2	9	26

7. Hypothesis Test Results and Data Analysis

In this section the required hypothesis has been evaluated for each level. It should be mentioned that ANOVA and T- tests are used in the analysis process. We will accept or deny the hypothesis in two ways. First we consider the respondents as one part is analyzing the data. In the second way as mentioned before, in the four first hypotheses, the respondents at least belong to two parts. Therefore if we achieve the results of each part and compare them, we'll able to accept or deny the main hypothesis.

7.1 The Test Results of First Hypothesis

According to table 3 proposition H_0 is rejected since ($\text{sig}=0,000$) $\text{sig};0.05$. Rejecting H_0 means that performing ERP has influenced on the control activities. figure 8: test results.

Management Accounting(MA) section: According to table 3, H_0 proposition is rejected since ($\text{Sig}=0.002$) $\text{sig};0.05$. Rejecting H_0 means that from management accounting personnel point of view ERP function has influenced the control activities.

Cost Accounting(CA) section: According to table 3, H_0 proposition is rejected because, ($\text{Sig}=0.000$) $\text{sig};0.05$. Rejecting H_0 means that cost accounting personnel admit ERP performance has influenced the control activities.

General Accounting(GA) section: According to table 3, H_0 proposition is rejected because, ($\text{Sig}=0.009$) $\text{sig};0.05$. Rejecting H_0 means that general accounting personnel believe performing ERP has influenced the control activities.

Financial Management(FM) section: According to table 3, H_0 Proposition is rejected because ($\text{Sig}=0.035$) $\text{Sig};0.05$. Rejecting H_0 means from financial management personnel point of view performing ERP has influenced the control activities.

Table 3: ERP implementation project performance

Descriptives

Control Activities

	N	Mean	Std. Devia	Sig	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
management accounting	10	3.8714	.83693	.002	3.2727	4.4701	2.43	4.86
cost accounting	10	4.2348	.38574	.000	3.9588	4.5107	3.61	5.00
general accounting	16	3.4469	.49311	.009	3.1841	3.7096	2.55	4.00
financial management	7	3.6548	.63906	.035	3.0637	4.2458	2.92	4.50
Total	43	3.7627	.65037	.000	3.5625	3.9628	2.43	5.00

7.2 Results of Testing Second Hypothesis

As we are comparing more than two parts here, we will use variance analysis for comparing different parts. First, we should use test of homogeneity of variances. According table 4, H0 hypothesis is not being refused, because (sig = 0.081) sig>0.05. It means that variances are homogenous and we can use variance analysis.

Table 4: Test of Homogeneity of variances

Levene Statistic	df1	df2	Sig.
1.045	3	39	.081

According to table 5, H0 is refused, because (sig = 0.017) sig<0.05. This means that at least one of the parts is different from others.

Table 5: ANOVA

ANOVA

Control Activities

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.024	3	1.341	3.807	.017
Within Groups	13.741	39	.352		
Total	17.765	42			

According to table 6 and figure 1, cost accounting part shows more effective control activities compared to other parts. Besides, as it may be seen, cost accounting part has significant difference. Based on this graph, public accounting part has the least efficiency.

Table 6: multiple comparisons

Multiple Comparisons

Dependent Variable: Control Activities
LSD

(I) TYPE	(J) TYPE	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
management accounting	management accounting					
	cost accounting	-.3634	.26546	.179	-.9003	.1736
	general accounting	.4246	.23928	.084	-.0594	.9085
	financial management	.2167	.29252	.463	-.3750	.8083
cost accounting	management accounting	-.3634	.26546	.179	-.1736	.9003
	cost accounting					
	general accounting	-.7879*	.23928	.002	-.3039	1.2719
	financial management	.5800	.29252	.054	-.0117	1.1717
general accounting	management accounting	-.4246	.23928	.084	-.9085	.0594
	cost accounting	-.7879*	.23928	.002	-1.2719	-.3039
	general accounting					
	financial management	-.2079	.26899	.444	-.7520	.3362
financial management	management accounting	-.2167	.29252	.463	-.8083	.3750
	cost accounting	-.5800	.29252	.054	-1.1717	.0117
	general accounting	.2079	.26899	.444	-.3362	.7520
	financial management					

*. The mean difference is significant at the .05 level.

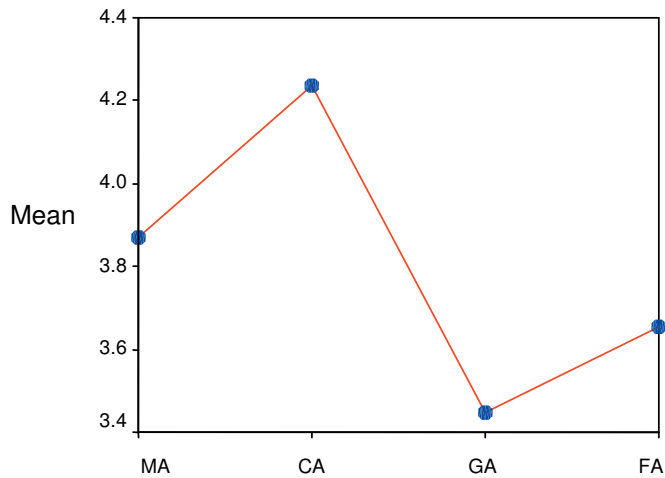
8. Conclusions

The effectiveness of ERP implementation has been proven based on the tests done for the four parts, since all these parts have approved these effects. But the effect has not been the same in all parts, as in some parts there is more effects and in some less. According to the comparison test, we see that the effect of performing organizational resources management on control activities in cost accounting has been more than other parts. This means that internal controls in cost accounting are stronger than in other parts. As shown in the LSD table, we observe that performing organizational resources management in cost accounting part is more effective than in other parts and has more effective control activities. Another result that is extracted from the table is that cost accounting part has significant difference compared to public accounting. This means that in public accounting part, ERP implementation has the least effect on control activities.

We should note that according to the first approach that considered people in its general test, the hypothesis has been proven as well. These

hypotheses may be vastly interpreted which will come further. The proof of the hypotheses in this research means that this system has positive impact on recording and editing the documents. Furthermore, ERP facilitates financial reporting, closing accounts, controlling workflow, and controlling production and storage. We should note that these activities are different in each part based on the expertise, but altogether, the effect of this system on the mentioned items in cost accounting part is more than other parts.

Figure 1: means plot



8.1 Final Results

The aim of this research is studying ERP effect on the organization's control activities. As we saw in the previous sections, all of the hypotheses had been confirmed by the respondent.

The ERP implementation have influenced on control activities in all those 4 parts. However, the impacts are different in each segment.

As stated in the introduction, we can say that Esfahan Steel company has been successful in performing ERP. According to the proof of all hypotheses, the managers of all levels of the organization can rely on

ERP system and control activities, as one of the components of internal control to make their decisions and run the entity in a favorable way. According to this research and previous research, one of the elements of success of these systems is internal control in a highly reliability and assurance of them. While the effect of ERP on control activities is being proven, external auditors can evaluate internal controls better, which leads to compliance tests. Based on the results of this research they can relatively make sure about the internal controls and accordingly can reduce duration of investigation through reduction of compliance tests and increase of tests' credits. Finally it causes time reduction, cost reduction, and better quality of investigation.

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