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The Consequences of Information Technology Control Weaknesses on Management Information Systems: The Case of Sarbanes-Oxley Internal Reports

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ABSTRACT

In this paper, we investigate the association between the strength of information technology controls over management information systems and the subsequent forecasting ability of the information produced by those systems. The Sarbanes-Oxley Act of 2002 highlights the importance of information system controls by requiring management and auditors to report on the effectiveness of internal controls over the financial reporting component of the firm's management information systems. We hypothesize and find evidence that management forecasts are less accurate for firms with information technology material weaknesses in their financial reporting system than the forecasts for firms that do not have information technology material weaknesses. In addition, we find that this association appears to be driven by control weaknesses most directly related to data processing integrity. Our results support the contention that information technology controls, as a part of the management information system, affect the quality of the information produced by the system.

Keywords

Sarbanes-Oxley, Internal Controls, Information Quality, Management Forecast

INTRODUCTION

Many criticize the Sarbanes-Oxley Act of 2002 (SOX) as being bad for businesses because of the additional regulation and burdensome expense, some suggesting that it has led to the lack of competition of U.S. firms as compared to foreign firms. However, others suggest that SOX has been good because it served as a mechanism for pointing out deficiencies in a firm's information systems. Although SOX was aimed at improving information for external stakeholders, identifying and rectifying control weaknesses in the financial reporting system may lead to better internal information within a firm (Feng et al. 2009). In fact, documenting the extent that SOX compliance efforts also improve internal information is an ongoing concern for many firms.

SOX Section 404 highlights the critical importance of controls related to the financial reporting function of management information systems by requiring a regular assessment of the quality of the financial reporting function (hereafter referred to as the Financial Reporting System or FRS). Because management uses its FRS to manage operations, monitor performance, create forecasts, and report results to firm stakeholders, control quality of the FRS is likely to affect many management decisions. In fact, Feng et al. (2009) find that SOX Section 404 material weaknesses related to the FRS affect firms' internal management information and, hence, the quality of management earnings forecast.

Extending Feng et al. (2009), this study considers extent that the existence and resolution of information technology (IT) control weaknesses impact the ultimate usefulness or quality of the information produced by financial reporting system. By doing so, we also extend the stream of research on information system (IS) quality issues (for a discussion of this literature see Lee et al., 2002; Nelson et al., 2005). Arguably, if there are significant weaknesses over the capturing or processing of data within an FRS, the information produced by such a system may be less effective in its ability to aid decision making. One important management decision outcome that could potentially be affected by a poor FRS is management earnings forecasts. Prior studies suggest that management earnings forecasts are very informative to market participants, including investors and analysts (e.g., Williams, 1996). The extent to which management forecasts mitigate the information asymmetry in the capital market, however, largely depends on

the degree of credibility, integrity and accuracy of the forecasts (Healy and Palepu, 2001). If management relies on inferior information, the quality of its forecasts will be lower.

In this paper, we hypothesize that the stronger (weaker) IT controls over the FRS, the higher (lower) the information quality produced by the system. We use the firm's SOX 404 Management's Report on Internal Controls to identify material weaknesses in IT controls. Firms reporting material weaknesses in IT controls are hypothesized to have weaker controls over the production of management information, which negatively impact the quality of the information management uses in forming earnings forecasts, resulting in lower forecast accuracy. We also examine how the relation between internal control material weaknesses and management forecast accuracy varies by the *type* of IT material weaknesses reported. Keeping this in mind and using extant information system quality research as our guideline, we categorize IT control weaknesses across three dimensions: a) data processing integrity, b) system access and security, and c) system structure and usage (available from the authors) to identify those types of IT material weaknesses that we expect will have the greatest impact on the FRS, i.e., those related to information accuracy issues.

This study contributes to several streams in the IS literature by highlighting the implications of IT controls on information quality issues for system users and decision makers. First, this study provides empirical evidence on the importance of designing systems with appropriate IT controls to increase information quality (e.g., Ballou and Pazer, 1995). It also contributes to the research stream that investigates the impact of information environment (including data and system) quality on decision making (e.g., Chengalur-Smith and Pazer, 1999). For example, research to date has used experimental settings to provide insight into which type of data-quality information is most effective (Fisher et al. 2003). In contrast, this paper is the first to directly test the relationship between information quality and decision making. Third, this study contributes to the IS literature focused on the measurement and indicators of system and data quality (e.g., Miller and Doyle, 1987; Pierce 2004). Specifically, our evidence suggests that control reports, mandated by SOX, can provide information to system users about the underlying system and data quality. Finally, this study also contributes to the nascent internal control literature.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Information Quality and the Sarbanes-Oxley Act of 2002

Extant literature focuses on the data reliability assessments within FRSs as a determinant of information quality (Krishnan et al. 2005). At the same time, recent accounting scandals and the subsequent requirements enacted in SOX also emphasize the critical importance of data reliability assessments in FRS. SOX was established in an attempt to strengthen internal controls over financial reporting among U.S. public firms and increase investor and stakeholder confidence in published financial reports. Among the many SOX provisions, SOX 404 requires an annual assessment by a firm's executive management and the external auditor of the firm's internal controls over the system that provides financial reporting information, hereafter referred to as internal controls over financial reporting (SEC 2003). Among other objectives, the focus of these controls "pertain to the maintenance of records, which in reasonable detail, accurately and fairly reflect" the transactions and economic condition of the firm (PCAOB, 2007).

The SOX internal control requirements directly integrate and reflect the importance of information quality on decision-making. For example, if internal controls are not effective, the firm must also identify the types of internal control material weaknesses in Management's Report on Internal Controls. For the purpose of identification, a "material weakness" is defined as a control deficiency that results in a *reasonable possibility* that a *material misstatement* of financial information will occur without being detected or corrected (PCAOB, 2007). The designation of "*material*" level, that pervades the accounting and auditing profession, represents a misstatement that makes it probable that the decisions of a reasonable person would be changed or influenced by the misstatement (FASB 1980). As such, SOX-related IT material weaknesses are especially severe because they indicate system problems that are most likely to result in poor quality information affecting decision making. The quality of the information produced by the financial reporting function of the Management Information System (MIS) is particularly germane as it represents core data used by managerial decision makers (Krishnan et al. 2005).

IT Controls, IS Quality, and Earnings Forecasts

Regulators view the extent and nature of different risks to internal controls vary because they all dependent on the nature and characteristics of the firm's ISs (PCAOB, 2007; AICPA, 2002). In fact, to comply with SOX, financial auditors of publicly-listed firms are explicitly required to consider how an "entity's use of IT in its ISs affects the entity's internal controls" over the FRS (PCAOB 2003). Thus, SOX 404 material weaknesses can be related to IT as well as non-IT control elements. For example, non-IT material weaknesses may be due to inadequate business competence or assignment of accounting responsibilities. In contrast, IT material weaknesses can take the form of incompatible applications or poor IT staff support, among others.

Doyle et al. (2007) assert that the types of material weaknesses vary widely with respect to severity and underlying reason. Prior literature, auditing standards and IT professional guidance suggests that since IT is an integral part of capturing, processing, and disseminating information, IT material weaknesses should have a pervasive impact on the informational quality of the system (e.g., ITGI 2004). Consistent with the asserted importance and pervasive impact of IT controls across a firm's information systems, Klamm and Watson (2009) find that IT material weaknesses are associated with other indicators of the firm's information system quality including more misstated financial accounts. Overall, their results are consistent with firms with IT material weaknesses appearing to have a greater likelihood of financial reporting irregularities and lower levels of reporting reliability than firms with non-IT material weaknesses.

To the extent that management utilizes information about prior business transactions to formulate expectation about future performance, breakdowns in the controls over the automated means of originating, processing, storing, and communicating information can lead to poor inputs into management production of forecasts.

This leads to our first hypothesis:

H1: Management earnings forecast accuracy is lower for firms with SOX 404 IT material weaknesses than for firms that do not have SOX 404 IT material weaknesses.

Since the impact of the types of material weaknesses varies (Doyle et al. 2007), from an IT perspective, we investigate whether certain types of IT material weaknesses will have a greater impact on the informational quality of FRSs than others. To categorize the types of IT material weaknesses, we turned to extant information/data/system quality literature to identify a list of dimensions which affect data quality and therefore financial information reliability in our study. Unfortunately, varied frameworks and definitions are used to investigate the concepts of quality (e.g., Wang et al. 1995; Strong et al. 1997; Nelson et al. 2005).

Keeping the language used in SOX 404 reports, IT professional guidance (e.g., COBIT® 4.1) as well as guidance from IT audit professionals in mind, we draw on the categories from Strong et al. (1997) combined with definitions from Pipino et al. (2002) to categorize IT control weaknesses across three information quality dimensions: a) data processing integrity, b) system access and security, and c) system structure and usage. Data processing integrity reflects Strong et al.'s intrinsic data quality category which is concerned with data accuracy defined by Pipino et al. (2002) (via free-of-error) as the extent to which data is correct and reliable. For example, if the development, maintenance, and change management of programs is not properly handled, then accuracy will be threatened; if the internal control framework is not functioning properly, it is likely that risks are not recognized and controls not properly defined to help ensure reliable data.

Wang and Strong (1996) investigate characteristics of data quality and find that factors impacting data accuracy (or reliability) are the most important in many settings. Similarly, regulatory requirements and professional guidance all emphasize the importance of strong IT controls to support data processing integrity and enable better business decisions by providing higher-quality information (e.g., AICPA, 2002; ITGI, 2007). Therefore, we expect this dimension to be most directly related to the accuracy of information and therefore should have a direct (and largest) impact on the accuracy of forecasts. All combined, we hypothesize the following:

H2: Management earnings forecast accuracy is lower for firms with data processing integrity SOX 404 IT material weaknesses than for firms without data processing integrity SOX 404 material weaknesses.

Research Models

To test H1, that managers in firms with SOX 404 IT material weaknesses will have larger earnings forecast errors than firms with either effective internal controls or non-IT material weaknesses, we estimate the following OLS regression model:

$$\begin{aligned} MFERROR = {} & b_0 + b_1 ITMW + b_2 OTHERMW + b_3 LnAT + b_4 BIG4 + b_5 LITIGATE + b_6 GROWTH \\ & + b_7 LOSS + b_8 LEVERAGE + b_9 BETA + b_{10} CFO\_VOLATILITY + b_{11} ABSCHGROA \\ & + b_{12} DISPFOR + b_{13} HORIZON + b_{14} SURPRISE \end{aligned} \quad (1)$$

In equation (1), we include management forecast error (MFERROR) as our empirical proxy for decision-outcomes resulting from the management IS. MFERROR is measured as the absolute value of management forecast error (realized earnings less the management earnings forecast) scaled by stock price at time t-1. Management forecast is the average of management annual forecasts (Ajinkya et al., 2005; Feng et al., 2009).

Our test variables are ITMW (equal to 1 if firms have IT material weaknesses, 0 otherwise) and OTHERMW (equal to 1 if firms have non-IT material weaknesses, 0 otherwise).[1] We expect that both variables are positively associated with MFERROR with the coefficient of ITMW larger than that of OTHERMW.

To investigate whether certain types of IT SOX 404 material weaknesses will have a greater impact on the informational quality of FRSs (H2), we categorize ITMW across three dimensions: a) data processing integrity (hereafter, "IT PROCESS"), b) system access and security (hereafter "IT SECURITY"), and c) system structure and usage (hereafter, "IT STRUCTURE"). Using the SOX 404 report for each firm in our sample, we identified the IT material weaknesses and coded the control weaknesses among our three categories. The coding was done by two of the authors independently. Any differences were discussed and a consensus coding was achieved. The inter-rater reliability was greater than 90%.

We following prior literature (e.g., Doyle et al., 2007; Ajinkya et al., 2005; Feng et al., 2009) for our control variables.

SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

We begin with all SOX 404 reports available on Audit Analytics, which are 11,528 firm-year observations for fiscal year 2004 through fiscal year 2006. After excluding observations without necessary data, our final sample for management forecasts contains 3,025 firm years, including 40 firms with IT control material weaknesses, and 277 with non-IT control material weaknesses. Table 1 describes the variable definitions used in the analysis.

Table 1 Variable Definitions

NO MW	= 1 if firm has effective internal controls, 0 otherwise.
ITMW	= 1 if firm has IT-related internal control material weaknesses, 0 otherwise.
ITIMPROVE	= 1 if firm has ITMW in year t but has no ITMW in year t+1; 0 otherwise
ITADVERSE	= 1 if a firm has ITMW in both year t and t+1; 0 otherwise
ITWORSE	= 1 if firm has no ITMW in year t, but has ITMW in year t+1.
OTHERMW	= 1 if firm has internal control material weaknesses other than IT related, 0 otherwise.
OTHERIMPROVE	= 1 if firm has non-ITMW in year t but has no non-ITMW in year t+1, 0 otherwise.
OTHERADVERSE	= 1 if a firm has non-ITMW in both year t and t+1, 0 otherwise.
OTHERWORSE	= 1 if firm has no non-ITMW in year t, but has non-ITMW in year t+1.
NUMBERMW	= the total number of internal control material weaknesses.
MFERROR	= absolute error of management earnings forecast, which equals the absolute value of the difference between actual earnings and management earnings forecasts scaled by the stock price at the beginning of the period.
LnAT	= natural log of total assets.
BIG4	= 1 if the auditor is Big 4, 0 otherwise.
LITIGATE	= 1 if the firm is in the high litigation industry.
GROWTH	= sales growth from year t-1 to year t
LOSS	= 1 if the net income is negative, 0 otherwise.
LEVERAGE	= total liabilities / total assets.
BETA	= beta from the market model.

[1] To the extent that an IT material weakness was not specifically disclosed as IT-related, it would be included in the "other" material weakness category for our study. In terms of the potential implications for our tests, this would bias our "ITMW" results away from statistical significance. To counter the potential dangers of miscoding, the coding was done by two of the authors independently. Any differences were discussed and a consensus coding was achieved.

CFO_VOLATILITY	= The standard deviation of quarterly operating cash flows over the prior 7 years.
ABSCHGROA	= The absolute value of the change in ROA from year t-1 to year t.
DISPFOR	= standard deviation of analyst forecasts before management forecasts.
HORIZON	= natural log of number of days between management forecast and the fiscal period end
SURPRISE	= absolute value of (management forecast -median analyst forecast) / stock price at the end of the last year.
IT PROCESS	= 1 if a firm has ITMW related to data processing integrity; 0 otherwise
IT SECURITY	= 1 if a firm has ITMW in the data quality dimension of access; 0 otherwise
IT STRUCTURE	=1 if a firm has ITMW in IT structure quality dimensions; 0 otherwise.

Table 2 presents the descriptive statistics for three groups of firms: observations with effective internal controls (N = 2,708), observations with IT-related material weaknesses (N = 40), and observations with non-IT related material weaknesses (N = 277). The univariate results show that management forecast errors are significantly larger for those firms with material weaknesses than for those firms that do not. Moreover, firms having IT material weaknesses have significantly larger forecast errors than those having non-IT material weaknesses, providing univariate support for H1. As for control variables, compared to firms with either effective internal controls or non-IT material weaknesses, IT material weakness firms are generally smaller, less likely to be Big 4 clients, more likely to report a loss, with more volatile cash flows and earnings, and have shorter forecast horizons.

Table 2 Descriptive Statistics on IT Material Weaknesses, Non-IT Material Weaknesses, and Management Forecast Accuracy for Year 2004 - 2006

	No MW (1)	ITMW (2)		OTHERMW (3)		(2) vs.(3)
N =	2708	40		277		
	mean	mean	t-stat.	mean	t-stat.	t-stat.
MFERROR	0.009	0.041	11.51***	0.016	6.19***	5.39***
LnAT	21.165	20.093	-4.01***	20.634	-5.02***	-1.93*
BIG4	0.929	0.550	-9.06***	0.910	-1.16	-6.61***
LITIGATE	0.266	0.425	2.26**	0.365	3.53***	0.74
GROWTH	0.178	0.233	1.42	0.178	0.01	1.16
LOSS	0.082	0.375	6.62***	0.195	6.25***	2.60***
LEVERAGE	0.623	0.669	0.97	0.616	-0.34	0.98
BETA	1.178	1.188	0.13	1.276	3.30***	-1.03
CFO_VOLATILITY	0.036	0.061	4.57***	0.046	4.31***	2.15**
ABSCHGROA	0.042	0.105	4.85***	0.064	4.22***	2.15**
DISPFOR	0.068	0.060	-0.69	0.065	-0.63	-0.42
HORIZON	5.115	4.716	-3.71***	5.161	1.11	-2.95***
SURPRISE	0.004	0.005	1.66*	0.004	0.66	1.30

All p-values are two-tailed.

REGRESSION RESULTS

Table 3 presents the multivariate regression results explaining the relation between IT material weaknesses and management forecast accuracy for the years 2004 through 2006. The model is significant in explaining forecast errors and has an adjusted R-square of 37.3%, suggesting they are explaining a relatively good proportion of the variation in management forecast errors. Both ITMW and OTHERMW are significantly positive, suggesting both IT and non-IT material weaknesses contribute to management forecast errors. However, the coefficient of ITMW is more than six times larger than that of OTHERMW, and the difference is statistically significant ($p < 0.001$). Those results suggest that IT material weaknesses have a greater impact on management forecast errors than firms with either no material weaknesses or firms with non-IT material weaknesses, which provides support to our H1.

As for control variables, consistent with Feng et al. (2009), we find smaller firms (LnAT), financially weaker firms (LEVERAGE and LOSS), firms with higher beta (BETA), more volatile cash flows (CFO_VOLATILITY), greater change in earnings (ABSCHGROA), larger analysts forecast dispersion (DISPFOR), longer forecast horizons (HORIZON), and greater management forecast revisions (SURPRISE) have larger forecast errors. Firms in litigious industry (LITIGATE) and faster growth (GROWTH) firms have smaller forecast errors.

Table 3 Regression Analyses on the Relations between IT Material Weaknesses and Management Forecast Accuracy for Year 2004-2006

Dependent Variable = MFERROR			
	Coeff.	t-stat.	p-value
Intercept	-0.009	-1.85	0.064
ITMW	0.025	10.49	<.001
OTHERMW	0.004	4.41	<.001
LnAT	0.000	-1.70	0.089
BIG4	0.000	-0.07	0.943
LITIGATE	-0.002	-2.92	0.004
GROWTH	-0.005	-4.60	<.001
LOSS	0.015	14.87	<.001
LEVERAGE	0.003	2.87	0.004
BETA	0.002	3.21	0.001
CFO_VOLATILITY	0.018	2.13	0.034
ABSCHGROA	0.021	5.74	<.001
DISPFOR	0.038	9.36	<.001
HORIZON	0.003	6.96	<.001
SURPRISE	1.085	21.77	<.001
Total Obs. =		3025	
ITMW Obs. =		40	
OTHERMW Obs. =		277	
F-value		129.5	<.0001
Adj. R2		0.373	

All p-values are two-tailed.

Our univariate analyses indicate that firms with ITMW are more likely to be volatile firms. If firms' IT control quality affects management forecast accuracy, we expect the management forecast error to decrease (increase) as the IT control quality improves (deteriorates). To examine the change in IT control quality on forecast accuracy, we break out our sample into four groups: those that have no ITMW in both years (the benchmark group), those have IT material weaknesses in year t, but have no IT material weaknesses in year t+1 (ITIMPROVE); those have IT material weaknesses in both year t and t+1 (ITADVERSE); and those have no IT material weaknesses in year t, but have IT material weaknesses in year t+1 (ITWORSE). In addition, we also partition the non-IT material weaknesses to four groups using the same way (OTHERIMPROVE, OTHERADVERSE, and OTHERWORSE). The dependent variable, ΔABSERROR, is defined as the difference in ABSERROR in year $t + 1$ and year t. If the forecast accuracy is primarily driven by the IT control material weaknesses, we expect the coefficient of ITIMPROVE to be negative, and the coefficient of ITWORSE to be positive, while we have no signed expectation for the change in other types of material weaknesses. Table 5 presents the results of our change analysis from year t to year t+1. Consistent with the argument that poor IT quality reduces the accuracy of management forecast, the coefficient of ITIMPROVE is significantly negative, while ITWORSE is significantly positive, suggesting when a firm's IT controls improve (deteriorate), management forecast errors decrease (increase). The finding of the positive coefficient of ITWORSE also links the *origination* of IT control problems with an increase in management forecast errors.[2] [3] As for the change in non-IT material weaknesses, OTHERWORSE is also significantly positive, suggesting when firm's non-IT controls deteriorate, firm's forecast accuracy also suffers.

Table 4 Regression Analyses on the Relations between the Change of IT Control Quality and the Change of Management Forecast Accuracy

Dependent Variable = ΔABSERROR			
	Coeff.	t-stat.	p-value
Intercept	0.001	1.44	0.150
ITIMPROVE	-0.007	-1.89	0.058
ITADVERSE	0.010	1.47	0.142
ITWORSE	0.031	5.96	<.001
OTHERIMPROVE	0.002	1.76	0.078
OTHERADVERSE	-0.004	-1.42	0.157
OTHERWORSE	0.004	2.33	0.020
ΔLnAT	-0.001	-0.52	0.604
ΔBIG4	-0.001	-0.34	0.737
LITIGATE	0.000	-0.59	0.558
ΔGROWTH	-0.002	-1.04	0.298
ΔLOSS	-0.078	-1.83	0.068

[2] As shown in Table 4, the number of observations for each IT control quality change category is quite small. Although we find statistical significance for several of our IT change categories, there could still be a concern of statistical power. To alleviate this concern, we use another variable to measure the change in IT control quality, ΔITMW, to replace the three dichotomous variables. ΔITMW is defined as the difference in the ITMW indicator variable in year $t + 1$ and the ITMW indictor variable in year t ($ITMW_{t+1} - ITMW_t$). The untabulated results show that ΔITMW is significantly positive with a t-stat. of 4.85.

[3] Although we control for changes in each of our control variables in Table 4, it is possible that the underlying *level* of a firm's volatility affects a firm's ability to remediate the IT material weakness, and it is this underlying volatility that is driving the association in Table 4. To investigate this possibility, we correlate the level of loss, cash flow volatility, change in absolute ROA, and analyst forecast dispersion with ITIMPROVE, ITADVERSE, and ITWORSE. We find that none of the IT change variables is significantly correlated with the innate volatility variables. Thus, the underlying level of innate volatility is not driving the association between the change in IT control quality and the change in management forecast errors.

ΔLEVERAGE	0.010	7.91	<.001
ΔBETA	0.007	3.47	0.001
ΔCFO_VOLATILITY	0.033	6.90	<.001
ΔABSCHGROA	0.000	-0.30	0.763
ΔDISPFOR	0.019	3.10	0.002
ΔHORIZON	0.004	6.67	<.001
ΔSURPRISE	0.942	12.80	<.001
Total Obs. =	1444		
F-value	30.6	<.0001	
Adj. R2	0.270		

All p-values are two-tailed.

Our next hypothesis examines the impact of the different dimensions of IT material weaknesses (i.e., "IT PROCESS", "IT SECURITY" and "IT STRUCTURE") on management forecast accuracy. As previously discussed, we expect IT PROCESS concerns to be the most positively associated with the forecast error. The regression results are not tabulated. Consistent with H2, the coefficient of IT PROCESS is significantly positive, suggesting that firms with IT material weaknesses related to the area of data processing integrity have greater management forecast errors. The coefficient of IT SECURITY is also positive and marginally significant, indicating that the control problems related to system access and security could also contributes to information quality, hence, management forecast errors. In contrast, the coefficient of IT STRUCTURE is negative and significant after controlling for the other two types of IT material weaknesses. The coefficient of IT PROCESS is also significantly larger than that of IT SECURITY and IT STRUCTURE (p-values = 0.032 and < 0.001, respectively) indicating that data processing integrity control problems have the largest impact on management errors.

Overall, the regression results suggest that an IT material weakness has a significantly negative impact on management forecast accuracy, and its impact is larger than that of a non-IT material weakness. An improvement (deterioration) in IT control quality also corresponds to the decrease (increase) in management forecast errors. In addition, we find that IT material weaknesses related to controls over data processing integrity are especially important in determining the forecast quality.

CONCLUSIONS

Data quality research discusses the pervasive impact of the informational quality on organization's management information systems. However, prior studies generally do not have direct data to test the link between information quality and decision making. SOX 404 requires management and auditors to report on the effectiveness of internal controls over the financial reporting component of the management information systems, providing us with data to consider the impact of controls on the informational quality on these systems.

We hypothesize and find evidence that firms with IT material weaknesses in their FRS are associated with less accurate management forecasts than the forecasts for firms that do not have material weaknesses as well as firms that have non-IT material weaknesses in their FRS. The change analyses suggest that the improvement (deterioration) of IT control quality is associated with decrease (increase) in the forecast errors. In addition, using IT control dimensions based on prior literature, auditing standards, and IT professional guidance, we find that FRS with IT material weaknesses related to data processing integrity have the least accurate management earnings forecasts. We conclude that systems with IT data quality issues are negatively associated with the usefulness of the FRS compared to other types of IT control problems.

Subject to these caveats, our study contributes to the IS literature by providing the first-time empirical evidence linking the IT control quality to the management decision outcome. We call on future research to assess the impact of different information quality dimensions as well as COBIT-inspired information criteria to see how they impact various types of management and FRS user decisions. Decision support, enterprise, and business intelligence systems exist to provide more, and hopefully better quality, information to the users. Linking the data quality to the ultimate decision making quality can only enhance the development and use of such systems.

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