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## Enterprise Resource Planning (ERP) Support For Internal Control Effectiveness

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### ABSTRACT

ERP is a software package which already changed the way data is collected, disseminated, and used. ERP systems also have built-in control which in every transaction is supervised carefully. However, only a few findings in accounting empirical research reveal how the ERP systems support internal control effectiveness. In this paper, we investigate the effect of ERP systems on internal control effectiveness over financial statements. Using annual reports of listed firms in the Indonesia Stock Exchange and logistic regression technique, we find that firms with ERP reported fewer general internal control weaknesses than firms without ERP. Hence, ERP adoption and implementation in Indonesia's firms cannot reduce internal control weaknesses, especially in a specific levels of financial statements because they have not fully utilized the ERP control features.

**KEYWORDS:** Enterprise Resource Planning; Internal Control Effectiveness on Financial Statements; Internal Control Weaknesses

## INTRODUCTION

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Financial statements are a communication tool used by management to inform company performance. The performance information contained in the company's financial statements should reliably and accountably in order to protect investors' interests in their efforts to make investment decisions (Hastuti, 2009; Siregar, 2015). Information technology is needed to produce reliable financial statements (Sumner, 2013). Information technology that able to process data in an integrated manner to ensure data validity is enterprise resource planning (ERP). According to Dechow and Mouritsen (2005), Rikhardsson and Kræmmergaard (2006), ERP can help firms process operational data in an integrated and standardized manner. ERP can do this through the existing application in its modules (Sumner, 2013). The existence of an integrated database in ERP, as well as easy access by all sections or divisions (Andiyani, 2008) ultimately, results in efficiency, namely efficiency in the company's operations so that it impacts both the company's business processes (Wibisono, 2013; Liu and Du, 2014; Suryalena, 2013; Ying, 2016).

ERP implementation helps firms improve business operating efficiency and improves corporate internal control (Turner and Owhoso, 2009). Improved internal control can be achieved, among others, through user access control, segregation of duties, and data integrity (Turner and Owhoso, 2009; Ageng, Noorlailie, and Isnalita, 2018; Fadilah, 2019). Increasing this control can be realized with the control features provided by the built-in on the ERP (Chang, Yen, Chang, and Jan, 2014). In line with agency theory, the use of ERP systems with built-in control features can reduce the information asymmetry that occurs between agents (management) and principals (investors), so agency costs incurred can be reduced (Morris, 2011).

Some previous studies (Spathis and Constantinides, 2004; Khajavi and Mirbagheri, 2013; Mudiantono, 2013) have discussed the benefits of using ERP for firms. Other research (Gattiker and Goodhue, 2005; Hawari and Heeks, 2010; Boltana and Gomez, 2012; Fadilah, 2019) discusses comparisons between before and after firms have implemented ERP, in terms of business processes, performance reporting, and internal control. Morris (2011) study about the relationship of ERP implementation with internal control weaknesses, as well as Catalya and Hadiprajitno (2014) which also discussed the implementation of ERP and internal control weaknesses in the state-owned company in Indonesia, as well as Puspandoyo (2015) which examined the similar factors in the banking sector. Based on previous research reviews, ERP research in all non-financial sector public firms has not been studied and discussed in depth. Sector non-financial is a sector that is strongly associated with the ERP system, so the performance reports presented in the financial statements to be affected by business data obtained through the implementation of ERP (Romney dan Steinbart, 2018). Likewise, research findings that empirically test the internal control in preparing financial statements with ERP implementation in Indonesia are still limited. The lack of empirical evidence drives the importance of this study. This study contribute theoretically to test the impact of ERP implementation on the internal control and practically for firms that ERP implementation will increase the internal control, and for investors to invest more secure in companies that implement ERP because it can process integrated operational business data. Therefore, this study aims to empirically test (1) differences in disclosure of internal control weaknesses in firms that have implemented and do not have implemented ERP, (2) firms that have implemented ERP tend to report less general internal control weaknesses than firms did not have implemented ERP, and (3) firms that have implemented ERP tended to report less specific internal control weaknesses than firms that did not have implemented ERP.

## Research Hypothesis

Based on agency theory, management as an agent tends to report its performance to the investor (principal) by their interests because of management moral hazard (Jensen dan Meckling, 1976). Therefore, there is a need for a monitoring system that is carried out continuously and integrated with the firm's business operational processes. This monitoring process carried out by implementing ERP with a built-in control function.

ERP software is used to manage all firms' data, and then the results of data processing can be used to provide information to anyone who needs it. This system helps organizations deal with a series of corporate operational activities (Somers and Nelson, 2003). According to Mudiantono (2013) and Elbardan and Kholeif (2017), an ERP system is a business management system that consists of a comprehensive set of software that integrates all business functions within a firm.

The results of Soral and Jain (2011) show that the use of technology will improve the quality of auditing and internal control systems in organizations (Doyle and McVay, 2007; Foster and Shastri, 2013). Kim, Nicolaou, and Vasarhelyi (2013) observed that auditing conducted by ERP allows these things: recording events on the *network-wide audit trail*, detecting misuse and unauthorized activity, reviewing access patterns and history access from individuals and objects, find attempts to bypass protection mechanisms, and find extended use of privileges that occur when users change their identities (Dahlén and Elfsson, 1999; Brown, 2003; Brazel, 2005)

Internal control over the firms will not necessarily be better (Abdel-Khalik, 1993; Boynton, Johnson, and Kell, 2004). Not all internal controls in the firm can function properly, and this occurs due to the firm's internal control components weaknesses (Sawyer, 2012). The use of ERP in firm operations will increase supervision in the system. Alzoubi (2011) and Julisar (2016) found that ERP systems' use improves the firm's internal control functions, especially for operational activities in finance and accounting. The use of an ERP system is useful to ensure the implementation of firm operational transactions run correctly and smoothly. This transaction happens because ERP has a built-in control feature so that the operation process will be indirectly monitored. With this supervision, indirectly, most of the internal control components can be implemented well (Morris, 2011).

***H<sub>1</sub>: Firms that have implemented ERP reported fewer material internal control weaknesses than firms that did not have implemented ERP.***

Based on agency theory, financial statements must be presented correctly, free of intentional or unintentional mistakes by management so that investors as principals obtain information reliably for decision making (Jensen and Meckling, 1976; Morris, 2011). The presentation of reliable financial statements certainly requires assistance that can integrate data from various divisions or sections. ERP is an information technology that is able to integrate all cross-division transaction data using a database (Sumner, 2013).

Dechow and Mouritsen (2005), Morris (2011), Kim et al. (2013) explained that firms that had implemented ERP reported less material internal control weaknesses than firms that had not implemented ERP—from that perspective, it is essential to separate the internal control into general and specific. Internal control, in general, is a form of general control. In contrast, internal control in specific is a form of application control, which in theory explains that general internal control related to the control environment and control activities, while specific control related to control at the application processing level (Morris, 2011; Romney and Steinbart, 2018). If management intentionally makes use of the

control feature to manage earnings, or does not do the division of tasks properly, it will tend to find weaknesses in internal control related to control in general, although control is particularly useful. Based on these arguments, the formulation of the hypothesis is as follows:

***H<sub>2</sub>: Firms that have implemented ERP reported less internal control weaknesses in general than firms that did not have implemented ERP.***

The moral hazard, which is the main issue of agency theory will arise due to conflicts of interest and information asymmetry, that is, information held by management as agents and investors as principals are not balanced. Management can take advantage of their actions because they have more information than investors (Jensen dan Meckling, 1976).

In principle, information asymmetry that occurs between management and investors can be suppressed by using ERP because ERP is based on integrated data with various features that strengthen internal control, such as anti-financial statement manipulation, user access restrictions, and ongoing audits (Turner, and Owhoso, 2009). Morris (2011) and Chang, Yen, Chang, and Jan (2014) explain, if the company did not take advantage of built-in controls in full, will be found to be a lot of internal control weaknesses at a special rate in the financial statement, even though control has generally been effective. This can happen if the company chooses not to activate some of the control features during ERP implementation (Moorthy, Mohamed, Gopalan, and San, 2011). Alternatively, an integrated control system in ERP can reduce material weaknesses in specific internal controls. Based on these arguments, the formulation of the proposed hypothesis is as follows:

***H<sub>3</sub>: Firms that have implemented ERP reported less internal control weaknesses in specific than firms that did not have implemented ERP.***

**METHOD**

The independent variable in this research is ERP implementation which is a categorical variable, given a value of 1 if the firm implements ERP, and a value of 0 (zero) if the firm does not implement ERP. The dependent variable studied is internal control weaknesses that are measured using items in the auditor's report. The internal control weaknesses items divided into two categories, internal control in general and internal control in specific. The items of internal control weaknesses refer to the research of Morris (2011).

This study uses secondary data with the population of all firms listed on the Indonesian Stock Exchange (BEI) in 2016 not included in the financial sector. Data obtained through the website www.idx.co.id and company website. The financial sector was not included as a sample of this study because of other regulations governing the sector and differences in business processes that result in differences in the calculation of variables. Besides, in 2016, digital enterprise developed very rapidly, including cloud-based ERP (Lesmana, 2016). *The following table provides sampling for this study:*

No	Keterangan	Total
1	Firms listed on Indonesia Stock Exchange in the year 2016	539
2	Firms in financial sectors	(89)
3	Firms do not have implemented ERP	(328)
4	Firms with incomplete data	(2)
5	Total firms have implemented ERP used in this study	120

**Table 1.**  
Sample Selection

This study also uses firms that do not have to implement ERP (control firms)—by stratified random sampling totalling 120 companies or equal to the number of firms that have implemented ERP.

Table 2 below summarizes the characteristics of the sample:

Characteristics	Total		Percentage	
<b>Loss before extraordinary:</b>				
- No loss	196		82%	
- Loss	44		18%	
<b>Sector:</b>				
	ERP	NON ERP	ERP	NON ERP
- Main	13	38	26%	75%
- Manufacturing	70	42	63%	37%
- Service	37	40	11%	89%

**Table 2.**  
Firms  
Characteristics

Table 2 indicates that only 18% of firms suffered a loss before extraordinary items. It means 82% of the sample have a good operational performance by not reporting in operating loss. Table 2 also shows that 63% of firms that have implemented ERP are manufacturing, while 89% of firms that do not have implemented ERP are service companies. The use of ERP integrates all transaction data from various divisions or sections, especially production divisions that have their complexities in preparing their financial statements (Somers and Nelson, 2003). The sample characteristics will be discussed further in the results and discussion section.

This study uses logistic regression data analysis techniques with two testing models that include control variables related to internal control weaknesses. (Doyle et al., 2007; Morris, 2011; Bedard, Hoitash, Hoitash, and Westermann, 2012).

**Model 1 for hypothesis 2**

$$\ln \frac{GEN}{1 - GEN} = \beta + \beta_1 ERP + \beta_2 LOSS + \beta_3 LOGMKTV + \beta_4 SALEGRW + \beta_5 INVTAT + \beta_6 LOGAGE$$

**Model 2 for hypothesis 3**

$$\ln \frac{SPE}{1 - SPE} = \beta + \beta_1 ERP + \beta_2 LOSS + \beta_3 LOGMKTV + \beta_4 SALEGRW + \beta_5 INVTAT + \beta_6 LOGAGE$$

where:

- GEN : 1 if firm reporting general internal control weaknesses, else 0;
- SPE : 1 if firm reporting specific internal control weaknesses, else 0;
- ERP : 1 for firms that have implemented ERP, 0 for control firms;
- LOSS : 1 for firms with loss before extraordinary items, else 0;
- LOGMKTV : natural log of market value: Ln (closing price per share x numbers of outstanding shares);
- LOGSALEGRW : natural log change in sales (percentage): Ln ((net sales<sub>t</sub> – net sales<sub>t-1</sub>)/net sales<sub>t-1</sub>);
- LOGINVTAT : natural log inventory to total assets: Ln (total inventory/total

239 LOGAGE : assets)  
: natural log of firms age

**RESULTS AND DISCUSSION**

Tables 3 and 4 provide descriptive statistics of the sample that are categorized into firms that implemented ERP and not implemented ERP, as well as their internal control weakness criteria.

VARIABLE	Erp = 0				Erp = 1			
	Mean	Min.	Max.	Std.De v.	Mean	Min.	Max.	Std.De v.
<i>LOGMKTV</i>	28,744 2	22,854 4	33,337 8	2,1460	27,714 6	23,045 7	31,471 0	1,7263
<i>LOGSALEGR W</i>	- 2,1951	- 6,2449	- 0,1326	1,0252	- 1,7502	- 6,7495	- 1,3290	1,4743
<i>LOGINVTAT</i>	- 2,2912	- 8,0413	- 0,3686	1,4134	- 2,9201	- 8,3017	- 0,5970	1,6212
<i>LOGAGE</i>	3,4719	1,6094	5,0434	0,6066	3,1725	1,3863	4,5326	0,5488

**Table 3.**  
Descriptive  
Statistic based  
on ERP  
Implementati  
on

Table 3 summarizes that firms which implemented ERP have lower market values, are younger, higher sales growth rates, and a lower ratio of total inventory to total assets. Firms that have implemented ERP are actually relatively new because they must have a competitive advantage compared to their predecessor firms. These firms tend to be more efficient in managing inventory so they can be more active in increasing revenue through sales. However, it turns out investors are still waiting for the results of ERP implementation, which indicate from the low market value.

Based on Table 4, it can be seen that GEN = 0 appears more frequently (222 times) than GEN= 1 (18 times). Likewise, SPE = 0 appears more frequently (210 times) than SPE = 1 (30 times). This means that the sample do not have enough control weaknesses, both general and specific. Findings show that the weaknesses of internal control are found in many firms that do not implement ERP, with a frequency of 15 times (88%) for general internal control and 19 times (63%) for specific internal control.

ERP		GEN = 0		GEN = 1		SPE = 0		SPE = 1	
		Freq	%	Freq	%	Freq	%	Freq	%
1	<i>ERP</i>	117	0,527 0	3	0,176 5	109	0,5190	11	0,366 7
0	<i>Non ERP</i>	105	0,473 0	15	0,882 4	101	0,4810	19	0,633 3
<b>LOS</b>									
0	<i>No loss</i>	175	0,862 1	5	0,294 1	160	0,8377	18	0,620 7
1	<i>Loss</i>	28	0,137 9	12	0,705 9	31	0,1623	11	0,379 3

**Table 4.**  
Descriptive  
Statistic based  
on Internal  
Control  
Weaknesses

Table 5 summarizes the control variables used in this study:

	GEN =0	GEN =1	SPE =0	SPE =1		GEN =0	GEN =1	SPE =0	SPE =1
	<b>LOGMKTV</b>					<b>LOGINVTAT</b>			
Mean	28,32	26,74	28,31	27,60	Mean	1,20	1,18	1,20	1,19
Minimum	22,85	23,04	22,85	23,04	Minimum	1,14	1,14	1,14	1,14
Maximum	33,33	30,04	33,33	30,16	Maximum	1,25	1,22	1,25	1,22
Std. Dev	1,99	1,71	2,03	1,75	Std. Dev	0,02	0,02	0,02	0,01
	<b>LOGSALEGRW</b>					<b>LOGAGE</b>			
Mean	3,35	3,27	3,35	3,31	Mean	0,18	0,17	0,18	0,18
Minimum	3,12	3,18	3,12	3,18	Minimum	0,13	0,13	0,13	0,13
Maximum	3,50	3,33	3,50	3,40	Maximum	0,22	0,20	0,22	0,20
Std. Dev	0,07	0,05	0,07	0,06	Std. Dev	0,01	0,01	0,01	0,01

Table 5. Descriptive Statistic for Control Variables

Firms that do not have general control weaknesses (GEN = 0) have a higher market value, higher sales growth, as well as a greater inventory to asset ratio, and older than firms that have internal control weaknesses in general (GEN = 1). Likewise with firms included in the SPE = 0 and SPE = 1 groups. Firms with SPE= 0 have a higher market value, higher sales growth, a greater inventory to asset ratio, and a relatively older compared to a group of firms with SPE = 1 (see Table 5). These results indicate that firms that do not have internal control weaknesses tend to be valued positively by investors because they have good performance and have a long experience in business operation.

Before logistic regression testing, all variables will be tested for multicollinearity. The results of multicollinearity testing using the correlation matrix showed that all variables tested had a correlation value below 0.95; both for GEN and SPE groups; which means there is no strong correlation between the variables tested (Hosmer and Lemeshow, 2004). After the multicollinearity test, the next step is the goodness of fit test using the likelihood ratio test and Cox & Snell and Nagelkerke R Square. The results summarized in the following Table 6:

<b>Likelihood Ratio</b>	<b>GEN</b>	<b>SPE</b>	<b>R Square; Hosmer &amp; Lemeshow</b>	<b>GEN</b>	<b>SPE</b>	<b>Result</b>
-2 likelihood initial df	125.600	177,803	<i>Cox &amp; Snell R Square</i>	0,139	0,055	<i>Overall model fit</i>
	239	239	<i>Nagelkerke R Square</i>	0,337	0,103	
-2 likelihood final df	91,925	167,344	<i>Chi-Square</i>	11,377	3,655	
	233	233	<i>Sig</i>	0,181	0,887	

Table 6. Goodness of Fit Test

The models proposed in this study are fit, both for the GEN and SPE models. Using Cox & Snell R Square and Nagelkerke R Square in the GEN model, 33.7% the ERP implementation can explain the effectiveness of internal control, and 10.3% by the SPE model. These results indicate that there are still several variables besides ERP implementation that can support the effectiveness of internal control. The test results are said to be accurate and meet statistical requirements because the GEN and SPE models can predict the value of observations as indicated by the significance value of the Hosmer and Lemeshow test above 0.05. The results of the classification test for the GEN and SPE models show a significant value (more than 50%), which means that there is no misclassification found in the models (see Table 7).

Observation	Prediction				Accuracy (%)
	GEN=0	GEN=1	GEN=0	SPE=1	
UM =0	220	2			99,1
UM=1	14	4			22,2
KHS=0			210	0	100
KHS=1			30	0	0

**Table 7.**  
Accuracy of Models Classification

The results of ERP supports on internal control effectiveness can be seen on the Table 8 below:

Variable	GEN						SPE					
	B	S.E	Wal	d	Sig.	Exp (B)	B	S.E	Wal	d	Sig.	Exp (B)
ERP	1,663	0,742	5,026	1	0,025	5,277	0,332	0,457	0,528	1	0,467	1,394
LOSS	-	0,624	14,499	1	0,000	0,093	-	0,461	5,361	1	0,021	0,344
LOGMKTV	-	0,175	2,396	1	0,122	0,763	-	0,117	1,393	1	0,238	0,871
LOGSALEGRW	-	0,238	0,013	1	0,910	0,973	0,073	0,170	0,185	1	0,668	1,076
LOGINVTAT	-	0,189	0,963	1	0,327	0,831	-	0,135	1,182	1	0,277	0,864
LOGAGE	0,644	0,575	1,256	1	0,262	1,904	0,032	0,376	0,007	1	0,932	1,033
Constant	2,625	5,323	0,243	1	0,622	13,806	2,084	3,448	0,365	1	0,546	8,036

**Table 8.**  
Logistic Regression Analysis

These results are entered into the two models,

#### Model 1

$$\begin{aligned} \ln \frac{GEN}{1 - GEN} = & 2,625 + 1,663 ERP - 2,377 LOSS - 0,271 LOGMKTV \\ & - 0,027 LOGSALEGRW - 0,186 LOGINVTAT + 0,644 LOGAGE \end{aligned}$$

#### Model 2

$$\begin{aligned} \ln \frac{SPE}{1 - SPE} = & 2,084 + 0,332 ERP - 1,066 LOSS - 0,138 LOGMKTV \\ & + 0,073 LOGSALEGRW - 0,146 LOGINVTAT + 0,032 LOGAGE \end{aligned}$$

Based on the statistical data processing, the first hypothesis (H1) is supported. The number of internal control weaknesses reported by firms that have implemented ERP is 14 times (3 times for GEN and 11 times for SPE) compared to 226 times (117 times for GEN and 109 for SPE) in firms that do not implement ERP. ERP is able to help investors carry out a continuous monitoring function on the preparation of financial statements so that moral hazard management can be suppressed. The results of this study support the prior research by Morris (2011) and Catalya and Hadiprajitno (2014).

Based on the first hypothesis (H1), then the next step has divided the result into GEN and SPE groups to see the effect in more detail. The results of this test indicate that the second hypothesis (H2) was supported. It means that firms which already implemented ERP likely less reported their internal control material weaknesses in general than control firms. The results of this study are consistent with Morris (2011) which was also supported by Chang et al. (2014) and Puspandoyo (2015). Firms that have implemented ERP will report lower general material weaknesses than control firms (firms that do not have implemented ERP). Firms that already implemented ERP can detect internal control weaknesses in accounting processes more accurately than firms do not have implemented ERP (Dechow & Mouritsen, 2005; Rikhardsson dan Kræmmergaard, 2006). ERP implementation enables the company to conduct continuous supervision of the preparation of financial statements, making it possible to suppress moral hazard management behaviour. Based on these arguments, the results of this study support agency theory.

In the SPE model group, the results show that the third hypothesis (H3) is not supported. Firms that already have implemented ERP will report lower specific internal control weaknesses than control firms. This result is presumably because Indonesia firms have not implemented ERP thoroughly, meaning that it is only a few modules from overall ERP module used. The built-in control model that exists in the ERP system is not fully used. Besides, the implementation of ERP is one of the many factors that can affect the effectiveness of internal control, factors such as the effectiveness of the internal auditor function, management support, and the implementation of corporate governance make internal control more reliable and more effective (Puspandoyo, 2015; Julisar, 2016). Also, Indonesia firms tend to use ERP as a tool for processing accounting data without optimizing its use as a control tool for the preparation of financial statements (Suryalena, 2013; Mudiantono, 2013). The less optimal utilization of ERP becomes an opportunity for management as agents to take deviant actions that can benefit them so that it can increase agency costs (Jensen dan Meckling, 1976).

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## CONCLUSION

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This study aims to investigate the ERP system support in realizing effective internal control. The results of this study indicate that firms have implemented ERP tend to report less internal control weaknesses, because of the built-in control system in ERP, which allows firms to carry out internal control more effectively.

The result of this study support the prior studies by Morris (2011), Catalya and Hadiprajitno (2014), Puspandoyo, (2015), and Julisar (2016) indicate that firms already have implemented ERP systems tend to report fewer internal control weaknesses than firms that do not have implemented ERP. Based on the results of logistic regression, it was found that implementing ERP had a significant effect only on general internal control weaknesses but not on specific internal controls, because Indonesia firms that already have implemented ERP did not optimize the control features of ERP. The results of this study have implications for ERP investment. It is better if firms consider the critical control features carefully so that the continuous supervision function can be carried out by ERP optimally. The results of this study also have implications for future studies that must consider the industrial sector and the completeness of ERP control features in addition to the built-in controls that are already available.

This study has some limitations. First, there is no directory of Indonesia public companies that have implemented an ERP system, so there is a possibility that the information used in this study is not updated. Second, the sample of this study is all Indonesia public companies other than finance; where each sector has its contribution to the implementation of ERP, this causes logistic regression to be less accurate if there are firms with a different relationship in one to another industry. Third, this study also does not include the ERP system implementation period as a control variable or additional variables as in prior study by Morris (2011). Fourth, Indonesia does not have published reports on the effectiveness of internal control, so there is no reliable guideline for material weaknesses in the internal control of each company.

Further research carries out more specific research on existing industries to determine the contribution of ERP implementation to existing industries. The development of a research model is also needed, especially the implementation period of the ERP system as a control variable as well as other variables related to the ERP system. This research has provided an empirical framework of the benefits obtained from firms that have implemented ERP systems on the effectiveness of internal control. The results of this study can be used as consideration for firm managers to implement an ERP system as an information technology that can optimize the firm's internal control.

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