CIO Turnover, IS Alignment and Revolutionary Change

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ABSTRACT

Information systems (IS) alignment is an important aspect in using information technology to gain business value. A critical part of this process is the existence of a good relationship between the CEO and CIO. However, this relationship is disrupted due to CIO turnover. Using a punctuated equilibrium model perspective, this study examines the organizational impact of CIO turnover and its effects on IS alignment. The study uses secondary data drawn from InformationWeek 500 and Compustat databases to test the hypotheses. The results show that, on average, CIO turnover does not lead to revolutionary change in the firm and has little impact on IS alignment.

Keywords (Required)

IS Alignment, CIO Turnover, Profile Deviation, Punctuated Equilibrium.

INTRODUCTION

Information systems (IS) alignment has been an important issue to organizations for a long time (Brancheau et al., 1996, Niederman et al., 1991, Watson et al., 1997). IS alignment refers to the strategic and beneficial use of information technology (IT) in the firm (Luftman and Brier, 1999). It has been shown that IS alignment leads to performance impacts (Chan and Reich, 2007, Sabherwal and Chan, 2001).

IS alignment is driven by several factors such as a prior history of success of the IT department, organizational size, and environmental uncertainty (Chan et al., 2006). However, prior research has also determined that IS alignment requires the involvement of both IT and business executives (Gupta et al., 1997, Hussin et al., 2002, Kearns and Lederer, 2003, Reich and Benbasat, 2000). In particular, the roles of, and relationships between, the chief executive officer (CEO) and the chief information officer (CIO) are seen as crucial to the success of alignment efforts (Earl and Feeny, 1994, Feeny et al., 1992). While prior research has examined many factors that affect this relationship, such as the CIO’s rank and role (Karimi et al., 1996), the impact of a change in either executive (that is, change in CEO or CIO due to turnover or any other cause) has not been explored. In this study we consider the impact of CIO change on strategic IS alignment. In particular, the study takes a punctuated equilibrium model perspective of CIO turnover and matches it to changes in IS alignment. This is an important undertaking because CIO turnover is having an impact on company’s bottom lines (Hacker, 2003, McGillicuddy, 2007).

The paper begins with a consideration of the literature on IS alignment and CIO turnover using the punctuated equilibrium model. Next, we explain our model which consists of a longitudinal consideration of the impacts of CIO change on IS alignment, then close with a discussion of the implications of this work.

PUNCTUATED EQUILIBRIUM MODEL

Punctuated equilibrium is an evolutionary model that posits a different tempo (rate of change) and mode (mechanism of change) of evolution in contrast to Darwinian or gradual evolution (Eldredge and Gould, 1972, Gould, 1989, Gould and Eldredge, 1977). Whereas Darwinian evolution hypothesizes a slow, steady evolutionary process based solely on natural selection, punctuated equilibrium suggests that evolution occurs as short episodes of change (revolutionary periods) against a backdrop of long periods of stability (equilibrium periods). Organizational theorists have used punctuated equilibrium as a metaphor for organizational change (Tushman and Romanelli, 1985). Organizations are constrained by inertial forces to remain in equilibrium conditions until an external force disturbs the equilibrium. One such external force is the changing of a company’s executive team members. Punctuated equilibrium is used to explain changes in executives (Tushman and
Rosenkopf, 1996). Tushman and Romanelli (1994) suggested that changes in CEO may lead to revolutionary periods in a firm’s strategic orientation. They argue that a new CEO may not have entrenched interests in current policies and strategies and may therefore be more likely to change them. This is especially true of outside successors who have no history with the company. Applying this same logic to the CIO position, this paper tests the impact of CIO change on IS alignment. The CIO exerts influence on the CEO in information technology matters (Enns et al., 2001, Earl and Feeny, 1994, Feeny et al., 1992). This relationship forms a part of the formal processes of IS alignment that provide competence. The CIO ensures that IT strategies are used to support and, sometimes, lead business strategy (Chan et al., 1997, Sabherwal and Chan, 2001, Sabherwal et al., 2001). However, should the CIO leave (for any reason), this relationship is disturbed. The inertia that is built up – which provides a much needed environment for competence building – is destroyed (Sastry, 1997, Tushman and Romanelli, 1985), thereby causing a change that resets the relationship between CEO and CIO, and between CIO and the executive team. This paper is arguing that this change will affect the IT support provided by the CIO for the business strategy thus leading to incremental change in the firm (that is, a change in IS strategy but not in business strategy).

**MODEL AND HYPOTHESES.**

Changes in the chief executive officer (CEO) and the senior executive team, as well as the organizational impacts of these changes, have been extensively studied in organization theory (e.g. Brown, 1982, Dalton and Kesner, 1983, Keck and Tushman, 1993, Miller, 1993, Shen and Cannella Jr., 2002, Tushman and Rosenkopf, 1996, Virany et al., 1992, Wiersema, 1992). Studies have found that CEO succession and senior executive team changes have associations with several variables such as organization size (Dalton and Kesner, 1983), successor type (Brown, 1982, Dalton and Kesner, 1983, Shen and Cannella Jr., 2002, Wiersema, 1992), environmental stability (Keck and Tushman, 1993, Tushman and Rosenkopf, 1996, Virany et al., 1992), organizational performance (Brown, 1982, Miller, 1993, Shen and Cannella Jr., 2002, Tushman and Rosenkopf, 1996, Virany et al., 1992), and strategy (Wiersema, 1992). Using longitudinal methods, Brown (1982) found that CEO change follows a pattern – there is a performance slide leading to CEO succession and then a subsequent return to pre-succession performance. Similarly, Wiersema (1992) and Miller (1993) found that there is significant strategic and organizational change after a CEO succession.

The punctuated equilibrium model argues that the executive leadership are responsible for the organization’s strategic orientation (Tushman and Romanelli, 1985). During equilibrium periods, inertial forces operate to maintain the status quo (Wiersema, 1992). Tushman and Romanelli (1985) note that “only executive leadership can initiate and implement the set of discontinuous changes required to affect a strategic reorientation” (p.180). However, executives themselves may be constrained in their personal commitments and interdependencies by inertial forces so that revolutionary change is most often initiated by outside successors (Keck and Tushman, 1993, Tushman and Romanelli, 1985, Tushman and Rosenkopf, 1996, Virany et al., 1992). That is, revolutionary change is most likely possible when there is a simultaneous change in executive leadership in both the business and the IT department. Executive succession is associated with major change in the composition and working relationships of the executive team.

The CIO is a lower level executive. His departure would most likely not affect the entire organization in the manner that CEO succession does. The impact of a CIO change would mainly affect his department as well as his web of relationships in the executive team and around the firm. Sabherwal et al. (2001) found that changes in leadership played a critical role in triggering revolutionary change. A new chief information officer (CIO), particularly one brought in from outside the firm, will most likely not be tied to the prevailing traditions and will be a force for change. However, Tushman and Rosenkopf (1996) note that merely changing the CEO without a concomitant change in executive team as a whole, will only trigger incremental change in the system (p.940). Therefore, the change in CIO alone is hypothesized to lead to incremental change. In other words, replacing the CIO leads to organizational changes that may impact IS strategic alignment but may not bring transformative change to the firm. This leads us to our first hypothesis.

**H1: The change in CIO will not be related to revolutionary change.**

One of the key factors in strategic IS alignment is the relationship between the CEO and CIO (Earl and Feeny, 1994, Feeny et al., 1992). Earl and Feeny (1994) found that CEOs who support their CIOs and include them in their top leadership teams gain value from their IT departments. Feeny et al. (1992) suggested that an excellent relationship between the CEO and the CIO would be expected to correlate with progress in exploiting IT. Hence, strategic IS alignment is high where the CEO/CIO relationship is excellent. This alignment is disturbed once the CIO is changed. The level of IS strategic alignment drops due to the departure of the CIO, and the new CIO may change the direction of this relationship entirely. This means that the initial level of strategic IS alignment after a change in CIO will be low. Also, due to the resistance from the rest of the executive
team, implementing change in IS strategic alignment will take place more slowly. However, if there is support for IT from the executive team, the pace of change will be faster (Chan and Reich, 2007). This leads us to our second hypothesis.

H2: A change in CIO will be negatively associated with IS alignment.

RESEARCH METHOD

Measures

The measures were obtained from secondary data. Business strategy was based on Miles and Snow’s (1978) ideal types of prospector, analyzer and defender (Miles et al., 1978). Information systems strategy was calculated from data in the InformationWeek database of innovative users of IT. IS alignment was calculated using a profile deviation approach as follows:

Step 1. The values for the business strategy variables and the IS strategy variables were standardized.
Step 2. Each firm was classified in each year into one of the Miles and Snow (1978) business strategy categories. Firstly, each category’s ideal strategy profile was identified from the literature. The High, Medium and Low values were then operationalized as 1, 0 and -1 respectively. Secondly, the Euclidean distance from each firm’s business strategy to each of the three ideal business strategy profiles was calculated using the formula: 

\[
\text{Distance (Ideal Profile)} = \sqrt{\sum (X_i - I_i)^2}
\]

where \(X_i\) = the normalized score for the \(i\)th business strategy attribute, and \(I_i\) = the ideal normalized score (that is, 1, 0 or -1) for the \(i\)th attribute in the ideal strategy profile from which the distance is being measured. Thirdly, after computing the distances to each of the ideal strategy profiles, the shortest distance was picked and the ideal profile to which it belonged became the business strategy being pursued by the firm. For example, if the Euclidean distances to defenders, analyzers and prospectors for a firm were 2.01, 1.02 and 3.32, then the firm would be pursuing an analyzer strategy because the distance to the analyzer ideal profile is the shortest.

Step 3. The business strategy calculated in step 2 is used to identify the ideal IS strategy that is theoretically best suited to it. First, the ideal IS strategies are standardized with High, Medium and Low values being operationalized as 1, 0 and -1 respectively. Secondly, the distance of each company’s IS profile from the ideal IS strategy for its identified business strategy is computed using the formula in step 2. Thirdly, the alignment is computed as one minus the distance computed. This alignment value is then used in the testing of the hypotheses.

Change in CIO was based on CIO data in the InformationWeek 500 database. CIO change was a dummy variable with 0 representing no change and 1 representing change. The CIO variable is lagged by one year to enable the effects of change to register in the firm’s web of relationships. Revolutionary change was measured by a change in business strategy, that is, change occurred when a company moved from prospector to analyzer, or analyzer to defender and so on. Revolutionary change was a binary variable with 1 representing change and 0 representing no change.

Sample

A sample of 728 companies was used in the analysis. The main sources of the data are: 1) Standard and Poor’s Compustat database of company financial data, 2) InformationWeek 500 annual lists of innovative users of information technology, and 3) 10K documents from companies’ SEC filings. The combination of Compustat and InformationWeek 500 surveys provide a consistent, longitudinal view of companies’ evolution in IT use. The many data elements collected make it possible to have a rich view of the context of, as well as the potential factors that affect, IT use. This study uses data from 2000 through 2007 of companies that appear in both InformationWeek 500 and Compustat. Table 1 below presents some of the sample characteristics.
The companies are relatively large with minimum revenue of $500 Million. The alignment measure represents the deviation from an origin of 1, that is, an alignment score of -1.4 means that the organization is 2.4 units of misalignment from perfect alignment. The change in alignment reflects the absolute difference between two consecutive alignment scores. On average each firm had 1.54 CIO change events and 1.35 revolutionary changes in the 8 years under study. The size variable represents the number of employees in the firm.

RESULTS

The analysis was carried out using “logit” regression for hypothesis 1 and random coefficients modeling for hypothesis 2. The analysis was done using the free R statistical programming environment (http://www.r-project.org/).

|                | Estimate | Std. Error | z value | Pr(>|z|) |
|----------------|----------|------------|---------|----------|
| (Intercept)    | -1.41473 | 0.04662    | -30.349 | < 2e-16 *** |
| Change         | 0.01373  | 0.10680    | 0.129   | 0.898    |
| No Change      | 0.10338  | 0.08219    | 1.258   | 0.208    |

Table 2. Log odds results for CIO change

A logit regression was used to predict revolutionary change in the firm from a change in CIO. Table 2 provides the log of the odds together with the standard errors, Wald z-values and the associated p-values. A change in CIO was not related to revolutionary change as can be seen from the non-significant results. For every 1 CIO change event, the odds of experiencing revolutionary change (vs. experiencing incremental change) increased by a factor of 1.01. These findings can also be interpreted using predicted probabilities. With all other variables assumed to be held constant, the probability of experiencing a revolutionary change in the firm from a CIO change event is 0.20 while the probability of having revolutionary change without a change in CIO is 0.21. The results support the notion that CIO change does not lead to revolutionary change.

<table>
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<th></th>
<th>Value</th>
<th>Std.Error</th>
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<th>p-value</th>
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<td>1136</td>
<td>3.5341</td>
<td>0.0004***</td>
</tr>
<tr>
<td>TIME:CIO Change</td>
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<td>0.0322</td>
<td>1136</td>
<td>-2.2562</td>
<td>0.0242*</td>
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</table>

Table 3. Relationship of CIO Change to IS Alignment
A random coefficients model using the NLME package (Pinheiro and Bates, 2000) was used to test hypothesis 2. Table 3 provides the results. The model was designed to test for variation at the intercept (initial level of IS alignment) and over the slope (rate of change in the magnitude of IS alignment). The data were in longitudinal form. The mathematical model tested was as follows:

\[
\text{Alignment}_{ij} = \pi_{00} + \pi_{10} (\text{TIME})_i + \pi_{20} (\text{TIME}^2) + r_{ij}
\]

\[
\pi_{00} = \beta_{00} + u_{0j}
\]

\[
\pi_{01} = \beta_{01} + \beta_{11} (\text{CIO Change})_j + u_{1j}
\]

\[
\pi_{02} = \beta_{20} + \beta_{21} (\text{CHANGE}) + u_{2j}
\]

where the \( \beta \)'s are the regression coefficients (fixed effects) and the \( u \)'s and \( r \), as well as the interaction terms, are the error terms (random effects). IS alignment was first modeled with time to get the fit of alignment over time (Ployhart et al., 2002). IS alignment seemed to fit a quadratic functional form. When CIO change is added, the intercept term for the fixed effects represents the average change in alignment for the companies that do not experience CIO change. IS alignment is not significantly related to time. However, the CIO change term represents the difference in IS alignment between companies experiencing CIO change and those not experiencing CIO change. The results show that the difference is statistically significant. That is, the initial levels of IS alignment of companies experiencing a CIO change differ significantly from those of companies not experiencing CIO change. However, instead of a drop in IS alignment as hypothesized, the coefficient is positive (0.4001) indicating an increase in IS alignment. In addition, the interaction term between time and CIO change represents the long term (or slope) differences between companies’ IS alignment. The negative coefficient indicates that for each year the IS alignment reduces by 0.0726 for companies experiencing CIO change when compared to companies not experiencing CIO change. This result is statistically significant at the p<0.05 level. Therefore, the results provide mixed support for hypothesis 2.

**DISCUSSION**

The change in CIO is thought to disrupt the working relationship between the CIO and the CEO. However, the disruption is not a great enough force to bring about revolutionary change. Hypothesis 1 indicated that CIO change will not lead to revolutionary change. A test of this hypothesis using change in the strategic orientation domain as a proxy for revolutionary change supports this hypothesis. Revolutionary change requires a large enough force to break through the inertia and entrenched interests that form within organizations (Romanelli and Tushman, 1994, Sastry, 1997, Tushman and Romanelli, 1985). Tushman and Rosenkopf (1996) put it more bluntly that revolutionary change requires not only a change of the top executive but also change of a substantial number of the executive team members. Therefore, while a change in CIO might have an effect in the organization’s web of IT relationships, the punctuated equilibrium model argues that this effect will be incremental at best.

Hypothesis 2 sought to test the relationship between CIO changes and IS alignment. The argument was that CIO change would lead to a drop in IS alignment and a slow rate of growth due to resistance and inertia. The results show that there is a statistically significant difference between companies that experience CIO change and companies that do not experience CIO change. However, instead of a drop in IS alignment, companies that experience CIO change have an increase in IS alignment. This may be due to the fact that CIO change occurs mainly as a result of low CIO performance. CIO change affords the new CIO a chance to make changes that their predecessor was not able to make due to political and other relational issues. The new CIO begins with a large stock of goodwill. On the other hand, the slope of the IS alignment trajectory tells a different story. The slope is negative indicating that the high initial value of IS alignment decreases with time. In fact, the coefficient indicates that the rate of decline in IS alignment in companies experiencing CIO change is faster than that experienced in companies with no CIO change.

**LIMITATIONS AND CONCLUSION**

The results of this study should be interpreted with reference to the assumptions enumerated below:

1. The CIO is assumed to be a member of the top management team. This assumption may not hold in some organizations where the CIO reports to an executive other than the CEO (for example, the chief financial officer or CFO). To mitigate
against this situation, the data sample actually used the top IS executive who was not always the CIO but someone close to the top executives or one of the top executives.

2. It is assumed that a change in IS strategy is not a revolutionary change. However, there may be organizations for which IS strategy is the primary driver of business strategy (Henderson and Venkatraman, 1993), meaning that a change in IS strategy would lead to a change in business strategy. This assumption might not hold in these situations. Nevertheless, a change in business strategy only occurs when there is a great force to break through a firm’s inertia. Therefore, business strategy is an appropriate proxy for the strategic orientation of the firm.

There is very little research on the effects of CIO turnover. This study seeks to provide a contribution to our understanding of what type of effect CIO turnover has on the firm as well as on IS alignment for which the CIO is responsible. This is a first step in studying the impact of CIO turnover on IS alignment and change within an organization. Further research is needed to find a more nuanced view of this phenomenon.

REFERENCES