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# THE EFFECT OF ERP SYSTEM IMPLEMENTATION ON REAL EARNINGS MANAGEMENT: EVIDENCE FROM AN EMERGING ECONOMY

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## ABSTRACT

*ERP systems have distinct advantages and have radically changed the financial reporting system. This study examined the effect of ERP implementation on real earnings management in an emerging economy, specifically in the context of Bangladesh. Using a sample of 1914 firm year observations during the period 2000-2017 listed in the Dhaka Stock Exchange, the research shows that ERP adopting firms are less likely to involve in real earnings management activities compared to ERP non-adopting firms. In particular, ERP non-adopting firms manage earnings by offering more price discount, lenient credit period, lowering discretionary expenses and increasing production cost. In addition, the study finds that corporate governance plays a positive role in limiting real earnings management in the context of ERP implementation.*

**Keywords:** Enterprise resource planning, real earnings management, corporate governance

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## 1. INTRODUCTION

As a part of Information Technology (IT), the use of Enterprise Resource Planning (ERP) is increasing all over the world. In corporate sector, ERP systems emerged in 1990s as one of the most important information technology (Gable, Scott, & Davenport, 1998). ERP systems are defined as “information systems packages that integrate information and information-based processes within and across functional areas in an organization” (Kumar & Van Hillegersberg, 2000). ERP system is a very potential choice among many corporation for its different advantages (Bradford & Roberts, 2001; Leary, 2002; Winters, 2004). ERP systems solve the problem of old legacy system that produce and store duplicate information (Leary, 2002). Another problem of the previous systems was that, a change in data might not be updated in all systems simultaneously. The execution of ERP systems represents a radical change from the traditional system to an integral system where everything can be processed and reported automatically. Prior studies document that ERP helps managers to improve their capabilities to analyze and process accounting information by providing timely information (Gable et al., 1998; Hitt, Wu, & Zhou, 2002). Moreover, ERP provides uniform picture of the firm’s financial position all over the year (Dillon, 1999). These uniformity or integrated system help to eliminate the barrier between different firm functions and thus, assist managers with the flexibility of unprecedented access to accounting information (Leary, 2002). Announcement of ERP adoption make positive impact among market participants and they try to link with improved performance of the companies (Hayes, Hunton, & Reck, 2001; James E Hunton, Lippincott, & Reck, 2003).

However, some recent studies argue that ERP systems settings may reduce the effectiveness of internal control system and audit quality (Brazel & Agoglia, 2007; Brazel & Dang, 2008; J. E. Hunton, Wright, & Wright, 2004; Wright & Wright, 2002). More discretion and increased access to accounting information with a weak internal control system provide managers with an opportunity to do earnings management activities. Brazel & Dang (2008) investigated on “The effect of ERP system implementation on the management of earnings and earnings release dates”. This study is different from their study mainly in two ways. First, they took discretionary accrual to measure earnings management. Managers like real earnings management (REMs) activities compared to accrual-based earnings management because management gets more flexibility in REMs compared to accrual earnings management (Graham, Harvey, & Rajgopal, 2005). At any time of the year, management can apply REMs whereas accruals management techniques are applied only at the end of fiscal year. This study measures real earnings management through Roychowdhury’s model (Roychowdhury, 2006). Second, this study compares the real earnings management activities between ERP and non- ERP adopters.

This study contributes to the literature in different ways. In the context of the developing countries, most of the earnings management studies are conducted by discretionary accrual. In Bangladesh perspective, the effect of ERP implementation on real earnings management has not been tested. Moreover, this study wants to see the effect of revised corporate governance guidelines on the relationship between real earnings management and ERP implementation. We collect a sample of ERP system implementation firms to test hypothesis through direct communication with all listed companies in Dhaka Stock Exchange (DSE). Consistent with the previous studies, this study excludes financial companies to measure real earnings management (Alves, 2012; Cohen, Dey, & Lys, 2008; Cohen & Zarowin, 2010; Roychowdhury, 2006). Our study accommodates 18 years of data (2000-2017). For the first time, Bangladesh Securities and Exchange Commission (BSEC) issued corporate governance guideline in 2006, which was conform or explain basis. Again in 2012, BSEC issued revised

compulsory corporate governance guideline (BSEC, 2012).. To check the robustness of our result; we divide our sample into two-time frames: (i) prior to compulsory corporate governance (2000-2011) and (ii) after compulsory corporate governance (2012-2017). Our study shows that ERP adopting firms are less likely to be involved in real earnings management compared to ERP non-adopting firms. We also find that revised corporate governance guidelines play an important role to limit REMs.

The remainder of the paper is presented as follows. Section 2 reviews existing literature and develops the hypothesis, section 3 discusses sample selection and research design, section 4 explains the analysis and result and section 5 concludes the paper.

## **2. PRIOR RESEARCH AND HYPOTHESIS DEVELOPMENT**

A significant amount of investment is required to implement ERP system. O'Leary, (2000) documents that average implementation cost of ERP system is \$15 million, sold by top vendors like Oracle, SAP and AG. ERP systems are capable to collect and disseminate financial information to managers on timely basis and this will improve their capability to analyze and interpret financial information (Gable et al., 1998; Hitt et al., 2002). ERP system can expedite management's monitoring activities (Davenport, 2000; Oliver, 1999). After ERP implementation, management gets real-time financial information and free access to accounting information (Dillon, 1999; O'Leary, 2000). Brazel & Dang (2008) divided research related to ERP systems implementation into three research streams. First, challenges to implement ERP system and positive factors that may influence successful ERP implementation. Second, Market respondents react positively to announcement of ERP system implementation. For example, Hunton, McEwen, & Wier (2002) argue that analysts revise their prediction positively after getting message of ERP adoption. In third phase, research has been conducted by using accounting-based performance measures to see the positive impact of ERP system implementation, if any. On the other hand, Morris & Lakshmana (2010) divided ERP system implementation research into two parts. First group studied different methods to identify the factors of success and failure of ERP implementation. Other group investigated the impact of ERP implementation of firms' performance. Previous studies document that ERP system has different advantages. For example, it reduces the ratio of employees to revenues, and the ratio of cost of goods sold to revenues (Poston & Grabski, 2001); increase value and performance (Santos, Peffer, & Mauer, 1993), generates positive relationship between IT investment and firm performance (Peffer & Santos, 1996). On the other hand, there is no conclusive evidence that ERP implementation ensures the quality of financial reporting. For instance, Brazel & Dang (2008) report that following ERP implementation, firms are showing more discretionary accrual, which indicates lower earnings quality. They also argue that ERP system helps to increase ability of manager to manage earnings in four ways. First, ERP system enriches the information set of management and increases the gap of information asymmetry between managers and external users. This gap fuels the investors' confidence to the financial reporting. Second, ERP system reduces year end adjustment of the firms and external auditors raise question about this procedure. Third, accrual or earnings management requires multiple years of planning, and ERP system facilitate multiple years panning. Fourth, ERP system gives more opportunity to management to access and control financial reporting. In contrast, Dorantes, Li, Peters, & Richardson (2013) document that ERP adopter firms report lower discretionary accruals (Proxy of earnings management) compared to ERP non-adopters. Similarly, Morris & Lakshmana (2010) find ERP adopter firms shows lower discretionary accrual than ERP non-adopter firms. Moreover, they mentioned that ERP

system should provide greater transparency and accountability and deliver better quality report by limiting opportunistic activities of management.

Prior studies provide substantial evidences that top executives engage in earnings management (Defond et al., 1994; Healy, 1985; Teoh, Wong, & Rao, 1998b, 1998a). Management can manipulate the financial statement in different ways. One of the ways is by manipulating accrual (discretionary accrual, also known as abnormal accrual) without affecting cash flow. Higher discretionary accrual indicates more earnings management. There are different models to find out the discretionary accrual, which are the Jones model (Jones, 1991), the modified Jones model (Dechow, Sloan, & Sweeney, 1995), the modified Jones model (DeFond & Subramanyam, 1998) and the modified Jones model with return on assets (*ROA*) included as an additional independent variable (Kothari, Leone, & Wasley, 2005). Previous study found that testing accrual quality, earnings management can be measured. Taking operating cash flows into consideration, earnings management has been measured (Dechow & Dichev, 2002).

Firms management manage earnings by real activity decision(s). Different studies conducted to examine the real earnings management have emphasized on investment activities (Bartov, 1993; Bens, Nagar, & Wong, 2002; Bushee, 1998; Dechow & Sloan, 1991). Roychowdhury (2006) defined real earnings management as “management actions that deviate from normal business practices, undertaken with the primary objective of meeting certain earnings thresholds”. His study focused on operational activities of management to identify real earnings management. Previous studies found that Roychowdhury (2006) model has an extensive explanatory power to detect real earnings management (Cohen et al., 2008; Cohen & Zarowin, 2010). Empirical studies used discretionary accrual to measure earnings management (Brazel & Dang, 2008; Dorantes et al., 2010; Morris & Laksmana, 2010). Graham et al. (2005) and Bruns & Merchant (1990) conducted surveys, top financial executives prefer to manipulate earnings through real activities rather than accrual management. Real Earnings Management involves alteration or manipulation of real activities of the firms to meet some target of management at a cost of firm’s resources. Roychowdhury (2006) argues that firms use multiple real earning management techniques to fulfill financial target and to avoid losses. Specifically, he mentions that firms are giving price discount to boost-up sales, going for over production to show higher gross profit margin ratio, and reduce discretionary expenditure to report inflated earnings. REM involves changing regular investment and operational decision. If these types of changes or alterations are brought for optimum reason, we should not expect any negative result in future for such managerial actions or decisions. However, these alterations may happen for own purpose of the management, not for the firm. Chief financial officers are keen to stop investment activities to increase earnings, knowing their negative impact on future earnings of the firms (Graham et al., 2005). Similarly, Roychowdhury (2006) and Cohen & Zarowin (2010) mention that real earnings management causes negative impact on future value. Moreover, it has impact on cash flow of the firms. Management offers sales discount in panning of sales manipulation. This creates customer expectation regarding lower sales price in future and may force the firm to offer their product in lower price in future. If firms produce more to increase the gross margin ratio, it may increase carrying cost as well as more efforts are required to sell the excess produced product. There may be different reasons to management for preferring real earnings management over accrual management. However, Roychowdhury (2006) mentioned two reasons for choosing real earnings management. First, it is easier for auditors or regulators to find out the accrual management than real decision regarding pricing and production manipulation. Second, management can manipulate real decision at any time of the year. It gives more flexibility to the management. More

importantly, consistent with the evidence provided by Graham et al. (2005), (Cohen et al., 2008) documented that management changed their choice from accrual management to real earnings management in the Post Sarbanes-Oxley Act (SOX) period. So, this research uses real earnings management model (Roychowdhury, 2006) to detect REM. This study investigated the effect of ERP system on earnings management (measured by real earnings management) between ERP adopter and non-adopter. Our hypothesis, stated in alternative form, is as follows:

H1: ERP implementation has a significant relationship with real earnings management.

### **3. SAMPLE SELECTION AND RESEARCH DESIGN:**

#### **3.1 Sample selection**

ERP is a new concept in the corporate arena of Bangladesh. Due to ERP implementation, business activities are changing. The effect of ERP implementation on earnings management are yet to be tested. With the consistent development of scope for business, many companies are installing ERP system in Bangladesh. There is no data set to know the number of ERP implementing firms in Bangladesh. While communicating with the local vendors to know the name of ERP implementing firms and time of implementation, they were found disinclined to share this information. Moreover, there is no regulatory requirement for listed companies to disclose the information of ERP implementation news to public. Thus, the research has been entirely depended on survey-based data in order to collect the names of ERP-adopting firms. Due to the absence of sampling frame of ERP-adopting firms, survey-based ERP implementing firms' list has been treated as the sampling frame. Prior to collecting information, permission from Dhaka Stock Exchange (DSE) has been taken with assurance of maintaining the secrecy of data. Using the telephone numbers which are available on listed companies' website or DSE monthly review, a survey has been taken through telephone-interview. After communicating with all non-financial listed firms (enlisted with DSE up to December 2017) it is found that total 94 firms have implemented ERP system in their firms.

This study also investigates the effect of ERP implementation on earnings management among ERP adopter and non-adopter firms. The same 94 ERP implementing firms have been used for this purpose. To compare with non-adopters of ERP, the matched pair approach has been followed, as recommended by Barber & Lyon (1997), and used previously by Morris & Laksmana (2010). In matched pair approach, another 94 firms have been selected as a control group. One ERP adopter firm is first matched with another firm from same industry. We consider similar size of the firms to compare. If reasonable matching has not been possible, firms from another industry is used to do the matching. After including the 94 control firms, total sample firm size for analysis has become 188 and total firm year observations is 1914. Table 1 and 2 show number of observations conferring to each year and each industry respectively.

#### **3.2 Research Design**

##### **3.2.1 Earnings Management**

Healy & Wahlen (1999) defined earnings management as "Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company, or to influence contractual outcomes that depend on reported economic numbers". This definition has several aspects. First, management can manage

earnings through their judgment. For example, they can apply their judgment to estimate depreciation. Second, they can mislead the different stakeholders about the economic outcomes of the firms. It occurs when management can have access to information and alter due to bad motives, that is not accessible by outsiders.

In case of ERP implementing firms, management can manipulate the financial statement more easily since, this system is more flexible for managers to access. However, earnings management reduces credibility of financial reporting, obstructs the trust of users of financial reports, and increases biases in the financial statements. There are different angles of earnings management. Shareholders expect managers to ensure the optimum use of the fund they supply. A firm offers financial reward to management for its financial achievements, and failure to meet financial targets may have negative consequences on management (Stringer, Didham, & Theivananthampillai, 2011). Thus, failure to achieve financial target according to shareholders' expectation may be one of the reasons for management to manipulate earnings. Besides, prior research argued that there are different incentives for a firm's management to manage earnings by smoothing earnings (Barth, Elliott, & Finn, 1999), escaping missing earnings forecasts (Kasznik & McNichols, 2002), and avoiding losses (Brown, 2001). Moreover, Healy & Wahlen (1999) documented three types of motivation for earnings management, which are: capital market expectation and valuation, written contract in terms of accounting number, and anti-trust and regulatory issue. Previous studies found that firms report positive unusual accrual prior to initial public offers (Teoh et al., 1998a), seasoned equity offers (Teoh et al., 1998b), and stock-financed acquisition (Erickson & Wang, 1999). Moreover, firms involve in earnings management in order to meet analysts' forecasts (Burgstahler & Eames, 1998). Firms also involve in manipulation to meet capital market expectation through altering research and development expenses (Bushee, 1998).

### **3.2.2 Dependent Variable: Real earnings management**

Recently, there has been an increased appreciation for understanding and documenting the procedure of firms to manage earnings through real activities manipulation in addition to accrual-based activities (Gunny, 2010; Roychowdhury, 2006; A. Zang, 2007). Roychowdhury, (2006) finds evidence that firms use multiple real earnings management tools in order to meet certain financial reporting. Following Roychowdhury, (2006), several studies examine the real earnings management activities by using same proxies (Cohen et al., 2008; Gunny, 2010; A. Zang, 2007) and increase the empirical validity of these proxies. This study relies on prior studies to take proxies for real earnings management, and similar to Roychowdhury (2006) proxies, abnormal cash flows from operation, production costs and discretionary expenses have been used here to measure real activities manipulations.

Three methods have been applied here to examine the impact ERP implementation on the above three variables:

1. Increasing sales value through lenient credit period or increased price discount
2. Increasing production cost to reduce cost of goods sold
3. Recording lower discretionary expenses

Dechow, Kothari and Watts (1998) model, as implemented by Rowchowdhury (2006), has been used here to generate normal level of cash flow from operation (CFO), production cost and discretionary expenses. *Sample of firm years: year and industry wise*

**Table 1** Year wise

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
ERP adopting firm	26	31	34	36	39	41	46	51	52	56	61	62	66	71	76	79	87	94	1008
ERP non-adopting firm	26	31	34	36	39	41	46	51	52	56	61	62	66	71	76	79	87	94	1008
Annual reports are not Available	10	8	8	6	8	6	6	4	6	4	6	4	6	4	6	4	4	2	102
Final sample	42	54	60	66	70	76	86	98	98	108	116	120	126	138	146	154	170	186	1914

Industry	Engineering	Food	Fuel & Power	Jute	Textile	Pharmaceutical	Paper & Printing	Service & Real estate	Travel and leisure	Cement	IT-Sector	Tannery	Ceramic	Telecommunication	Miscellaneous	Total
Number ERP adopting firms	160	144	74	22	197	148	10	18	12	40	36	38	30	6	73	1008
Number of ERP non-adopting firms	160	144	74	22	197	148	10	18	12	40	36	38	30	6	73	1008
Annual reports are not Available	20	18	6	0	22	12	0	2	0	4	2	4	2	0	10	102
Final sample	300	270	142	44	372	284	20	34	24	76	70	72	58	12	36	1914

Abnormal cash flows from operation (AB\_CFO): Offering more sales discount and lenient credit period, firms can increase sales volume for a short period of time. These sales discount and lenient credit period will help to boost current year earnings, assuming that firms' gross margin ratio is positive. This extra sales revenue does not increase current year operating cash flows due to lenient credit period or increased price discount. Actual cash flows will be less than normal level cash flows. Abnormal cash is the difference between actual cash flow from operation and normal level cash flows from operation. We measure normal CFO as a function of sales and change in sales and estimate normal level operating cash flow from operation by following cross-sectional regression model. According to Roychowdhury (2006), Cohen et al. (2008) and Cohen & Zarowin, (2008), following cross-sectional regression will estimate normal level of cash flow from operation. The following model has been employed for each industry and each year:

$$\frac{CFO_{it}}{Assets_{i,t-1}} = k_{1t} \frac{1}{Assets_{i,t-1}} + k_2 \frac{Sales_{it}}{Assets_{i,t-1}} + k_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + \varepsilon_{it}$$

Where:  $CFO_{it}$  = Cash flow from operation during the period of t for firm i;  $Assets_{it}$  = Value of total asset at the end of year t for firm i;  $Sales_{it}$  = value of total sales during the period of t for firm i; and  $\Delta Sales_{it}$  = change in sales between  $Sales_{it} - Sales_{it-1}$

Abnormal production cost (AB\_PROC): Producing more units, management can spread the fixed cost per unit, and thus, reduce per unit cost. As long as this reduction cannot be out weighted by incremental marginal cost per unit and holding, management can produce more unit but report lower cost of goods sold and higher operating margin. Due to excess production, production cost will be abnormally higher than the normal level of production cost. Abnormal production cost is the difference between actual production cost and normal level of production cost. Normal level of production cost has been used as a function of sales and change in sales in previous two years. According to Roychowdhury (2006), Cohen et al. (2008) and Cohen & Zarowin, (2008), following cross-sectional regression will estimate normal level of production cost:

$$\frac{Proc_{it}}{Assets_{i,t-1}} = k_{1t} \frac{1}{Assets_{i,t-1}} + k_2 \frac{Sales_{it}}{Assets_{i,t-1}} + k_3 \frac{\Delta Sales_{it}}{Assets_{i,t-1}} + k_4 \frac{\Delta Sales_{it-1}}{Assets_{i,t-1}} + \varepsilon_{it}$$

Where:  $Proc_{it}$  = Production cost during the period of t for firm i. We compute it by adding changes in inventory with the cost of goods sold. All other variables are defined previously.

Abnormal discretionary expenses (AB\_DISEX): Firms may report lower discretionary expenses which includes research and development expenses, selling and administrative expenses, and advertising expenses to boost current year earnings. Hence, firms report abnormally lower level of discretionary expenses than actual level of discretionary expenses. Abnormal discretionary expenses is the difference between actual discretionary expenses and normal level of discretionary expenses. Normal discretionary expenses can be measured as a linear function of sales. According to Roychowdhury (2006), Cohen et al. (2008) and Cohen & Zarowin, (2008), following cross-sectional regression will estimate normal level of discretionary expenses:

$$\frac{Disex_{it}}{Assets_{i,t-1}} = k_{1t} \frac{1}{Assets_{i,t-1}} + k_2 \frac{Sales_{it}}{Assets_{i,t-1}} + \varepsilon_{it}$$

Measuring discretionary expenses using current year sales may have significant effect on residual of the equation. Therefore, this study also takes into account the previous year's sales to measure discretionary expenses.

$$\frac{Disex_{it}}{Assets_{i,t-1}} = k_{1t} \frac{1}{Assets_{i,t-1}} + k_2 \frac{Sales_{i,t-1}}{Assets_{i,t-1}} + \varepsilon_{it}$$

Where:  $Disex_{it}$  = discretionary expense during the period of t for firm i. Combined value of research and development, advertising, and selling and administrative expenses are considered to measure discretionary expenses. Other variables are defined previously.

The abnormal CFO, abnormal discretionary expenses and abnormal production costs are measured as the difference between the normal levels predicted from the above equation and actual values. As proxies of real earnings management, these three variables have been used in this study. For a specific level of sales, if a company wants to show higher profit by real earnings management, they will try to do one or all of these: lower cash from operation, and/or lessen discretionary expenses, and/or increase production cost. Similar to Zang, (2007), Cohen et al., (2008) and Cohen & Zarowin, (2010), we multiply AB\_CFO and AB\_DISEX by negative one. Thus, higher amount of AB\_CFO and AB\_DISEX indicate that firms are involved in manipulation through high sales discount, lenient credit period and reducing discretionary expenses. As discussed earlier, over production indicates that firms are reducing cost of goods sold and showing higher profit.



In order to measure real earnings management, sum of the standardized value of AB\_CFO, AB\_DISEX and AB\_PROC have been taken. Similar to Cohen & Zarowin, (2008), this study also considers the variables individually to see the effect of individual variables,.

Firms may simultaneously apply one or more technique(s) for manipulating financial statements, where, one technique is related to another. Prior studies document that firms manipulate their earnings by applying more than one techniques (Cohen et al., 2008; Deng & Wang, 2006; Razaque, Ali, & Mather, 2016; Roychowdhury, 2006). Previous studies developed and used two aggregate measures of REMs, REM\_1 and REM\_2 (Cohen & Zarowin, 2010; Razaque et al., 2016; Zang, 2012). They reported that REM is the proxy for A\_CFO, A\_DIS, REM\_1, A\_PROD and REM\_2. REM\_1 is the aggregate of A\_CFO and A\_DIS. REM\_2 is the aggregate of A\_DIS and A\_PROD. This study considers several control variables as suggested by prior REMs literature. Following preceding literature, LEV has been included as a control variables for risk of bankruptcy (Dyreg, Hillegeist, & Penalva, 2011). This study also includes ROA, SIZE and AGE as control variables (Becker, Defond, & California, 1998; Cohen & Zarowin, 2008; Deng & Wang, 2006; Roychowdhury, 2006). LEV is measured as the ratio of total debts to total asset, ROA is measured by return on asset, SIZE is measured by natural logarithm of total asset of the firms and AGE is measured by natural logarithm of total age of the firms.

To test H1, the study used the following regression model:

$$RM = \alpha_0 + \alpha_1 ERP + \alpha_2 LEV + \alpha_3 SIZE + \alpha_4 AGE + \alpha_5 ROA + \varepsilon_{it}$$

To see the effect of ERP implementation, ERP adopter and non-adopter firms have been compared here. A dummy variable is used to investigate the effect ERP. ERP=1 and ERP= 0 represent ERP implementing firms and control firms respectively. Five other equations have been used for each situation to measure the effect of ERP implementation on AB\_CFO, AB\_DIS, REM\_1, AB\_PROC and REM\_2.

## 4. ANALYSIS

### 4.1 Descriptive statistics and correlation

Table 3 reports descriptive statistics of all variables of this study. On an average, the sample firms have a negative REM. It indicates that Bangladeshi firms do manipulation through downward sliding. Among the control variables, LEV is 57 percent which is very close to 54 percent, as found by Hsu & Koh (2005). While comparing with other developing countries, it is found 36 percent in Jordan (Al-fayoumi, Abuzayed, & Alexander, 2010) and 34 percent in China (Wei, Xie, & Zhang, 2005). Result also shows that average return on asset is 7%. Table 4 reports that REMs proxies are negatively associated with three control variables (SIZE, AGE and ROA). On the other hand, this study finds positive association of REMs proxies with leverage.

Table 3

Variable	N	Mean	S.D.	Quantiles				
				Min	.25	Mdn	.75	Max
REM	1914	-0.00	0.21	-1.10	-0.09	-0.00	0.09	0.83
REM1	1914	0.00	0.11	-0.50	-0.05	0.00	0.06	0.39
REM2	1914	-0.01	0.18	-0.85	-0.07	0.00	0.07	0.71
AB_CFO	1914	0.00	0.08	-0.26	-0.04	0.00	0.04	0.24
AB_DIS	1914	-0.00	0.07	-0.24	-0.02	0.00	0.03	0.19
AB_PROD	1914	-0.01	0.15	-0.61	-0.05	0.00	0.04	0.52
LEV	1914	0.59	0.42	0.04	0.36	0.55	0.73	3.40
SIZE	1914	20.96	1.66	17.34	19.76	20.78	22.04	25.41
AGE	1914	2.48	0.89	0.00	1.95	2.77	3.14	3.66
ROA	1914	0.07	0.08	-0.23	0.03	0.07	0.11	0.32

Where REM is real earning management; REM\_1 is the aggregate of AB\_CFO and AB\_DIS; REM\_2 is the aggregate of AB\_PROD and AB\_DIS; AB\_CFO is the abnormal cash flows from operations; AB\_DIS is the abnormal discretionary expenses; AB\_PROD is the abnormal production costs; LEV is the ratio of total debt to total asset of the current year; SIZE is the natural logarithm of total assets of the current year; AGE is the natural logarithm of firms age and ROA is the net income to total assets ratio of the current year.

Table 4

Variable	REM	REM1	REM2	AB_CFO	AB_DIS	AB_PROD	LEV	SIZE	AGE	ROA
REM	1.0000									
REM1	0.7230**	1.0000								
REM2	0.9263***	0.4862***	1.0000							
AB_CFO	0.5199***	0.7919***	0.1596***	1.0000						
AB_DIS	0.5493***	0.6713***	0.5999***	0.0789***	1.0000					
AB_PROD	0.8710***	0.2903***	0.9373***	0.1569***	0.2834***	1.0000				
LEV	0.1077***	0.1318***	0.0379	0.1962***	-0.0231	0.0555*	1.0000			
SIZE	-0.0177	-0.0031	-0.0125	-0.0181	0.0170	-0.0223	-0.1525***	1.0000		
AGE	-0.0426	-0.0456	-0.0633**	0.0318	-0.1130***	-0.0266	0.1915***	-0.1143***	1.0000	
ROA	-0.2292***	-0.2616***	-0.1468***	-0.2676***	-0.1022***	-0.1314***	-0.4168***	0.2080***	-0.1030***	1.0000

Where REM is real earning management; REM\_1 is the aggregate of AB\_CFO and AB\_DIS; REM\_2 is the aggregate of AB\_PROD and AB\_DIS; AB\_CFO is the abnormal cash flows from operations; AB\_DIS is the abnormal discretionary expenses; AB\_PROD is the abnormal production costs; LEV is the ratio of total debt to total asset of the current year; SIZE is the natural logarithm of total assets of the current year; AGE is the natural logarithm of firms age and ROA is the net income to total assets ratio of the current year.

\* p<0.10. \*\* p <0.05. \*\*\* p <0.01.

## 4.2 Regression result

Table 5 reports cross sectional time series regression analysis with time and firms specific fixed effect. Table 5 shows the regression result representing the association between ERP implementation and real earnings management. Model 1 shows that the effect of ERP implementation on REM is negative, where, REM is significant at p<0.01 and t values are (-

6.47). Model 1 suggests that ERP non-adopting firms are more likely to involve in REM compared to ERP adopting firms, which is consistent with the findings of empirical studies (Davenport, 2000; Dorantes et al., 2010; Gable et al., 1998; Hitt et al., 2002; Oliver, 1999).

In case of control variables, LEV and SIZE are positively associated with REM. On the other hand, ROA is negatively associated with REM. AGE has negative relationship with REM, but not statistically significant. A manager can manipulate their earnings in three different ways. From model 1, management strategy to REMs has not been clear. In order to specifically understand the technique(s) used by management to manipulate financial statements, Model 2, 3 and 5 has been analyzed. These models report the relationship between ERP implementation and three primary measures of REMs (abnormal cash flow from operation, abnormal discretionary expenses, and abnormal production cost). According to Model 2, 3 and 5, compared to ERP adopting firms, ERP non-adopting firms are more likely to involve in real earnings management by offering more price discount and lenient credit period [ $p < 0.05$  and  $t$  values (-2.07)]; lowering discretionary expenses [ $p < 0.01$  and  $t$  values (-7.05)] and increasing production cost [ $p < 0.01$  and  $t$  values (-4.59)].

Cohen et al. (2008) report that REM is the proxy for A\_CFO, A\_DIS, REM\_1, A\_PROD and REM\_2. REM\_1 is the aggregate of A\_CFO and A\_DIS. REM\_2 is the aggregate of A\_DIS and A\_PROD. This study also tests the relationship between independent variables and REMs proxies. Model 4 and 6 report that ERP adopting firms are less likely to involve in REMs (REM\_1 and REM\_2) compared to ERP non-adopting firms. This relationship is statistically significant ( $p < 0.01$ ). The study result signifies that ERP systems are capable to collect and disseminate financial information to managers on timely basis and improve earnings quality. This result is consistent with recent studies, which have found that implementation of technology helps in improving the financial reporting quality (Hunton, Mauldin, & Wheeler, 2008; Masli, Peters, Richardson, & Sanchez, 2010).

Table 5

	1	2	3	4	5	6
	REM	AB_CFO	AB_DIS	REM_1	AB_PROD	REM_2
ERP	-0.083*** [-6.47]	-0.010** [-2.07]	-0.030*** [-7.05]	-0.040*** [-6.19]	-0.043*** [-4.59]	-0.073*** [-6.37]
LEV	0.034* [1.81]	0.032*** [4.98]	-0.010** [-2.19]	0.021** [2.40]	0.013 [0.84]	0.003 [0.15]
SIZE	0.009*** [2.68]	0.003** [2.01]	0.005*** [4.76]	0.007*** [4.30]	0.002 [0.73]	0.007** [2.15]
AGE	-0.012* [-1.95]	0.001 [0.24]	-0.008*** [-4.18]	-0.007** [-2.27]	-0.005 [-1.10]	-0.012** [-2.34]
ROA	-0.573*** [-7.54]	-0.244*** [-8.86]	-0.089*** [-3.32]	-0.333*** [-8.10]	-0.239*** [-4.54]	-0.328*** [-5.02]
Constant	-0.095 [-1.23]	-0.055* [-1.85]	-0.048** [-2.24]	-0.103*** [-2.72]	0.009 [0.14]	-0.039 [-0.58]
Observations	1,914	1,914	1,914	1,914	1914	1,914
R-squared	0.10	0.12	0.06	0.12	0.05	0.06
Adj. R-squared	0.09	0.10	0.05	0.10	0.03	0.05
Robust t-statistics in brackets *** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.10$						

### 4.3 Robustness of our result

To confirm the robustness of the results, the study wanted to see the effect of corporate governance on the relationship between ERP implementation and REMs. Practice of good governance enhances transparency and accountability. BSEC issued revised corporate governance guideline in 2012. This code was mandatory for all listed firms to follow, which was not the case for the preceding guideline. To check the robustness of the result, the research sample are divided into two groups: before compulsory CG (2000-2011) and after compulsory CG (2012-2017). Sub-sample data has been used to test the relationship, as depicted in Table 6. According to Table 6, ERP adopting firms are less likely to involve in REMs compared to ERP non-adopting firms in both periods, before compulsory CG ( $P < 0.01$ ) and during compulsory CG ( $P < 0.05$ ). Result also shows that coefficient value has decreased during compulsory CG (before compulsory CG 0.102 and during compulsory CG 0.064). This indicates that CG lessen the association between ERP implementation and REMs and helps to reduce REMs.

**Table 6**

	<b>BEFORE CG</b>	<b>AFTER CG</b>
ERP	-0.102*** [-6.71]	-0.064** [-2.58]
LEV	-0.010 [-0.42]	0.132*** [5.24]
SIZE	0.014*** [3.26]	0.005 [0.94]
AGE	-0.005 [-0.60]	-0.027*** [-3.02]
ROA	-0.560*** [-5.06]	-0.622*** [-6.13]
Constant	-0.161* [-1.73]	-0.058 [-0.44]
<b>Observations</b>	<b>1,160</b>	<b>754</b>
<b>R-squared</b>	0.10	0.15
<b>Adj. R-squared</b>	0.08	0.13
<b>Robust t-statistics in brackets</b> *** $p < 0.01$ , ** $p < 0.05$ , * $p < 0.10$		

## 5. CONCLUSION

In this paper, the effect of ERP implementation on real earnings management of Bangladeshi firms listed in the Dhaka Stock Exchange has been investigated during the period 2000-2017. The study finds that following ERP implementation, the extent of real earnings management decreases. Specifically, ERP non-adopting firms are more likely to manipulate real earnings by proposing more price discount and lenient credit period, reducing discretionary expenses and increasing production cost, compared to ERP adopting firms. The findings are found steady with empirical research findings. While checking the robustness of the results, they have been found robust. The impact of CG on the relationship between ERP implementation and real earnings management has been find positive. Corporate governance plays an important role to reduce REM. However, the impact of ERP implementation on real earnings management is considerably under researched, especially in an emerging economy.

The research is subject to some limitations. Although the data can be claimed to be very precise, all ERP implementation data have been collected over telephone. In addition, this study took into account only the real activities of management to measure earnings

management, where discretionary accrual model has not been considered. This study findings have important implications for future research. Since wealthy firms can afford the cost of ERP implementation, the research results may motivate future researchers to see the association between real earnings management and size of the firms in an emerging economy.

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