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THE VALUE OF CHIEF DATA OFFICER PRESENCE ON FIRM PERFORMANCE

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Abstract

In the era of big data, there are more and more organizations trying to establish a new breed of executive, Chief Data Officer (CDO), to identify new business opportunity from data assets and optimize corporate revenue. However, the relationship between CDO presence and firm's financial performance has not been rigorously studied and validated in literature. Based on upper echelon theory and strategic change perspectives, we examined the impact of pre-performance on the CDO appointment, as well as the CDO presence on post-performance. We collected a multi-industry dataset of 68 firms with a CDO position. The results show that the return on assets (ROA) is positively related to CDO appointment, while, market to book ratio (M/B) is negatively related to CDO appointment. In addition, we found that firms with CDO have superior financial performance than their peers who do not. This study provides an initial step towards understanding the empirical linkages between CDO presence and firm performance.

Keywords: Chief Data Officer, Strategic Change, Upper Echelon theory, Firm Performance.

1 INTRODUCTION

Data has penetrated into every industry and business function, it has been regarded as important corporate assets. In 2013¹, the world creates 5 extra bytes of data each day, which is the sum of data from human birth to 2003. With the rapid increasing of data volume and complexity, big data brings new challenges to firms. For example, it is more difficult in finding suitable approaches to analyze the big data, as well as finding the right person to manage data. Although some companies have appointed data managers to solve data-related problems, most of them are not fully exploiting the data, they are either do not have the capability to cope with big data or do not have time to explore value from big data. In a global survey² of 752 executives, most companies are still struggling in management and effective exploitation of data. Lee et al. (2014) point out that low-level data managers are lack of leadership and accountability in resolving data problems. The survey reveals that organizations need an executive level manager to manage big data.

In order to address these challenges, leading organizations have established a new C-level executive, the chief data officer (CDO). The role of CDO includes defining corporate strategic priorities, identifying new business opportunities, and representing data as corporate strategic assets³. Lee et al. (2014) identify three dimensions of CDO role, including collaboration, data space and value impact. The collaboration dimension focuses on CDO's engagement in organizational internal or external processes. For the data space dimension, CDO concentrates on either transactional data or big data. For the value impact dimension, CDO focuses on improving services or exploring strategic opportunities.

Over the past years, the number of firms with a CDO in their top management team has increased considerably. For example, many financial institutions, such as Bank of America, Credit Suisse Group, and General Electric, all appointed CDO in the year of 2011 in order to develop data strategy and implement data governance activities. CDO have gradually been recognized as the principal architects of data strategy and major catalysts of data-driven organizational transformation

Though the number of CDOs has dramatically increased in recent years, the relationship between CDO and corporate financial performance remains a significant concern. The few existing studies on CDOs are based on qualitative fieldwork, offering rich descriptions of CDO's role. A survey of global executives reveals that firms which appoint a top executive responsible for data management have superior financial performance than peers². Although firms have noted the importance of CDO as one of the C-level executives, there is little direct evidence linking CDO presence and firm performance. Research on this relationship is severely limited. The primary purpose of this study is to examine the relationship between CDO presence and firm performance. The research question addressed by this study is: what are the effects of CDOs on firm performance?

The following section describes the theoretical foundation that links CDO presence with firm performance, research hypotheses were proposed and empirically tested. Finally, theoretical and practical implications were discussed. Future research directions were also suggested.

2 LITERATURE REVIEW

We review researches of upper echelon theory and emphasize that the processes and internal mechanism are important to understand how TMT influences organizational outcomes. In addition, we summarize researches studies of the relationship between other CXOs, such as CIO, CMO, COO et al, and firm performance. Based on above analysis, we try to analyze the impact of CDOs on firm performance.

¹ <http://aci.info/2014/07/12/the-data-explosion-in-2014-minute-by-minute-infographic/> accessed 2/26/2016

² "Big data: Harnessing a game-changing asset," Economist Intelligence Unit, June, 2011.

³ http://en.wikipedia.org/wiki/Chief_data_officer ,accessed 2/26/2016

2.1 Upper Echelon Theory

Upper echelon theory (UET) explains how the Top Management Team (TMT) influences firm performance. According to the theory, researches mainly focus on teams' experiences, personalities and values which influence their perceptions and understandings of situations they faced, and then influence the firms' decisions and financial performance (Hambrick & Mason, 1984). Therefore, the top managers are reflection of organization (Hambrick, 2007; Hambrick & Mason, 1984). There are lots of researches studying the direct impact of TMT characteristics on organizational outcomes, such as the size of TMT (Eisenhardt & Schoonhoven, 1990), top managers' age (Wiersema & Bantel, 1992), tenures (Finkelstein & Hambrick, 1996), and education level (Finkelstein & Hambrick, 1996; Smith et al., 1994). Although the demographic features have the obvious advantage of measurement, results are inconsistent among findings.

Denis et al. (2001) and Smith et al. (1994) try to understand the processes and internal mechanisms of how TMT influences organizational outcomes. Smith et al. (1994) find out that top managers' social integration and communication directly influence firm performance. Amason and Sapienza (1997) indicate that TMT size positively influence TMT members' cognitive or affective conflict and then influence team decision quality and team efficiency. Hambrick (2007) consider that behavioural integration of top management team capture team members' interaction process and have direct positive effects on organizational performance (Li & Hambrick, 2005; Lubatkin et al., 2006).

Hambrick (1994) defines behavioral integration as the extent of TMT members engage in mutual and collaborative members' interaction. He describes three features of TMT behavioral integration process. First, it captures the quality and quantity of information sharing in the top management team; second, it presents the level of collaboration among TMT members and, finally, it reflects the extent of enterprise-level and executive-ranking joint decision making. Thus, The CDOs who are responsible for improving data quality, implementing data strategy is expected to improve behavioral integration of TMT.

In summary, the composition of TMT affects the organizational outcomes by influencing the internal process. We are trying to explain how CDO influences behavioral integration of TMT, and then contribute to firm performance.

2.2 CDO Presence and firm performance

2.2.1 CXO Presence

There are several researches that estimate the impact of the C-level executive presence on corporate financial performance, including CIO (Khallaf & Skantz, 2011; Ranganathan & Jha, 2008), CMO (Nath & Mahajan, 2008), and COO (Marcel, 2009). Most of them use the upper echelon theory to explain the relationship. For example, Khallaf and Skantz (2007) investigate the effect of a new CIO announcement on stock performance. They find that the market reacts positively to the presence of a new CIO. However, market reaction studies estimate the short term value of CIO presence to firms. Subsequently, there are some researches focusing on estimating the long run benefits of a new executive to the firms. Ranganathan and Jha (2008) examine the impact of CIO presence in TMT on firm performance. Based on upper echelon theory, they propose that CIO in TMT will enhance the heterogeneity, which will have impact on the shared understanding of IT and improve IT-business decision making, and finally improve firm performance. Results shows that firms included CIO in their TMT have significantly better financial performance than their peer firms. Khallaf and Skantz (2011) discuss the impact of CIO presence on firm accounting performance. The mutual understanding between CIO and CEO facilitate IS alignment with firm strategy and finally enhance the importance of IT in firm performance, however, this advantage is limited largely to newly created positions. In addition, the relationship is contingent on the level of industries' sales growth and uncertainty of the environment (Johnson & Lederer, 2010).

Nath and Mahajan (2008) analyze the influence of the presence of CMO on firm performance. They estimate three moderation variables including strategic, structural, and environmental factors influencing the relationship between CMO presence and firm performance. However, they find CMO presence has no significant effect on firm performance. Marcel (2009) investigate the relationship between COO presence and firm performance. They argue that COO presence enhances benefits of TMT information processing which ultimately positively influences firm performance. Table 1 describes several researches studying the effects of an executive presence on firm performance.

Author	Variables	Theory	Results
Ranganathan & Jha (2008, ICIS)	CIO presence; Firm performance;	Upper echelon	Better performance than peers
Nath & Mahajan (2008, JOM)	CMO presence; Firm performance; strategic, structural, and environmental factors;	Contingence theory	Neither a positive nor a negative impact
Marcel (2009, SMJ)	COO presence; Firm performance; TMT characteristics	Upper échelon perspective	Positive relationship
Khallaf & Skantz (2011, IJAIS)	CIO appointment; Firm performance;	Resource-based view and upper echelon theory	Limited to firms appointing a CIO for the first time

Table 1. The literature review of other chief officers

2.2.2 Firm Performance and CDO Presence

The inconsistent research findings of CXO presence and firm financial performance may due to the lack of consideration of the impact of firm performance on CXO presence. CXO presence is treated as firm's strategic change in resource allocation. For example, the appointment of CDO indicates that firms pay more attention to data initiatives and realize the importance of data-driven decision making in the organizational top management team. And performance is regarded as an important factor influencing firm's strategic change (Hambrick & Cannella, 2004; Kimberly & Quinn, 1984).

Based on organizational adaptation theory, organizations are more likely to make strategic change when firms have poor performance signalling a mismatch between organization and environment (Boeker & Goodstein, 1991; Kimberly & Quinn, 1984). When firms' performance is poor, the board of directors would make strategic actions to change current situations. Prior research suggests low performance leads to structural change of TMT composition (Boeker & Goodstein, 1991; Salancik & Pfeffer, 1980). For example, organizations have to appoint data managers when firms have to deal with big data problems which seriously influence firms' critical business activities. There are also researches finding out that poor performances lead to the change of business strategy (Boeker, 1989; Zajac & Kraatz, 1993). These results indicate that there is a negative relationship between firm performance and strategic change. Firms are more likely to engage in strategic actions when they experience a poor performance.

An appointment of a newly-created CDO position indicates that there is a strategic change in resource allocation of the firm. Prior literature indicates that firm performance is an important variable which influence firms' strategic change (Hambrick & Cannella, 2004; Kimberly & Quinn, 1984). However, results are controversial on the relationship between firm performance and strategic change (Boeker & Goodstein, 1991). Organizational adaption theory indicates that strategic change is driven by low firm performance and will promote further performance turnaround (Boeker & Goodstein, 1991; Kimberly & Quinn, 1984). In the era of big data, CDO will improve data-driven decision making and ultimately improve firms' financial performance. There are also research findings showing that high performance

firms are more likely to engage in strategic change because of the availability of enough resources (Cameron et al., 1987; Caves, 1984). The appointment of CDO is not cost-free, and the resources allocated for the structural change is irreversible. However, previous researches also find out that there is a positive relationship between firm performance and strategic change (Cameron et al., 1987; Caves, 1984). They find that poor performance firms are less likely to resist strategic change because of lacking enough resources. It requires firms to allocate enough resources to support the appointment of one new executive. For example, Murray (2000) suggests that a COO employment is a costly structural arrangement. It includes expensive salary for executive, the time and costs for coordinating with other TMT members. Therefore, high performance firms provide the board of director resources to conduct strategic change.

In this study, we use accounting performance, return on assets (ROA) and sales growth, and marketing performance, market to book ratio, to estimate the relationship between firm performance and CDO presence. The accounting performances reflect firms' profitability and marketing performances reflect the expectation of investors in future benefits. After that, we conduct regression analysis to test the differences in firm performance before and after CDO appointment compared with control firms.

3 THEORETICAL FOUNDATION AND HYPOTHESES DEVELOPMENT

Chief data officer is one of the executive managers who engage in the TMT decision making in the firm. TMT represents the top executives as a team who should be responsible for the overall operation of the firm. The researches on strategic change suggest that performance drives the strategic change (Boeker & Goodstein, 1991; Kimberly & Quinn, 1984). In addition, there are also some studies on the impact of TMT composition on strategic decisions and business outcomes (Reger, 1997). Caves (1984) argues that firms need a certain level of resources to implement organizational strategic actions. Poorly performing Firms are lack of enough resources to implement change (Cameron et al., 1987). Prior researches of strategic change find that the organizational outcomes could be the determinant of functional TMT member presents. Hambrick and Cannella (2004) estimate the positive relationship between a firm's sales and COO presence.

The literature of strategic change suggests two conflicting results about the relationship between firm performance and strategic change. Based on organizational adaption theory, poor performances drive strategic change which influences further performance turnaround (Boeker & Goodstein, 1991; Kimberly & Quinn, 1984; Salancik & Pfeffer, 1980; Zajac & Kraatz, 1993). However, these studies concentrate on executive succession. There are also researches showing that high performance leads to strategic changes which require additional resources (Cameron et al., 1987; Caves, 1984), such as employing a chief operating officer. In this study, we consider the effects of performance on CDOs who increase numbers of TMT composition.

The appointment of CDOs is not cost-free and require firms to allocate additive resources to support the activities. The resources required for strategic change is always irreversible. Firms which have poor performance do not have the capability to appoint a new executive. Thus, we expect that high performance drives the CDO presence.

H1: Firms that have higher performance will be more likely to appoint a CDO.

According to the upper echelon theory (Hambrick, 2007; Hambrick & Mason, 1984), TMT composition influences organizational decision and outcomes through its internal processes (Marcel, 2009; Medcof, 2008; Nath & Mahajan, 2008; Preston et al., 2008). Researches also show that behavioral integration has direct positive effects on organizational performance (Li & Hambrick, 2005; Lubatkin et al., 2006).

We argue that CDO inclusion in TMT increases the collaboration extent among team members, which promote behavioral integration (Hambrick, 1994). First, CDOs increase the collaboration among TMT members, increasing quantity and quality of information sharing. Initiatives conducted by CDOs include the development of data quality assessment, the implementation of the data standard and the establishment of data governance. Lee et al. (2014) identify that CDOs deliver consistent data among organizational groups and solve the data quality problems, which enhance and enrich the information sharing and processing among TMT teams. Through the implementation of data initiatives (Lee et al., 2014), CDOs increase the benefits of information exchange.

Second, CDOs improve the level of collaborative behavior among the team members. In many organizations, data problem are count on data managers, however, the middle level managers are lack of authority and power to really solve the problem. CDOs strengthen the alignment of data practices with business processes, they create a direct relationship with the CEO and other C-level peers helping the deployment of data-driven activities. During the process, it promotes cross-functional cooperation which helps improve the effectiveness of business operations (Smaltz et al., 2006). Higher levels of engagement between CDOs and TMTs is likely to improve CDOs' capabilities of communication, the business operation, and data governance. The shared understanding between CDOs and other executives will provide stronger alignment between data strategy and business strategy.

Finally, CDOs enhance the extent of joint decision making. CDOs are responsible for develop new business opportunities through vast and unstructured data mining (Lee et al., 2014). Compared with traditional data managers, CDOs emphasize the importance of data-driven decision marking. CDOs focus on leveraging data to create value and bring new revenues (Lee et al., 2014). Under turbulent and competitive environment, firms may require a new executive who concentrates on the numerous strategy-related activities to deal with complex and extraordinary demands (Menz & Scheef, 2014). Thus, we expect that firms appoint CDOs will have higher performance than peers.

H2: Firms that appoint CDOs will exhibit better financial performance than those who do not.

Prior research has argued the impact of new created CIO announcements on firms' abnormal stock returns (Chatterjee et al., 2001). Investors take these announcements as the positive sign of firms' future development. The position of CDOs indicates that firms start to improve firms' data quality and restructure business process through big data analysis (Lee et al., 2014). We therefore believe that CDOs presence in the announcements would further encourage shareholders' support resulting in higher market value. Firms' appointment of CDO represents a firm's strong commitment to data assets, reflecting the organization's efforts to manage data assets more effectively. Therefore, we expect that firms have CDOs will have greater market value than their industry peers.

H3: Firms that appoint CDOs will exhibit better market value than those who do not.

4 RESEARCH METHOD AND RESULTS

This research uses matched pair analysis to compare the differences between firms who have CDO and firms who do not. The method is widely used in information systems (Bharadwaj, 2000; Chae et al., 2014; Santhanam & Hartono, 2003).

4.1 Sample Selection

We collect information of CDOs and appointed firms mainly from three data sources by searching keywords "CDO" or "Chief Data Officer". First, we assemble a database of 29 US firms having CDOs through public announcements made by firms in their press release from LexisNexis Database. Second,

we collect information of 41 CDOs who are not formally be titled as CDOs but functional as a CDO through their public statement. According to Lee et al. (2014), the part of CDOs we selected refer to executives who are carrying out enterprise-level CDO roles. Third, we collect data from LinkedIn website which has more than 300 million professionals. Through searching “CDO” or “Chief Data Officer”, we can achieve names and appointed dates of CDOs and information related to employing companies our search results in a final usable dataset of 91 publicly traded US firms that appointed CDOs⁴.

We follow the procedure suggested by Chae et al. (2014) for comparing the performance of incident firms (firms that had appointed CDO) and those who do not (control firms). We utilize four-digit Standard Industry Classification (SIC) scheme as a benchmark to select the control group for each incident firm. Four-digit SIC classification is a more specific classification. Control firms were chosen from the same five-year average sales level with the CDO firms before the appointed date. As Bharadwaj (2000) and Chae et al. (2014) suggest, the control firm should be in the same industry as the CDO firm, and its average sales must be between 70 percent and 130 percent of the CDO firms’ average sales from the same period. There are 69 control firms which meet the requirements. For the rest, we use three-digit or two-digit SIC to find the firms whose sales are in the required range. After eliminating firms with missing performance measures, we finally have 68 control firms.

4.2 Performance Measures

Annual firm performance is measured by accounting-based performance and market-based performance. Accounting performances reflect the profitability of the firm and marketing performances measure the expectation of investors to firms’ future benefits. The performance indicators that we select to estimate the effect of firm performance on CDO appointment are the same with those used by Hambrick and Cannella (2004). The accounting performances include return on assets, sales growth, and marketing performances include market to book ratio.

In addition, we compare the firm performance before and after the CDO appointment. We employ five accounting ratios for comparing financial performances, including return on assets, return on sales, operating income to assets, and operating income to sales, and sales growth. Firms’ market performance is assessed by market to book ratio. Performance data is gathered from Mergent Online database.

4.3 Regression Model

We employ matched sample comparison group methodology to estimate the relationship between CDO presence and firm performance. The two fiscal year before the appointment date ($t=-2, -1$) is as the benchmark to compare the change in performance two fiscal year after the appointment date ($t=1, 2$). The appointment date ($t=0$) is not used in the regression model. We require that there are at least one pre-appointment and one post-appointment year for the firm. First, we use the logistical regression model to estimate the effect of firm performance on CDO appointment. The model is described below:

$$CDO_{i,t} = \alpha_0 + \alpha_1 \times Average (Return\ on\ Assets)_{i,t-2...t-1} + \alpha_2 \times Average (Sales\ Growth)_{i,t-2...t-1} + \alpha_3 \times Average (Market\ to\ Book\ ratio)_{i,t-2...t-1} + \varepsilon_{i,t}(1)$$

Where $CDO_{i,t}$ is equal to 1 if a firm appoints a CDO, and 0 otherwise. The firm performance is measured by average two years performance before the CDO appointed date ($t=-2, -1$).

⁴ 25 CDOs from LinkedIn do not have specific appointed dates. Reports shows that nearly 70% of current CDO positions were created in 2012 (Aiken, 2013). So 2012 was estimated as their appointed dates in our statistical analysis.

Second, we compute the above six ratios for all incident firms and control firms. Thereafter, we carry out the regression model to statistically test the differences in firm performance before and after CDO appointment relative to control firms. The regression model can be represented as:

$$FPM_{i,t} = \beta_0 + \beta_1 \times CDO_i + \beta_2 \times Post_{i,t} + \beta_3 \times CDO_i \times Post_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where, $FPM_{i,t}$ is one of the six firm performance measures for firm i in year t ($t=-2, -1, 1, 2$). We use dummy variables to measure the presence of CDO. “0” indicates that the firm has not employed CDO; “1” indicates that the firm has employed CDO. $Post$ is equal to 1 for years of $t=1, t=2$, and 0 otherwise.

Our hypothesis 1 predicts that high performance drives the appointment of CDOs. Thus, the first hypothesis predicts the relationship between firm performance and CDO presence is positive. Our hypothesis 2 and 3 predict that firms appointing CDO will have long term performance following the appointment relative to industry control firms. In our model, the variable $POST$ measures the difference in performance before and after the appointment. The interaction variable $CDO \times POST$ captures the strategic change implied by CDO appointment. The significance of the interaction variable coefficient will indicate whether firms appointed CDOs have a higher firm performance than the control firm.

4.4 Empirical Results

Table 2A shows the descriptive statistics of firm performance used in the regression model. There are three average performances used to logistical regression, including average return on assets, average sales growth and the average market to book ratio. These performances are measured by the average two years’ performance ($t=-2, t=-1$) before the CDO appointment. The other performance measures are applied to analyze the effect of CDO appointment to firm performance. Firms used in the regression model include “incident” firms and matched control firms from the same industry. The performance consists of every two years before and after CDO appointment. We try to compare the differences in performance of each incident firm with the performance of matched control firms before and after CDO appointment.

Table 2B describes the performance of pre- and post-appointment years for incident firms and control firms. It tests whether there are significant differences between pre- and post-performance for firms. The preliminary tests show that performance improves following CDO appointment. Firms appointing CDO show significant improvement in return on assets, return on sales and market to book ratio. However, there is no significant performance difference for firms who do not appoint CDO, except operating income to assets. It indicates that the control firms’ performance keeps stable during the observation period.

Table 2C reports the performance for incident and control firms for pre- and post-appointment years. It shows that CDO firms’ performance is significantly higher than control firms after CDO appointment. Firms improve performance significantly in return on sales and market to book ratio. The results of pre-performance comparison show that CDO appointments are made partly in response to poor sales growth and high operating income to assets.

Performance measures	N	Mean	Median	STD
Average Return on Assets	110	2.58	1.15	5.86
Average Sales Growth	110	1.08	1.03	0.26
Average Market to Book ratio	110	1.86	1.15	2.52
Return on Assets	384	3.65	1.36	5.76
Return on Sales	458	9.78	8.31	15.65

Operating Income to Assets	330	6.35	6.21	12.25
Operating Income to Sales	219	19.48	15.06	17.77
Sales Growth	490	1.05	1.03	0.21
Market to Book ratio	464	2.09	1.27	3.06

Table 2A. Descriptive statistics of firms' performance in the study

Performance measures	CDO firms					Control firms				
	Post-appointment		Pre-appointment		t-stat	Post-appointment		Pre-appointment		t-stat
	N	Mean	N	Mean		N	Mean	N	Mean	
ROA	97	4.3619	96	2.7096	1.935*	95	3.3772	96	4.1453	-0.955
ROS	115	13.4377	115	9.2654	1.882*	113	7.4072	115	8.9639	-0.831
OI/A	84	6.7930	83	8.4045	-1.079	81	6.5660	82	3.5951	1.330
OI/S	55	21.2756	54	16.7741	1.547	55	18.1271	55	21.6948	-0.935
SG	123	1.0298	123	1.0492	-1.070	121	1.0084	123	1.1043	-2.935***
M/B	118	2.8486	118	1.9331	2.066**	110	1.6715	118	1.8828	-0.611

ROA: return on assets; ROS: return on sales; OI/A: operating income to assets; OI/S: operating income to sales; SG: sales growth found as sales (sale) in year t divided by sales in year t-1; M/B: market to book ratio

***1% level; **5% level; *10% level

Table 2B. Performance for pre- and post-appointment years for CDO firms and control firms

Performance measures	Post-appointment years					Pre-appointment years				
	CDO firms		Control firms		t-stat	CDO firms		Control firms		t-stat
	N	Mean	N	Mean		N	Mean	N	Mean	
ROA	97	4.3619	95	3.3772	1.266	96	2.7096	96	4.1453	-1.634
ROS	115	13.4377	113	7.4072	2.739***	115	9.2654	115	8.9639	0.159
OI/A	84	6.7930	81	6.5660	0.152	83	8.4045	82	3.5951	2.152**
OI/S	55	21.2756	55	18.1271	0.988	54	16.7741	55	21.6948	-1.371
SG	123	1.0298	121	1.0084	1.266	123	1.0492	123	1.1043	-1.654*
M/B	118	2.8486	110	1.6715	2.649***	118	1.9331	118	1.8828	0.148

ROA: return on assets; ROS: return on sales; OI/A: operating income to assets; OI/S: operating income to sales; SG: sales growth found as sales (sale) in year t divided by sales in year t-1; M/B: market to book ratio

***1% level; **5% level; *10% level

Table 2C. Performance for incident and control firms for pre- and post-appointment years

In this study, we consider the CDO appointment as strategic change for firms. It is the decision that firms seriously consider for firms' long term performance improvement. Long period performance is more suitable than short term performance to explain the CDO appointment. To examine whether firm performance influences the CDO appointment, Table 3 uses the logistical regression model for two groups for the average two years of pre-performance. The chi-square of goodness of fit test is 7.358 (p=0.499), which suggests our model fit the data. The coefficient results ($\alpha_1=0.105$, p=0.045; $\alpha_2=-0.238$, p=0.045)

show that return on assets have a significant positive effect on CDO appointment, thus supporting the H1. In contrast, there is a significant negative relationship between market to book ratio and CDO appointment. We think that market to book ratio reflects the expectation of investors to firms' future benefits, which has little impact on firms' resource allocation. However, the poor marketing performances promote firms to make strategic change to improve investors' confidence on firms' future profitability.

We examine the financial and market performance of incident firms and control firms in Table 4. The interaction variable CDO*Post captures the performance improvement of CDO appointment compared with control firms. As predicted by H2, there is a positive and significant effect of CDO appointment on firms' post-performance. The performance measures of return on assets, returns on sales, operating income to sales, sales growth increase after appointing CDO. In addition, the market to book ratio also increases, which supports the H3. In detail, we find that CDO is significant and negative for return on assets, sales growth, meaning that CDO firms' performance is below the performance of control firms prior to appointing a CDO. However, the CDO is significant and positive for operating income to assets. Note also that Post is significant and negative for sales growth, meaning that control firms suffer the reduction of sale growth performance after CDO appointment. By contrast, CDO*Post is significant and positive, indicating that firms appointing CDO avoid the negative post-appointment firm performance effect suffered by control firms. Relative to control firms, there is an improvement in post-appointment performance for CDO firms. In summary, the results support the upper echelon theory, CDO appointment increases the behavioral integration of TMT, which ultimately improves firms' performance.

		Predicted sign	Logit Coefficient	Significance (P-value)
Constant		(0)	0.497	0.573
Average Return on Assets		(+)	0.105	0.045
Average Sales Growth		(0)	-0.321	0.682
Average Market to Book ratio		(-)	-0.238	0.045
N		110		
Chi ²		9.094**		
-2 log likelihood	Cox & Snell R Square	Nagelkerke R Square	Hosmer and Lemeshow Goodness-of-Fit Test	
143.399	0.079	0.106	Chi-square	df
			7.358	8
				Significance
				0.499

***1% level; **5% level; *10% level

Table 3. Predicting CDO presence with firm performance

Performance measures	ROA		ROS		OI/A	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Constant	4.415	7.064***	8.964	6.185***	3.595	2.673***
CDO	-0.125	-1.730*	0.010	0.147	0.197	2.536**
Post	-0.067	-0.923	-0.050	-0.756	0.121	1.557
CDO*Post	0.183	2.062**	0.159	1.972**	-0.163	-1.708*

N	384		458		330	
R-square	0.013		0.020		0.020	

***1% level; **5% level; *10% level

Performance measures	OI/S		SG		M/B	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Constant	21.695	9.052***	1.104	59.101***	1.883	6.730***
CDO	-0.139	-1.445	-0.132	-2.087**	0.008	0.127
Post	-0.101	-1.053	-0.229	-3.613***	-0.035	-0.525
CDO*Post	0.197	1.679*	0.158	2.043**	0.160	1.996**
N	219		490		464	
R-square	0.014		0.029		0.022	

***1% level; **5% level; *10% level

Table 4. Regression results for CDO presence and firm performance

5 DISCUSSION

5.1 Implications for Theory and Practice

First, Previous literature have contrary results for the effect of performance on strategic change. This study suggests that this inconsistent results may due to the selection of different performance measures. Second, while the effect of other C-level executives (CIO, CMO, and COO) on firm performance have been discussed, the impact of CDO is still silence in the literature. This study analyzes the significant and positive effect of CDO presence on firm performance. In terms of the implications for practitioners, first, results shows that higher return on assets drive the appointment of CDOs, it emphasize the timing of CDO appointment. Second, lower M/B drives the CDO appointment indicate the effect of investors' expectation is very important. Third, this study also clearly demonstrates that firms with CDOs are likely to have higher financial performance. Our results provide better guidance for firms on how to improve their data management capability and create value from data. Limitations and Suggestions for Future Research

This study contributes to the literature of the top management team (TMT) and enriches the upper echelon theory (UET) by estimating the relationship between CDO presence and firm's financial performances, more empirical studies on CDO is encouraged in the future. Future researches would further examine on the internal mechanism from CDO function to firm performance. Besides, this study is based on two years of performance before and after the appointment, extension of this work could undertake a more longitudinal analysis. Apart from using accounting-metrics, we also use market measures. There are several other alternate measures of firm performance and future studies could employ them as well.

In addition, the sample size is relatively small. The number of firms which have the position of CDO in this study is 68. Based on the definition of (Lee et al., 2014), future research may extend the scope of CDO by its function. The effect of TMT diversification and strategic alignment on CDO-performance relationship is suggested, and more control factors should be considered. At last, though the importance of CDO presence has been recognized, there is little effort to link CDO leadership with firm performance.

Our study bridges this important gap for further investigation. More research is required to understand how CDO leadership contributes to firm capabilities and performance.

6 CONCLUSION

The aim of this research is to examine the relationship between CDO presence and firm performance. In particular, whether firm performance drives the appointment of CDO, and whether there is performance improvement after CDO appointment. Based on strategic change perspectives and the upper echelon theory, we propose that firms with high performance are more likely to appoint CDO, and CDO can enhance the TMT-level behavioral integration, and then contribute to firm performance.

Considering both financial and marketing performance, results indicate that ROA is positive related to the CDO appointment and the CDO appointment is not cost for free which require large resources to support the position. By contrast, the M/B is negative related to CDO presence. When the expectation from investors is reduced, firms try to make strategic change to increase their confidence. In addition, CDO plays an important role in improving firm strategic growth. The empirical results support our arguments on the significant relationship between CDO presence and firm's performance.

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