Enterprise Resource Planning Implementation and Accounting Information Quality

Y Anni Aryani
Accounting Department, Economics Faculty
Universitas Sebelas Maret (UNS)
Surakarta, Indonesia
y_anniar@yahoo.com

Krismiaji
Accounting Department
AA YKPN
Yogyakarta, Indonesia
xmiaji@gmail.com

***Abstract*—This study investigates the effect of ERP system implementation on accounting information quality of firms listed in Indonesian Stock Exchange. The accounting information quality proxies are relevance and faithful representation. Relevance is measured with time lag between fiscal year-end and earnings announcements date, whereas faithful representation is measured with absolute discretionary accrual. The study finds that the implementation of ERP system increase the absolute discretionary accrual, thus the faithful representation of the accounting information decreases. With respect to relevance, firms with incentive to increase the timeliness of earning release date experience a decrease in reporting lag after implementing ERP system.**

Keywords-ERP system implementation; discretionary accruals; relevance; faithful representation

I. INTRODUCTION

This study investigates the change of accounting information quality after implementing Enterprise Resource Planning (ERP) system. To be useful for decision making, accounting information must have two qualitative characteristics which are relevant and faithful representation [31]. The implementation and usefulness of ERP system has become a radical shift from legacy system to a new system that integrated business function through automation work flow and a database [9]. Previous accounting research shows that the announcement of ERP system implementation have a positive response from market and have a positive impact on operational performance [26], [29].

ERP system is developed to collect and disseminate information timely to managers, therefore it improve the ability of the managers to process and analyse accounting information [16], [27]. The objective of ERP system implementation is to provide information that enable management to have a whole view of the firm's financial condition at all time [18]. This integrated system removes cross functions barrier and result in managers capability to access, process, analyse and disseminate accounting information to external users quickly [36], [27], [32].

There are a few empirical studies to support that claim, although the fact shows that ERP system implementation positively impact the timeliness of accounting information by shortening financial close cycle [10], [41]. One of the studies was done by [9] which investigated the impact of ERP system implementation on timeliness earning announcements. The study found that the time lag between fiscal year end and earnings announcement shorten, in other word, the timeliness earnings announcement increase after the implementation of ERP system.

The prior research results above shows the advantage of ERP system implementation. However, previous literatures also found that internal control effectiveness and audit quality decrease in ERP system settings [30], [44], [8]. ERP system has a unique risk due to the chain and interdependence of the business process, relational database and reengineering process. The understanding of this risk is crucial in the planning and assuring the reliability of the system. Exploratory study done by [44] found that ERP implementation process has impact on the system reliability. Study by [9], [30], and [8] show the increasing of absolute discretionary accrual value after implementing ERP system. This finding provides evidence that reliability of accounting information decrease after the implementation of ERP system.

From the previous literatures it can be concluded that the effect of ERP system implementation on financial accounting quality is still debatable. It is argue that the decrease in audit quality and internal control effectiveness after implementation of ERP system will decrease the faithful representation of the accounting information. Prior research shows inconsistency between the improvement expectation of the information quality after the implementation of ERP system. This is still dominated by the information characteristics that will be delivered (good news or bad news) and the audit opinion. Therefore, research question stated in this study is as follow: is accounting information quality change after the implementation of ERP system?

In Indonesia, it can be argued that the problems of decreasing in external audit quality and internal control effectiveness after ERP system implementation will also occurs. However, this argument need to be examined considering the absent of empirical evidence about this matter especially in Indonesia. This condition motivates this study to test whether the ERP system implementation has effect on the accounting information quality.

Using sample of companies listed in Indonesian Stock Exchange (BEI) implemented ERP system, this study finds that the implementation of ERP system increase the absolute discretionary accrual, thus the faithful representation of the accounting information decreases. With respect to relevancy, firms with incentive to increase the timeliness of earning

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release date experience a decrease in reporting lag after implementing ERP system.

The remainder of the paper is structured as follows: section two discusses the literature review along with the hypotheses development. The research method and results discussion are presented in section three and four respectively. Finally, section five presents the conclusions along with the implication of the study, the limitations and suggestions for further research.

II. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

A. ERP Implementation and Faithful Representation

One of the advantages of the implementation of ERP system is the ability to improve internal management decision making, therefore, it should cause ERP adopters outperform to non-adopters [29]. The implementation of ERP system also improves managers' capability to manage accounting information for external users.

ERP system able to improve information set of management and increase the asymmetry information level between managers and external financial report users. Prior research has shown that higher level of asymmetry information and the connected agency cost increases the investor's attention of the earning quality reporting [14], [20]. Therefore, the higher level of asymmetry information between management and investor increase the moral hazard problem because management able to use higher discretion in earning reporting. This is possibly because management has more control over the internal information regarding the firm's financial condition than investors.

Previous research suggests that there is incentive for a firm to manage earning in order to avoid missing earning forecast [33]; income smoothing [4]; and avoid losses [11]. The incentive accelerates with the implementation of ERP system [13], [6]. [22] found that the existence of earning management in respond to the market incentive is pervasive and accrual is a method to fulfill earnings benchmark.

After ERP system implementation, the opportunity to manage information increase because of increasing access and control to information by management; and decreasing in the protection of audit quality. The policy makers [1] said that opportunity is an important element whether the managers manage information to report financial performance that fulfil their objectives and not reflected the right firm's financial condition. Therefore, it is possible that the faithful representation of financial information damaged by the implementation of ERP system. Thus, the hypothesis formulated as follows:

H_1: ERP system implementation decreases the faithful representation of accounting information.

B. ERP Implementation and Relevancy

In Indonesia, regulation about listed firm financial statement disclosure was ruled by Decision of Chairman of Capital Market Supervisory Agency Number Kep-134/BL/2006, dated December 7, 2006 [3] with attachment Number X.K.6. This decision stated that time to announce financial statements is four months from financial statement date.

A firm's annual report is an important information source for investors and potential investors. Annual report is not only present many important information about the firm and many decisions make by management in one period, but also report the asset, liability and performance of the firm. Annual report published by a firm may be enable the readers react differently, positively or negatively. This reaction is not only in the individual level, but also in the market level [40].

Studies regarding the time delay of annual report publication by a firm to capital market have been done in Australia [19], [43] and United States [14]. [19] divide the characteristics of reporting time delay into three types: preliminary lag, auditor's signature lag, and total lag. Preliminary lag is the number of days between ends of year until firm's beginning report submission date to capital market. Auditor's signature lag is the number of days between ends of year and audit report signature date. While total lag is the number of days between ends of year and annual report publications date by capital market.

One of the benefits of ERP system implementation as stated by [39] is the efficiency improvement through computerization. From the financial accounting information perspective, this indicate a shorten in financial reporting cycle for ERP system adopters. Evidence from survey conducted by ERP system users shows that ERP system reduce reporting lag through processing business transaction more efficient and reducing accounting cycle [35], [41], [27], [37]. Reducing time in reporting cycle should enable ERP system adopters to produce financial report for external users more timely, and eventually increasing the information relevancy.

Study examines the timeliness earning reporting shows that firms published report earlier when they have "good news". For example, [21] defines "good news" and "bad news" with an earning expectation model and the result shows that report containing "bad news" tend to be delayed for publication. [14] found positive (negative) abnormal return for firm publishing its financial report earlier (later) compare with the expected time lag. [24] conducted further study by illustrate that timeliness disclosure from firm with "good news" have negative implication to its competitors. Consistent with that study, [42] and [34] shows that firms delay its financial reporting when they have audit qualified opinion. [23] and [2] found evidence that firm delay to announce bad news to investors until stock market had beed closed or the next week.

Evident from prior research above show that firm do effort to find the proper time to present it financial accounting information. A firm that announce "good news" to its external users will reduce time lag between its fiscal year end and reporting date. Evidence shows that ERP system implementation should increase management capability to produce accounting information for external users timely; hence it will be more relevant. Therefore, the hypothesis formulated as follows:

H_2: ERP system implementation increase accounting information relevance for firms with "good news".

III. RESEARCH METHOD

A. Population and Sampling Method

The population of this study is all companies listed in Indonesian Stock Exchange implemented ERP system. Sampling method in this study is purposive sampling. Sample in this study is the company that fulfills criteria, such as, having complete financial data three years before and after ERP system implementation; having ERP implementation date data.

B. Variable Definition and Measurement

Variables used in faithful representation analysis are ABSDA and Aft. ABSDA is dependent variable and the primary variable to measure faithful representation. As accrual measure used by [7] and [28], total accrual (TAC) is the different between earnings before extraordinary items and operation cash flow. Total accruals are scaled by total assets to control for firm size effect. Discretionary accrual is estimated with cross-sectional modified Jones Model [17], [45]. Model that will be used is regression model for each company and each year as follow:

$$TAC_{i,t} = \alpha_{1,t}\left(\frac{1}{TA_{i,t-1}}\right) + \alpha_{2t}\frac{\left(\Delta \mathrm{Rev}_{i,t} - \Delta AR_{i,t}\right)}{TA_{i,t-1}} + \alpha_{3t}\frac{PPE_{i,t}}{TA_{i,t-1}} + \varepsilon_{it} \qquad (1)$$

Where:

TAC i, t = total accrual scaled by total asset for firm sample i at period t;
TA i, t-1 = lagged total asset, for firm sample i at period t-1;
ΔREV i, t =changes on net income for firm sample i at period t;
ΔAR i, t = changes on net receivable for firm sample i at period t;
PPE i, t = gross fixed asset for firm sample i at period t.

Nondiscretionary accruals element is fitted values on equation (1). By eliminating nondiscretionary accruals component from total accruals, it will result discretionary accruals component. Thus, discretionary accruals is the absolute value of the residual of equation (1). Aft is the primary independent variable. Aft is a dummy variable which is set to 1 for the years falling after ERP system implementation (t+1 to t+3) and 0 for years before ERP system implementation (t-3 to t-0).

Variables used on relevance quality or timeliness accounting earning announcement analysis are Reporting Lag (Lag), EPS, and Aft. Lag is a dependent variable. Similar to prior studies [21], [14], [25], this study uses reporting lag (Lag) which is the time lag between firm's earning announcement date and end of fiscal period, as proxy for timeliness variable. Furthermore, other study [38] suggest that a "good news" firm tend to announce its earning earlier compared to a "bad news' firm. Therefore, it will be examined whether reporting lag for "good news" firm shorten after ERP system implementation. EPS is an independent variable and used to identify firms with good news. Similar to prior research [25], in this study firms with good news will be identified with EPS variable which is the different between earning per share (EPS) year t and year t-1, scaled by EPS's number year t-1. Positive (negative) earning number will show good (bad) news. After (Aft) is another primary independent variable.

This study uses five control variables to test faithful representation after ERP system implementation (H_1), which are firm's size, leverage, firm's market-to-book-value, operating cash flow, and time-trend. Firm's size (Size) is measured by logarithm of total asset. Leverage (Lev) is a ratio between total liabilities and total assets. Prior research found there is relationship between leverage and discretionary accruals [5]. Firm's Market-to-Book-Value (MTB) is a ratio between share's market value and book value. Previous study suggests that MTB is a proxy for growth opportunity and may effected discretionary accruals. This study also uses Operating Cash Flow (OCF) as one of control variables since prior research found that a firm's operating cash flow affects discretionary accruals (Becker et al. 1998). Time-trend (Trend) is used to control the effect of economics general changes in one sample period. Consistent with prior research [12], Trend is coded 0 (null) for the first year of sample period and increased by 1 (one) for each year thereafter. To test the relevance of accounting information after ERP system implementation (H_2), this study uses three control variables, which are firm's size (Size), audit opinion (Audopn), and time-trend (Trend). Audit opinion (Audopn) will be included as control variable as prior research shows that firms will delay its earnings announcement if they got qualified audit opinion.

C. Hypothesis Testing Method

Hypothesis 1

This study employs regression analysis method using panel data covered three years before implementation of ERP system until three years after the system being implemented to test the hypothesis. Dependent variable is ABSDA which is absolute discretionary accruals value estimated with Jones Model [17], [45]. Independent variable are Aft for the implementation of ERP system. Control variables are Size, Lev, MTB, OCF, and Trend. Regression model to test the effects of ERP system implementation (H_1) on faithful representation accounting information will examine the sign and the significance of Aft. The regression model is as follows:

$$\mathrm{ABSDA} = ß_0 + ß_1\mathrm{Aft} + ß_2\mathrm{Size} + ß_3\mathrm{Lev} + ß_4\mathrm{MTB} + ß_5\mathrm{OCF} + ß_6\mathrm{Trend} + \varepsilon \qquad (2)$$

Where:

ABSDA	=	absolute discretionary accrual value estimated with the modified Jones Model
Aft	=	dummy variable which is set to 1 for years falling after ERP system implementation (t+1 to t+3) and 0 for years before ERP system implementation (t-3 to t-0);
Size	=	firm size measured by logarithm of total asset;
Lev	=	total liabilities divided by total asset;
MTB	=	equity market to book value
OCF	=	operating cash flows;
Trend	=	coded 0 (null) for the first year of sample period and increased by 1 (one) for each year thereafter

Hypothesis 2

In order to examine whether timeliness changes before and after ERP system implementation, this study uses regression analysis method using panel data covered three years before implementation of ERP system until three years after the system being implemented to test the hypothesis. Dependent variable is reporting lag (Lag). Previous research [38] suggests that firms with good news tend to announce its earning earlier

compared to firms with bad news. Therefore, this study will test whether reporting lag for good news firms shorten after ERP system implementation. Like prior research [25], this study identify firms with good news using variable EPS which is the different between earning per share (EPS) year t and year t-1, scaled with EPS's number year t-1. Positive (negative) earning number will show good (bad) news. To test H_2 this study examine the sign and the significance of Aft*EPS. Other factors that affect Lag such as Size, Trend, and Audopn are included in the model as control variables. The regression model is as follows:

$$Lag = \delta_0 + \delta_1 Aft + \delta_2 EPS + \delta_3 Aft*EPS + \delta_3 Size + \delta_4 Trend + \delta_5 Audopn + \varepsilon \quad (3)$$

Where:

Lag	=	time lag between firm's earning announcement and fiscal year-end;
Aft	=	dummy variable which is set to 1 for years falling after ERP system implementation (t+1 to t+3) and 0 for years before ERP system implementation (t-3 to t-0);
EPS	=	different between EPS year t and year t-1 scaled by EPS year t-1
Size	=	firm size measured by *logarithm of total asset*;
Trend	=	coded 0 (null) for the first year of sample period and increased by 1 (one) for each year thereafter;
Audopn	=	audit opinion.

IV. RESEARCH RESULTS

Data used in this study as sample are firms listed in Indonesian Stock Exchange that implemented ERP system. The total sample consist of 30 firms for six years, hence the total observation is 180 firm years. Table 1 shows descriptive statistics for sample data. From Table 1, it can be seen that median decreases and standard deviation increases for variable ABSDA, while the mean remain unchanged after implementing ERP system. Since ABSDA is an inverse measure of faithful representation quality, the decrease of median indicated that there is an increase in faithful representation of accounting information quality after ERP implementation, however this indication need to be tested further. From Table 1, it can be seen that the mean, median and standard deviation variable Lag decreases. This decrease indicates that after the ERP system implementation, the number of days required to publish financial report is shorten. It is an indication that the relevancy of financial information quality increases after the ERP implementation

Table 1

Descriptive Statistics

	Before ERP Implementation			After ERP Implementation		
Variable	**Mean**	**Median**	**Std.Dev.**	**Mean**	Median	**Std.Dev.**
ABSDA	0.070	0.046	0.064	0.070	0.050	0.081
Size	6.222	5.968	0.761	6.362	6.109	0.797
MTB	1.558	1.280	1.554	1.649	1.165	1.515
Lev	1.674	0.720	3.468	1.215	0.620	2.409
OCF	0.051	0.042	0.091	0.067	0.054	0.130
Lag	92.500	92.000	9.298	86.656	87.000	3.484
EPS	-0.011	-0.178	2.516	-0.139	-0.031	1.505
Audopn	0.722	1.000	0.450	0.833	1.000	0.375

Variable Definition:

ABSDA	=	absolute *discretionary accrual* value estimated used *modified Jones model*
Size	=	natural logarithm of total asset
MTB	=	ratio between market value and book value equity
Lev	=	total liabilities divided by total asset
OCF	=	operation cash flow scaled with total asset.
Lag	=	the difference between the firm's earning announcement date and fiscal year-end;
EPS	=	difference between EPS year t and year t-1, scaled by EPS year t-1; and
Audopn	=	audit opinion, is set to 1 for unqualified opinion and 0 for qualified opinion

Source: Data processed

V. DATA ANALYSIS AND DISCUSSION

In order to test the hypothesis, this study uses regression statistics analysis with software EVIEWS. The classic assumptions of regression model are tested before the regression statistics analysis done. The assessment shows that the data are normally distributed and there is no problem with multicolinearity, heteroscedasticity, autocorrelation and the existence of outlier in the data.

Hypothesis 1

The regression analysis result to test faithful representation quality is presented in Table 2. Results show a significant ($p = 0.001$) and positive coefficient for Aft. Since ABSDA is an inverse measure of faithful representation quality, this result indicates that faithful representation decrease after ERP implementation. This result support H_1 and provides evidence that after ERP implementation, the discretionary accrual number increase. The finding of this study is consistent with prior research done by [30] and [8] which found that ERP implementation reduced faithful representation quality of accounting information.

Table 2
Regression Analysis – *Faithful Representation*

$ABSDA = ß_0 + ß_1Aft + ß_2Size + ß_3Lev + ß_4MTB + ß_5OCF + ß_6Trend + ε$

Variable	Coefficient	t-Statistic	P-value
(Intercept)	-0.024	-4.310	0.000
Aft	0.008	3.322	0.001
Size	0.010	9.093	0.000
Lev	-0.001	-2.985	0.003
MTB	-0.002	-2.337	0.021
OCF	0.139	4.356	0.000
Trend	-0.001	-1.844	0.067
Adjusted R-squared	0.610		
Prob (F-statistic)	0.000		

Variable definitions:
ABSDA = the absolute value of discretionary accruals estimated using the modified Jones Model;
Aft = dummy variable, is set to one for the years falling after ERP system installation began (t+1 to t+3) and zero for the years falling before the beginning of ERP implementation (t-3 to t=0);
Size = logarithm of total assets;
Lev = total debts divided by total assets;
MTB = market to book value of equity;
OCF = operating cash flows scaled by total assets; and
Trend = a trend variable taking a value of 0 in first sample year and incremented by 1 for each year thereafter;

Source: Data processed

Hypothesis 2

The regression analysis result to test relevance quality is presented in Table 3. To test whether reporting lag decrease after implementation for good news firms (H_2), variable investigated is the interaction between Aft and EPS. Table 3 shows the regression result. The result show a negative (-0.122) and significant coefficient (p = 0,000) for interaction Aft*EPS. This result indicates that reporting lags of good news firms are significantly shorten or decrease after ERP implementation. This result support H_2. This result is consistent with prior studies done by [38], [21], [14], [24], [42], [34], [22], and [2] which found that firms with "good news" tend to announce their earnings earlier compared to firms with "bad news".

VI. CONCLUSION

This study examines whether a firm decision to implement ERP system has a positive impact on information quality. The implementation of ERP system increase management access on accounting data, decrease audit quality and internal control after the implementation of the system. In turn, this results the decreases of faithful representation of the accounting information. Furthermore, the efficiency offered by the ERP system should also reducing the reporting lag. It can be concluded from the result that the ERP system implementation increase the discretionary accrual (decrease faithful representation). In relation with the relevance of accounting information, this study finds that firms intended to increase the timeliness of earning reporting can reduce reporting lag after the ERP implementation primarily for firms with "good news".

This study has limitation due to the small sample data used in this research. This limitation should be consider when making any conclusion and generalizing the results. Moreover, the previous researches used in this study to develop arguments are research conducted in countries with possible different technology and culture with the country where this study has been done. However, this limitations offer further research in this area. This study has important implications, which are: (1) from theoretical perspective, this study contributes to the understanding of the ERP system implementation and it effect on the financial information quality. Theoretically, the ERP system implementation should enable it to increase the financial information quality that decreasing information asymmetry between managers and shareholders, hence reducing agency problem; (2) from the methodology perspective, this study provide guidance for further research in this area, especially in the measurement of financial information quality and ERP system implementation; and (3) from practical perspective, this study provide important evidence not only for managers and shareholders, but also for all decision makers especially regarding with the ERP implementation.

Table 3
Regression Analysis – Relevance

Lag = $\delta_0 + \delta_1$Aft + δ_2EPS + δ_3Aft*EPS + δ_4Size + δ_5Trend + δ_6Audopn

Variabel	Coefficient	t-Statistic	P-value
(Intercept)	92.440	143.023	0.000
Aft	-5.999	-22.165	0.000
EPS	0.003	0.320	0.750
Aft*EPS	-0.122	-21.318	0.000
Size	-0.108	-1.340	0.182
Trend	0.120	1.417	0.158
Audopn	0.156	0.608	0.544
Adjusted R-squared	0.968		
Prob(F-statistic)	0.000		

Variable definition:
Lag = the difference between the firm's earning announcement date and fiscal year-end;
Aft = dummy variable, is set to one for the years falling after ERP system installation began (t+1 to t+3) and zero for the years falling before the beginning of ERP implementation (t-3 to t=0);
EPS = difference between EPS year t and year t-1, scaled by EPS year t-1;
Size = logarithm of total assets;
Trend = a trend variable taking a value of 0 in first sample year and incremented by 1 for each year thereafter;
Audopn = audit opinion, is set to 1 for unqualified opinion and 0 for qualified opinion

Source: Data processed

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Y Anni Aryani, M.Prof.Acc., Ph.D., Ak., CA, received her bachelor's degree in accounting from Economics Faculty, Universitas Sebelas Maret, Surakarta, Indonesia, Master of Professional Accounting from Queensland University, Australia and Ph.D in accounting from Victoria University, Australia. She is a senior lecturer in Accounting Department, Economics Faculty, Universitas Sebelas Maret, Surakarta, Indonesia and is a member of Indonesian Accounting Association.

Krismiaji, M.Sc., Ak, graduated from Business and Economic College, University of Kentucky, Lexington, USA on 1995. He got M.Sc. degree in the field of Accounting. Currently, he is a Ph.D student in Ph.D program of Economics Faculty, Universitas Sebelas Maret, Surakarta, Indonesia. He is a lecturer at Accounting Academy YKPN Yogyakarta, YKPN School of Business Yogyakarta, and Indonesia Islamic University Yogyakarta, Indonesia. He is a member of Indonesian Accounting Association.