

## Determinants of CIO Compensation Structure and Its Impact on Firm Performance

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### Abstract

*Although Chief Information Officers (CIOs) are becoming increasingly critical in corporate governance and strategies, empirical studies focusing on CIOs and their impact on corporate performance are far and few in-between. In this paper we investigate the role of CIOs based on governance theory, agency theory and IT-business alignment framework using data collected from various financial databases. We first examine the determinants of CIO compensation structure and level. Then, we use CIO and top management team (TMT) compensation structure as a proxy to IT-business alignment and investigate its effect on firm performance. Our results provide empirical support for the hypothesized IT attention deficit of the board of directors in the literature. Moreover, we found that the CIO-TMT compensation alignment is indeed related to firm performance, and that its effect is moderated by the competitiveness of the market, the capital expenditure, and the market share of the firm.*

### 1. Introduction

In this highly competitive global economy powered by the Internet and other information technology (IT) innovations, firms spend around 3-5% of their revenues each year on IT to just to stay competitive [26] which translates into hundreds of billions of dollars in the US alone, and trillions worldwide. Consequently, Chief Information Officers (CIOs) are becoming increasingly critical in corporate governance and playing a significant role in corporate strategies. As the number of CIOs and the level of their compensations increase, shareholder-value advocates have slowly begun to scrutinize the worth of the technology executives [37]. According to agency theory [19, 28], firms can benefit if the requirements of the firm, expectation of the CIO, and the shareholder's wealth are aligned through utilizing different compensation strategies. Thus, better understanding of CIO compensation will help firms design a more effective

compensation structure that motivates CIOs to take actions that maximize the shareholder value as well as their personal goals. Such understanding could also help prevent overcompensating CIOs, which may have adverse effect on the shareholder wealth.

Studies in the academic literature have shown that the executive compensation packages are designed to reduce the agency costs [31]. Drawing from this literature, we argue that compensation structure may have a significant impact on the capital investment decisions. In other words, short-term compensation may prevent executives from undertaking the necessary risky decisions, and lack of performance linked compensation may hurt firm performance and shareholder's wealth. The decision to investing in Enterprise Resource Planning systems (ERP) provides a good example. ERP projects are often costly and their expected returns are usually long-term oriented. A CIO with short-term compensation may lean towards delaying such risky decision. On the other hand, if the CIO's interest is not linked to the firm's performance through long-term compensation, the CIO may be inclined to make investment that boost short-term performance but penalize shareholders in the long-run. Therefore, it is critical that the CIO's compensation structure is aligned with firm strategy and shareholder expectations.

In this study, we investigated the determinants of the level and structure of CIO compensation and its impact on firm performance using data collected from various financial databases. Grounding our arguments in the agency theory [19, 28] and IT-business alignment theory [24, 32], we first examine the factors that influence the level and structure of CIO compensation packages. We then examine how the alignment between IT and business, using the alignment between CIO and top management team's (TMT) compensation structure as a proxy, affects firm performance. In the next section, we begin our theoretical development and layout our hypotheses. Then, we describe the research methodology and measures used in our study. This is followed by the results section where we present the results of our statistical analyses. Finally, we conclude with the summary of our findings and highlight our contributions to the theory and practice.

## 2. Theoretical Development and Research Hypotheses

There is a rich body of literature on the structure of executive compensation package and its relationship to firm performance. Most studies on the executive compensation are grounded in agency theory [16]. The main interest of agency theory [28] is in understanding of the causes and consequences of goal disagreement between principals and agents. The underlying assumptions of the theory are: 1) the desires and goals of principals and agents are different; 2) it is difficult or expensive for the principal to monitor the agent due to information asymmetry; and 3) principal and agents have different levels of risk sharing [19]. The agency problem occurs when the principal delegates authority to the agent and is affected by the choices of the agent. As information asymmetry between the principal and the agent increases, the agency costs increase as well. Monitoring the agent and aligning the interest of the agent with that of the principal are two common approaches to mitigate the agency problem.

In most firms, especially publicly traded firms, the board of directors acts as a principal to protect the shareholders' interest, and top executives are agents hired by the principals on behalf of shareholders. That is, the directors can monitor executive actions to maximize shareholder value. The compensation literature postulates that when the information asymmetry increases and the effective monitoring becomes infeasible or too costly, the directors can align the interest of managers and shareholders through equity based compensation structure. The varying structure of executive compensation packages across firms is attributed to the firms' effort to reduce agency costs [31].

The studies in this research stream are generally interested in the determinants executive compensation and the consequences of different compensation strategies on firm performance. The majority of these studies have examined CEO compensation [5, 14, 38]; others have also investigated the aggregated compensation of top executives and directors [31, 33]. The common executive compensation consists of four parts: salary, bonus, stock options and other long-term incentives. Salary component is usually based on industry benchmarking, whereas bonus component is normally tied to yearly performance measures [35]. On the other hand, stock based options and other long-term incentive plans are generally used to mitigate the agency problems since these compensation components are believed to align the principal's interest (shareholder value) with the agent's interest (executive's personal goals). The popularity of stock options in the

technology firms during the late 1990s caught the attention of the scholars [1, 36, 39]. However, little is known about the compensation structure of CIOs and its consequences to firm performance. Giving the increasingly critical role of IT in corporate strategies and performance, a better understanding of the CIO compensation structure is clearly called for. To the extent of our knowledge, this is one of the first studies in the IS literature that investigates the CIO's compensation structure and level as well the consequences of the alignment of CIO and TMT compensation structure to firm performance with empirical data.

### 2.1. Determinants of CIO Compensation

Considering the well established literature on the corporate governance theory and executive compensation, we adopted Barkema and Gomez-Mejia's [20] executive compensation framework to investigate the determinants of CIO compensation. According to this framework, executive compensation structure and level are determined by governance (e.g., ownership structure, board of directors), contingencies (e.g., strategy, R&D level), and criteria (e.g., size, performance).

#### 2.1.1. Firm Governance Structure

One of the main research streams in the corporate governance literature investigates how the board structure and ownership structure of firms affect executive compensation [14]. Grounded in the agency theory, both dimensions of governance represent the monitoring function. The main purpose of the board of directors is to protect the interests of shareholders. Directors can accomplish this by utilizing proper compensation strategies which maximize the shareholder value [41]. Therefore, the board structure captures the external monitoring function. On the other hand, when this external monitoring becomes too costly due to ineffectiveness or increasing information asymmetry, the boards rely on self monitoring by granting performance related equity based incentives to executives.

Although the literature does not agree on an optimal governance structure, it is commonly accepted that weaker governance is associated with more agency problems and lower firm performance [14]. The board size, for instance, is frequently used as a proxy to the effectiveness of the governance. However, the definition of effective board size differs on the context of the research. On one hand, the resource based view favors larger boards since this gives more opportunities to managers to access critical

resources [17]. On the other hand, as the board size increases, the complexity of communication and decision making inhibits the effectiveness of the monitoring function. Since our arguments are based on the agency perspective, we favor for smaller boards for effective governance. From this perspective, smaller boards are associated with better monitoring function and also considered more effective in establishing executives' performance related compensation incentives [41]. Moreover, firms with larger boards tend to pay higher compensation to the executives [14]. Therefore, we posit that:

**H1a:** The size of the corporate board is positively related to the level of the total CIO compensation.

**H1b:** The size of the corporate board is positively related to the long-term components of the CIO compensation.

Based on the arguments of agency theory, executive compensation studies generally agree on the efficiency of outsider-dominated boards [13]. Scholars postulate an agency problem between the board and the shareholders when the board is mostly insider-dominated [30], especially when a conflict of interest between shareholders and managers exists. Outside directors are considered more independent than executives. Therefore, outsider-dominated boards are found more effective in protecting shareholders' interests [33]. However, studies on the effect of outside directors on the compensation level and structure have found mixed results. On one hand, some scholars argue that outside directors are not related to the compensation level and structure [14, 29], and on the other hand, outside directors are found to be associated with less equity-based compensation packages [38] and with more equity-based compensation structures [33]. Moreover, Huff et al. [27] investigated the "IT attention deficiency" of boards and reported that IT issues are rarely discussed in board meetings, and board members receive post hoc updates only on major IT issues. Therefore, consistent with the literature, we postulate that the presence of outside directors would not affect CIO compensation structure or level. Thus,

**H2a:** The percentage of outside directors on the corporate board is not related to the level of the total CIO compensation.

**H2b:** The percentage of outside directors on the corporate board is not related to the long-term components of the CIO compensation.

However, we argue that the presence of directors with IT background in the board would have a significant effect

on CIO compensation for several reasons. First, since most board directors view IT as technical issues [27], the presence of directors with IT background could make the board more informed on IT's strategic role. This, in turn, would reduce the information asymmetry between the CIO and the board. Second, we expect that the directors with IT background would be more involved with IT related decisions, and thus can guide the board towards more effective CIO compensation. Third, these directors would also be more aware of the fact that most IT investments are long-term oriented, and the compensation of IT executive should be matched to this long-term orientation as well. Therefore, we expect that:

**H3a:** The percentage of directors with IT background on the corporate board is positively related to the level of the total CIO compensation.

**H3b:** The percentage of directors with IT background on the corporate board is positively related to the long-term components of the CIO compensation.

Studies have shown that the presence of blockholders (defined as institutions or individuals who hold 5% or more of a firm's equity) is associated with effective external monitoring since holding a large amount of equity encourages them to monitor executive decisions more closely and effectively [16]. Moreover, when institutions hold a significant amount of equity, they often appoint one or more of their own executives as an outside board director, increasing the independence of the board. The studies in the literature have shown that the presence of blockholders is associated with declines in the executive's salary [14], non-salary compensation [14, 15], and the amount of stock options [6]. Blockholders also use more performance sensitive equity based compensation with respect to salary and bonus to foster a long-term managerial perspective [18, 22]. Thus, we expect that the presence of blockholders will have similar effects on CIO compensation as it has on CEO and other executive compensation. Therefore,

**H4a:** The percentage of blockholders of a firm is negatively related to the level of the total CIO compensation.

**H4b:** The percentage of blockholders of a firm is positively related to the long-term components of the CIO compensation.

### 2.1.2. Industry Characteristics

The innovation intensity has been reported as an important determinant of executive compensation

structure and level [40]. Since long-term investment decisions are more important in such firms [38], these firms put more weight on performance based compensation plans [12, 31, 33]. Moreover, as the intensity of innovations increases, firms also become more complex. This complexity increases the information asymmetry between executives and directors, and thus intensifies the agency problem. In order to reduce the agency cost, firms increase self monitoring by utilizing incentive based compensation strategy [20]. Lastly, intensive innovation strategies demand for more information processing from executives. Firms with higher information processing needs pay more compensation to their executives [23], mostly due to the demand for better managerial skills. Ang et al. [3] also presented evidence that innovation-intensive firms pay more to their IT professionals than non-innovation-intensive firms. Therefore, we expect that CIOs in innovation-intensive industries have larger compensation packages with more weight on long term compensation.

**H5a:** Innovation intensity of a firm has a positive effect on the level of total CIO compensation.

**H5b:** Innovation intensity of a firm has a positive effect on the long-term components of the CIO compensation.

## 2.2. IT-business alignment and firm performance

Another interesting stream of research investigates the relation between IT-business alignment and firm performance. Aligning information technology (IT) strategy with business strategy has been one of the top concerns of IT managers and business executives [32]. The most common approach to study IT-business alignment has been the contingency perspective [7] in which scholars examined the fit between IT and business structure and IT and business strategy in an organization [10, 24]. This body of literature has argued conceptually [24] and found empirical support [7, 10] for the enhancing effect of the alignment on organizational performance. However, direct quantitative measurement of this alignment is difficult if feasible at all since the alignment is more an on-going process than an end state [25]. Perception based measures are usually used in the studies. In this study, we argue that the degree of separation between the compensation packages of the firm's top executives (TMT) and its top IT executive (CIO) is a good indication of how much the firm value the contribution of IT, thus a proxy for the potential of IT-business alignment. Thus, we posit that:

**H6:** The degree of alignment between CIO and TMT is positively related to the long-term performance of the firm.

On the other hand, firm performance is a result of interactions among a multitude of variables in complex economic, social, and political environments. As such, the effects of IT-business alignment on firm performance are inevitably constrained by these factors. While it is impossible to consider all these factors in one study, we choose three of these factors in this study as moderating variables between alignment and firm performance: market share, industry competitiveness, and capital expenditure. Market share is defined as the percentage of the total market a firm services with its products and services. It is normally measured using the sales of the firm divided by the total sales of all firms servicing the same market. Industry competitiveness is a measure of the number of competitors in a given market. Capital expenditure is a measure of the cash flow of a firm, an indication of the ability to invest in strategic and long-term oriented projects. A large body of literature on firm performance is available and argues why these three factors can significantly affect the performance of a firm [8]. However, when considering how these factors might interact with alignment and its impact on firm performance, the picture becomes quite complex and not always consistent. For example, good cash flow gives executives more opportunities to make investment decisions, thus making the alignment even more critical since low degrees of alignment may result in diverse and unrelated investment decisions, which in turn hurt firm performance. Similarly, the importance of alignment becomes more significant in competitive markets since such environments are more dynamic and requires all top executives to be in concert in terms of strategies and execution. On the other hand, firms with large market share are likely to choose a defensive strategy, in which the significance of IT-business alignment may diminish. It could be argued that this IT-business alignment may play a more crucial role in the formulation and execution of competitive strategies of a firm if the firm is an analyzer or prospector rather than a defender in its strategic positioning [11]. The effect of business strategies on the relationship between alignment and organizational success is suggested in the literature as well [2, 9, 11]. Thus, we posit that:

**H7a:** A firm's market share negatively moderates the relationship between IT-business alignment and long-term firm performance.

**H7b:** A firm's capital expenditure positively moderates the relationship between IT-business alignment and long-term firm performance.

**H7c:** The competitiveness of the industry in which a firm operates positively moderates the relationship between IT-business alignment and long-term firm performance.

In the following sections, we test these hypotheses using data collected from various financial databases and discuss our findings.

### 3. Methodology

#### 3.1. Sample and Data

We used Standard & Poor’s ExecuComp database to create our initial sample. ExecuComp tracks the compensation of top five executives of the firms in the S&P 500, S&P 400 MidCap and S&P 600 SmallCap indexes. Our initial sample consists of the firms in which one of the top executives holds the CIO title. The initial sample had 498 compensation data. We collected the board structure and equity ownership data from the proxy statements of the firms. For firm performance related data, we used Standard and Poor’s Compustat database. Considering that the data imputation methods would not be proper, especially for the governance measures, we dropped the firms with missing data. After this screening process, our final sample consists of 433 compensation data over the 1994-2005 time period.

Table 1a and Table 1b summarize the characteristics of our sample. The sample is relatively evenly distributed across industries. Given that we only included the firms in the S&P indexes, the market capitalization is relatively large. On average, CIOs total compensation is highest in financial firms and lowest in manufacturing firms, and the long term compensation level and percentage is more evenly distributed across industries. However, when we adjust the CIO total compensations by the market capitalization of their respective firms, we observe that the relative CIO compensation is higher in manufacturing and service firms than financial firms.

**Table 1a: Descriptive characteristics of the firms across industries**

Industry Sector	% of Sample	Market Cap <sup>1</sup>
Manufacturing	20	2,397.0 (3,640.2) <sup>2</sup>
Financial, Insurance, Real Estate	17	6,015.9 (7,640.2)
Services	25	1,534.4 (2,937.1)

Other	38	8,377.2 (11,300.7)
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<sup>1</sup> Market capitalization (million \$)

<sup>2</sup> Standard deviation

**Table 1b: Descriptive characteristics of the compensations across industries**

Industry Sector	TC <sup>1</sup>	TC/Market Cap	LTC <sup>1</sup>	LTC/Market Cap	% of LTC
Manufacturing	790.4 (501.5) <sup>2</sup>	1.21 (2.1)	388.9 (432.2)	0.52 (1.28)	0.49 (0.22)
Financial, Insurance, Real Estate	1,385.3 (1,188.5)	0.55 (0.5)	663.7 (819.4)	0.18 (0.26)	0.48 (0.21)
Services	850.2 (638.7)	1.41 (1.4)	401.1 (459.6)	0.56 (0.77)	0.47 (0.22)
Other	1,231.6 (1,288.4)	0.94 (1.99)	665.7 (1,061.5)	0.25 (0.44)	0.54 (0.24)

<sup>1</sup> TC: Total Compensation (thousand \$); LTC: Long Term Compensation (thousand \$)

<sup>2</sup> Standard deviation

#### 3.2. Method

We conducted ordinary least square (OLS) analysis to test our models. Equation 1 outlines our arguments that CIO compensation (COMP) is a function of board structure (BS), ownership structure (OS), and innovation intensity (II). We used this function for both compensation level and structure. Equation 2 describes firm performance (PER) as a function of IT-business alignment (IB), market share (MS), competition level (CL), and capital expenditure (CE), as well as the interaction between alignment and other performance variables ( $X_1, X_2, \dots, X_n$ ). To prevent any violations of the OLS assumptions, we conducted residual analysis to ensure the normality, linearity, and heterocedasticity of our data.

$$(COMP) = f(BS, OS, II) \tag{1}$$

$$(PER) = f(IB, MS, CL, CE, X_1, X_2, \dots, X_n) \tag{2}$$

#### 3.3. Measures

*CIO Compensation Structure:* We captured CIO compensation level and structure with three measures; 1) total compensation, 2) long term compensation (options + restricted stocks + long term incentive plans + other long term compensation), and 3) the long term compensation as a percentage of total compensation.

*CIO-TMT Alignment:* We measure the level of alignment as the ratio of CIO’s long term compensation to

the aggregated total of TMT's (top five executives) long term compensation.

*Firm Performance:* We used Tobin's Q and ROA as proxies for firm performance. Tobin's Q is considered a better proxy for a firm's long-term performance than ROA. On the other hand, ROA is commonly used by the board to evaluate the value added to the firm by the executives [33]. Tobin's Q is calculated as the ratio of the market values of the firm's securities to the replacement cost of its tangible assets, and ROA is calculated as the ratio of net income to the book values of firm's total assets.

*Firm Governance:* We used two categories of measures to represent the characteristics of firm governance:

1) Board structure. The board structure captures the size of the board and the composition of board members. We used the following measures to capture the board structure.

- Board size: the number of directors in the board as the measure of board size.
- Percentage of outside directors: the number of outside directors as a percentage of board size. We define an outside director as a director who does not have any association with the firm at any managerial or employment level.
- Percentage of directors with IT experience: the percentage of the directors who hold an executive position in an IT firm or who have a CIOs title in another firm.

2) Ownership structure, which is measured by the percentage of shares held by blockholders: Since we use the agency theory as our theoretical lens, we exclude blockholders who are former employees or with family ties to the executives or directors of the firm. We calculated the aggregated sum of percentage of equity held by the blockholders.

*Innovation Intensity:* Studies in the literature use R&D intensity as a proxy for innovativeness and growth potential [20, 38, 40]. The most common measure of R&D intensity is the ratio of R&D spending to total sales [21]. We used the total R&D expense in the two digit industry SIC code as a percentage of total sales in the same SIC code to calculate the innovation intensity of the industry.

*Control variables:* In the determinants of compensation model (1), we controlled for firm performance, size and risk. We controlled for firm performance because the level of pay is a function of firm performance [14]. That is, more profitable firms may pay more to executives. We used firm's previous year ROA as a proxy of performance. Firm size can also affect the

compensation level [14, 34] as well as the compensation structure. Larger firms tend to pay more to their executives. Similarly, small firms may not utilize complex compensation packages and grant only salary and bonuses. We included natural logarithm of a firm's total assets to control for size. We also controlled for business risk since high variations in firms' returns can affect the compensation structure and level. Following the literature, we divide business risk into systematic and unsystematic risk [20, 39]. Systematic risk is associated with the variance of firm's risk due to the changes in the market, and captured by the correlation between the S&P 500 composite return and firms' return over trailing twelve months. Unsystematic risk, on the other hand, is the remaining business risk which is associated by the firm itself. This is measured as the standard deviation of ROA over eight trailing quarters.

In the firm performance model (2), we controlled for firm size and risk as well. We used firm's market value instead of total assets as a proxy to firm size to prevent possible high multicollinearity between total assets and Tobin's Q and ROA. We also included market share, competition level and capital expenditure in the performance model since these measures frequently studied as significant determinants of firm performance [8]. We calculated the market share of a firm as the ratio of its total sales to the total sales within the same industry SIC code. We used number of firms in a SIC category as a proxy to the competition level. Finally, capital expenditure data is collected from the Compustat database.

## 4. Results

### 4.1. Determinants of CIO Compensation

Table 2a and Table 2b show the regression results for the determinants of CIO compensation structure and level, respectively. First, we analyzed the determinants of the percentage of LTC (long-term components) in the compensation package. All the determinants in the model have the predicted signs. As we expected, the percentage of outside directors does not affect CIO compensation, whereas percentage of directors with IT background indeed has significant effect. Our findings indicate that firms with more directors with IT background use more long term compensation in CIOs compensation packages. The blockholder ownership does not have any effect on the options value and percentage. However, this measure is a strong determinant of percentage and level of total LTC as well as TC (total compensation). One explanation could be that blockholders may only intervene when the compensation levels are considerably outside the standard range. Contrary to our expectations, the board size does not have any effect on CIO compensation structure and

level, other than the level of options granted. In our sample, with the exception of only three firms, CEO is a member of the board in all firms. As suggested in the literature [38], this dual role has adverse effects on the board's monitoring function. Since we used board size as a proxy to effectiveness of governance, the CEO membership may have distorted the effect of the board size.

Since the percentage of directors with IT experience is a significant determinant of the long-term orientation in the CIO compensation packages, our results also find support for the literature that suggests that IT firms tend to use more long term compensation compared to firms in other industries [39]. Consistent with our arguments, innovation intensity of industry, as represented by the R&D expenditure as a percentage of sales, has significant effect on the long-term orientation of the CIO compensation package.

Finally, we must note that most of our models have a relatively low adjusted R<sup>2</sup> values, indicating that the commonly utilized governance determinants of executive compensation in the finance and management literature cannot fully account for the variances in CIO compensation structure.

**Table 2a. Determinants of CIO compensation structure**

	Dependent Variable	
	% of LTC	% of Options
Intercept	-.318 (-2.767)***	.002 (.017)
Board Size	-.006 (-1.285)	-.004 (-.804)
% of Outside Director	.169 (1.360)	.004 (.031)
% of Directors with IT background	.269 (3.787)***	.313 (4.477)***
% of Blockholders	.002 (2.602)***	.001 (.920)
Ind. R&D Intensity	.004 (2.667)***	.004 (2.327)**
Unsystematic Risk	.027 (3.445)***	.034 (4.293)***
Systematic Risk	-.006 (-.161)	-.029 (-.0761)
Size	.152 (7.123)***	.071 (3.403)***
ROA <sub>(t-1)</sub>	.002 (2.326)**	.002 (1.572)
Adjusted R Square	.14	.11
Model Sig. (p value)	(.000)***	(.000)***
* .10 level significance; ** .05 level significance; *** .01 level significance		

**Table 2b. Determinants of CIO compensation level**

	Dependent Variables		
	log(LTC)	log (Option Value)	log(TC)
Intercept	-.951 (-2.144)**	.603 (2.292)**	1.401 (7.872)***
Board Size	.000 (.024)	-.023 (-2.126)**	-.009 (-1.235)
% of Outside Director	.616 (1.283)	.252 (.899)	.191 (.995)
% of Dir. with IT background	.545 (1.987)**	.759 (4.713)***	.247 (2.249)**
% of Blockholders	.010 (3.392)***	.002 (1.244)	.003 (2.726)***
Ind. R&D Intensity	.013 (2.126)**	.010 (2.867)***	.002 (.658)
Unsystematic Risk	.081 (2.657)***	.065 (3.598)***	.012 (.979)
Systematic Risk	.029 (.194)	.000 (.001)	.137 (2.326)**
Size	.683 (8.218)***	.474 (9.483)***	.381 (11.520)***
ROA <sub>(t-1)</sub>	.010 (2.567)**	.005 (2.035)**	.003 (1.942)*
Adj. R Square	.19	.27	.33
Model Sig. (p value)	(.000)***	(.000)***	(.000)***
* .10 level significance; ** .05 level significance; *** .01 level significance			

**4.2. IT-business alignment and firm performance**

The results from the regression analyses are presented in Table 3a and Table 3b. We investigated the effect of CIO-TMT compensation alignment on two different firm performance measure; Tobin's Q and ROA. Because we had outlier values in our dependent variables, we further screen the data to obtain normal distribution. Due to this screening as well as missing data points in performance measures, the sample sizes dropped from 433 to 366 and 356 for Tobin's Q model and ROA model, respectively.

The results show that the CIO-TMT compensation ratio has a positive effect on firm performance as expected. We started our analyses by examining the effects of alignment on Tobin's Q, while controlling for firm size and risk. In this initial model, the coefficient of the alignment is significant at p < .05 level and the adjusted R<sup>2</sup> value is .13. Then, we analyzed the effects of the performance determinants (i.e., competition level, capital expenditure, and market share) on Tobin's Q measure. While only capital expenditure has a significant effect, the R<sup>2</sup> value of the second model has noticeably increased (.17). Lastly, we investigated the interaction

effect of the CIO-TMT alignment and our performance determinants. In this third model, all three interaction terms found significant, and the R<sup>2</sup> value is the highest (.21) among all Tobin's Q models. We followed the same steps to examine the effects of our determinants on firm's ROA value. Although these results show a similar pattern (the first model has the lowest R<sup>2</sup> value and the last interaction model has the highest R<sup>2</sup> value), the differences among the models are less noticeable as expected given that ROA IT-business alignment is associate with past performance. These results clearly support hypothesis 6, indicating that compensation alignment between CIOs and TMT has a positive effect on firm performance, and this effect is more noticeable in future oriented performance measures.

Furthermore, the signs of interaction terms support our arguments in hypotheses 7a-c. The effect of alignment is greater in more competitive markets. Similarly, when firms have high capital expenditure, aligning IT and business becomes even more essential. And lastly, for firms that have high market share, which are mostly likely to be defenders, aligning CIO and TMT compensations have negative effects on firm performance.

**Table 3a. IT-business alignment and firm performance (Tobin's Q)**

	Dependent Variable		
	Tobin's Q	Tobin's Q	Tobin's Q
Intercept	-.165 (-.747)	-.433 (-1.897)	-.481 (-2.193)**
Alignment	1.089 (2.314)**		
Competition Level		-.001 (-.077)	
Capital Expenditure		.044 (4.701)***	
Market Share		-.074 (-1.323)	
Alignment x Competition Level			.053 (1.861)*
Alignment x Capital Expenditure			.323 (5.374)***
Alignment x Market Share			-.761 (-2.140)**
Unsystematic Risk	.181 (5.913)***	.134 (4.589)***	.145 (4.837)***
Systematic Risk	-.171 (-1.169)	-.114 (-.820)	-.179 (-1.280)
Size	.372 (5.813)***	.483 (6.932)***	.485 (7.134)***
Adj. R Square	.13	.17	.21
Model Sig. (p value)	.000***	.000***	.000***

\* .10 level significance; \*\* .05 level significance; \*\*\* .01 level significance

**Table 3b. IT-business alignment and firm performance (ROA)**

	Dependent Variable		
	ROA	ROA	ROA
Intercept	-7.263 (-4.810)***	-6.335 (-3.735)***	-8.220 (-4.992)***
Alignment	6.739 (2.252)**		
Competition Level		-.080 (-1.412)	
Capital Expenditure		.231 (3.624)***	
Market Share		-.173 (-.450)	
Alignment x Competition Level			.032 (.158)
Alignment x Capital Expenditure			1.337 (3.166)**
Alignment x Market Share			-1.257 (-.523)
Unsystematic Risk	1.116 (5.807)***	1.071 (5.637)***	1.110 (5.596)***
Systematic Risk	.405 (.413)	.625 (.638)	.875 (.867)
Size	3.025 (6.976)***	3.099 (6.251)***	3.403 (6.786)***
Adj. R Sq.	.16	.18	.19
Model Sig. (p value)	.000***	.000***	.000***

\* .10 level significance; \*\* .05 level significance; \*\*\* .01 level significance

### 5. Concluding Remarks

In this study, we investigated the determinants and consequences of CIO compensation level and structure. Our results show that CIO compensation indeed suffers from IT attention deficit of boards. We empirically showed that the frequently used governance measures in the finance and management literature could not account for a large portion of the variances in CIO compensation packages, suggesting that there are other significant factors affecting the CIO compensation structure that need to be explored in future studies. On the other hand, we found that the number of board directors with IT background is a significant determinant of CIO compensation. The IT experience of board members was found to be significantly positive related to the percentage of long term components and total level of CIO compensation packages. Since these directors are either



CIOs or executives in technology firms, we assume that they were familiar with overall characteristics of CIOs and the role of IT in business, thus more inclined to long-term oriented compensation packages.

Perhaps more importantly, our paper found empirical support for the hypothesized effect of IT-business alignment on firm performance. We found that aligning CIO and TMT compensation structures has a significant positive effect on the long-term firm performance. Further, our analyses showed that the competition level and capital expenditure have positive moderating effects and market share has adverse moderating effect on this relation, supporting the argument that alignment is more likely to play a significant role in firms that are in more dynamic environments with more growth and investment opportunities compared to firms that are more focuses to defensive strategies.

Although this study has shown a number of interesting findings as discussed above, as one of the first empirical papers on CIO compensation and firm performance, it also suffers from a number of limitations. As the regression statistics indicate, the determinants included in the model could only account for a small portion of the total variance in the CIO compensation packages. Other determinants, especially the CIO's individual characteristics (e.g., track record, experience, charisma, performance, etc.), are not included in our model due to data limitations. The role of IT in firms could also be a major factor in CIO compensation structure. These limitations, however, also suggest several opportunities to expand this study in the future. One interesting future research could be comparing CIO compensation strategy between firms that utilize IT as a strategic tool and firms that treat IT as a commodity.

Our study draws attention to the importance of CIO compensation structure and level. From the practitioner perspective, we emphasized the IT attention deficit in boardrooms and underlined the importance of IT-business alignment on firm performance. Firms should consider having directors with IT background in their boards in order to better integrate IT into their business strategies and have proper compensation structures for their CIOs. Moreover, we showed that CIOs should not be benchmarked to short-term firm performance, but rather should be associated with long-term performance of the firm. Our study contributes to the corporate governance literature by pointing out that aggregated executive compensation studies may not capture the fine differences among different types of executives. Moreover, we contribute to the IS literature, by separating the determinants and consequences of CIO compensation structure and level. Perhaps most importantly, we have provided statistical support for the hypothesized impact of IT-business alignment on firm performance using secondary quantitative data, rendering addition credibility

to the theory which was mostly tested with survey and qualitative data based on perceptions of respondents.

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