The Information Technology Reporting Structure and Firm Performance: A Configurational Approach

Completed Research Paper

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Abstract

With the increasing recognition of the strategic role of information technology (IT) in modern organizations, prior studies have called for a direct reporting relationship between the IT head and the chief executive officer. Unlike prior studies that focus on the effect of IT reporting on firm performance, we propose a configurational lens to assess how several factors, such as firm size, industry, IT investment intensity, and the strategic role of IT in a firm, combine to determine IT reporting structure that yields high performance. Viewing firms as configurations based on different combinations of contextual causal conditions, we examine the optimal IT reporting structure for different configurations by using a configurational approach and a corresponding method, the fuzzy-set qualitative comparative analysis. We discuss implications for research and practice.

Keywords

IT governance, IT reporting structure, chief information officer, configurational methods, qualitative comparative analysis.

Introduction

Given the critical role and importance of information technology (IT) in contemporary organizations, there is an increased emphasis on creating the right governance mechanisms to achieve alignment between strategies and execution (De Haes and Van Grembergen 2009; Lee and Mithas 2014; Leonhardt et al. 2018; Mithas and Rust 2016). In this context, researchers have often emphasized the importance of IT governance for firm performance (Mithas and McFarlan 2017; Weill and Ross 2004). Although other aspects of IT governance such as those relating to allocation of decision rights, broader corporate governance, the role and structure of the IT department, determining the levels of IT investments and justifying IT investments, and options for IT delivery such as outsourcing, in-house, and hybrid arrangements for firm performance (Han and Mithas 2013; Joshi 2019; Lim et al. 2013; Liu et al. 2015; Xue et al. 2014) have received significant attention, relatively fewer studies have focused on who the CIO should report to considering contextual factors in a firm's competitive environment.

The issue of IT reporting structure has, however, attracted significant debate among IT practitioners about whether the IT head, or the CIO, should report to the chief executive officer (CEO), the chief financial officer (CFO), the chief operations officer (COO), or some other executive or manager. The proponents of the CIO-CEO reporting structure argue that moving the IT organization up to the C-suite allows for more direct visibility of business initiatives, challenges and operations (Shiver 2017), which leads to better alignment

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between business and IT (Luftman and Kempaiah 2007). In addition, reporting to the CEO gives the CIO more influence on the overall business strategy (Kuebler 2011) and therefore better chance for leading IT-driven transformation. On the other side of the debate, the opponents of the CIO-CEO reporting structure cite several issues such as CIO's underestimation of costs, communication problems, and conflicts of interest (Brans 2014). Therefore, they recommend that the IT head should report to other executives such as the CFO or the COO.

Among the academic studies in the information systems (IS) literature, several discuss the advantages of the CIO-CEO reporting structure (Preston and Karahanna 2009; Raghunathan and Raghunathan 1989; Raghunathan and Raghunathan 1993; Saldanha and Krishnan 2011; Watson 1990; Zafar et al. 2016). Banker et al. (2011) follow a contingency perspective and argue that the optimal IT reporting structure depends on the strategic positioning of a firm, i.e. whether a firm is pursuing differentiation or cost leadership. Specifically, firms that align their IT reporting structure with their strategic positioning (i.e., a differentiation strategy with a CIO–CEO reporting structure or a cost leadership strategy with a CIO–CFO reporting structure) have superior future performance.

Our work in this study extend the work of Banker et al. (2011), and uses a configurational view to argue that the search for a universally optimal IT reporting structure may be futile in that there may be multiple configurations of IT reporting structure that can yield high performance. Instead of assessing the importance of each contingency factor in isolation, there is a need to study these factors jointly to understand how different configurations of these factors affect performance. In particular, we examine whether the IT head should report to the CEO, CFO, or the COO based on firm size, industry, IT investment intensity, and whether the firm views IT as strategic or operational. We argue that the effect of each of these factors cannot be examined independently from other factors. For example, there is no straightforward answer on the optimal reporting structure for small versus large organizations or for those firms with high IT intensity versus those with low IT intensity. Instead, we treat each organization as a configuration of these characteristics along with its IT reporting structure to find which of those configurations lead to high financial performance, as measured by return on assets (ROA). We use fuzzy-set qualitative comparative analysis (fs-QCA), a neo-configurational approach that is based on set theory and Boolean algebra, to account for complex and unexplored interactions among firm-level and industry-level conditions that affect the optimal IT reporting structure. With fs-QCA, we are able to split all the cases (i.e., firms) into configurations of variables to assess whether each configuration is a sufficient condition for high or not-high firm performance. For example, we can test whether a configuration of large, low IT intensive manufacturing firm with IT-CEO reporting structure meets the conditions for sufficiency for high financial performance. Our analyses use survey data of 154 firms in India matched with data on the financial performance from another publicly available source.

Theoretical Framework

As the IT function in organizations have been expanded to include roles that impact the overall strategy, researchers have started to examine how IT is governed within organizations and how IT-related decisions are being made. The vast majority of studies on the IT reporting structure suggest advantages of the direct reporting relationship between the IT head and the CEO. For example, Raghunathan and Raghunathan (1989) show that CIOs who report to CEOs have expanded organizational roles and more effective IT planning. They also argue that the closer the IT manager is to top management, the more feasible it would be to maintain awareness on critical issues and trends affecting information management. Watson (1990) shows that IT managers who report directly to the top executive have a greater understanding of organizational goals, which in turn may impact their assessment of key issues. In addition, Preston and Karahanna (2009) conclude that the CIO who reports to the CEO and is a member of the top management team (TMT) will have a better understanding of the strategic needs of the business and the "mindset" of top management, leading to congruent IT vision and IT-business alignment. Similarly, Zafar et al. (2016) argues that a closer reporting relationship between the CIO and the CEO develops a trusting relationship and improves the CIO's deep understanding of business and enhances his or her capabilities. As a result, the CIO becomes effective as an integrator between business and IT, influencing organizational support for the IT related decisions. Finally, Saldanha and Krishnan (2011) find that IT-enabled business innovation is more likely when the CIO reports to the CEO.

In contrast to these studies, Banker et al. (2011) argue that the optimal reporting structure depends on a firm's generic strategic positioning. Differentiators are better off having their CIO reports to the CEO while cost leaders are better off having their CIO reports to the CFO. We extend Banker and his colleagues' argument further by using a configurational view, and suggest the need for considering many other factors that can also influence the optimal reporting structure.

Conditions Influencing IT Reporting Structure

We first show that whether the IT head should report to the CEO, the CFO, the COO, or other executive depends on several factors. Then, we argue that each of these factors cannot be analyzed independently and in isolation from other factors. Instead, we need to study them jointly so that each firm is considered as a configuration of different firm-level and industry-level characteristics and then we can study how these configurations influence firm performance.

We propose that optimal IT reporting structure depends on several conditions, namely, firm size, industry, IT investment intensity, and whether the firm views IT as strategic or operational. First, firm size can affect the optimal reporting structure in many ways. Larger firms tend to have more complex structural hierarchies and extra reporting levels; therefore larger firms might be less likely to have the IT head directly reporting to the CEO. In addition, larger firms with large IT departments are more likely to have dedicated attention to IT planning and budgeting while smaller firms' IT function can be combined with other supporting functions.

Second, a firm's industry can also play an important factor in determining the optimal IT reporting structure. IT can play different roles in different industries and these roles may impact how the IT investments are planned and managed within a firm regardless of the individual firm's strategic positioning. For example, some studies in the IS literature classify industries into three categories based on the role IT plays in firms in the industry: Automate, Informate, and Transform (Kim et al. 2017). Previous studies have analyzed the presence of a CIO position in those different industry categories. Lim et al. (2013) find that the impact of CIO's position on IT investments is much greater in "Transform" industries compared to "Automate" and "Informate" industries. In addition, Chatterjee et al. (2001) find that announcements of newly created CIO positions provoke positive market reactions for firms competing in industries undergoing IT driven transformation. Therefore, the highest level IT executive has different roles and levels of power and influence in those different types of industries.

Third, even those firms operating in the same industry can vary substantially in terms of their levels of IT investments. Firms with higher IT investment intensity may require more top management visibility for IT and a special attention to key decisions about IT utilization. This can be achieved through a dedicated seat for the CIO in the top management team and through a direct reporting to the CEO. Lim et al. (2013) find that a CIO position has stronger impacts in IT intensive firms than in non-IT intensive firms. However, it is possible to argue that IT intensive firms may require that those IT investments be placed under close scrutiny by finance-savvy executive such as the CFO to guide and control these investments.

Fourth, firms are also different in their IT orientation, that is, the way they view their IT investments. For some firms, IT plays a crucial role in their core business and is a part of their business strategy. Those firms view their IT investments as strategic investments. Other firms, in contrast, use IT mainly to improve operational efficiency and consider IT as a support function. Here IT is treated as a cost center that plays no central role in their business strategy. Firms whose IT head reports to C-level executives tend to have a strategic IT orientation, whereas firms whose IT head reports to other managers often have an operational IT orientation (Banker et al. 2011). Therefore, the optimal IT reporting structure is expected to be different for firms with different IT orientations. We propose that IT orientation is a firm-level attribute regardless of the industry and market where the firm competes. For example, even in the banking industry where information technologies are assumed to play a transformative role, firms may vary in how they view the main purpose of their IT investments. This general notion is also supported by the low correlation between IT orientation and industry categories in our dataset. Furthermore, a firm's IT orientation does not imply its IT investment intensity. For example, even those firms that use IT mainly for cost reduction might invest more in IT initiatives that promote lean operations, tight cost management, automated processes, cost-effective asset utilization, and efficient manufacturing (Banker et al. 2011). Therefore, firms with operational IT orientation may still have large IT investments if they can achieve such cost reductions. This

idea is also supported by the low correlation between IT orientation and IT intensity variables in our dataset. Therefore, we use a distinct condition for IT orientation in addition to industry classifications and IT intensity in our configurational analysis of the optimal IT reporting structure.

So far, we made an argument about various factors that can impact the suitable IT reporting structure. Our key overarching argument is that each of these factors cannot be analyzed independently from the others. In other words, there is no magic formula for small firms as compared to large firms, or for firms in a specific industry or with a specific IT orientation. Instead, each of these factors can work differently depending on the presence of other conditions or based on different levels of other factors. For example, the optimal IT reporting structure for firms with high IT investment intensity could be different, depending on firm size, industry, and IT orientation. That is, we relax a widely held assumption that there are only two-way or at most three-way interactions among different factors. We go beyond these relatively simpler interactions, and study all possible interactions by treating combinations of factors along with reporting structures as "configurations" that define different types of firms to examine which configurations are associated with high firm performance.

A Configurational Approach to the IT Reporting Structure Problem

We use the qualitative comparative analysis (QCA) to understand how causal conditions simultaneously and systemically combine to form configurations that are associated with an outcome of interest (Ragin 2008). The method is based on set theory and Boolean algebra where each variable is treated as a set. The value of each variable is represented by a membership value for each observation to each set, including the outcome set. The most basic variant of QCA is called the crisp set QCA (csQCA), where membership is a binary variable that takes either the value of 1 (member) or 0 (non-member). The algorithm starts by establishing a "truth table" with every possible combination of conditions (independent variables). The table has as many as 2^k rows, where k is the number of conditions. Each case (or observation) is assigned to one of these combinations based on its set membership values. The goal of the algorithm is to determine whether a condition or a combination of conditions (i.e. a configuration) is consistently a sufficient condition of the outcome set. In the set theory terms, a condition A is a sufficient condition of the outcome B if all members of set A are also members of set B, that is, A is a subset of B. A more advanced method is the fuzzy set QCA (fsQCA), which is an extension of the csQCA that allows for partial memberships in sets. A set membership can take any value from 0 (full non-membership) to 1 (full membership). For instance, firm size, measured as the number of employees, is transformed into a set membership value in a process called *calibration*. The final solution of the truth table algorithm is all the combinations of conditions that pass a sufficiency test. A common way to test the sufficiency of a condition (or a combination of conditions) is to calculate its *consistency*, the ratio of all cases belonging to this condition that also belong to the outcome set. If the consistency of a specific condition is above a specified threshold, say 0.80, then this condition is considered as a subset of the outcome and therefore a *sufficient condition*.

Data

The model is tested using data from two sources. The first dataset is based on a survey of firms in India. The survey generally asks each firm's representative about IT spending details and IT governance structure and decision making. We also use a public data for the financial performance of those companies. After removing observations with missing data, the final sample consists of 154 firms. Industries are categorized based on the role IT plays in each industry into three types: Informate, Automate, and Transform (Chatterjee et al. 2001).

Fuzzy Set Analysis

Models Set-up and Results

The fsQCA model includes the following conditions that are relevant to the IT reporting structure based on our theoretical framework: (1) Firm size, measured by number of employees, (2) Industry, whether a firm belongs to a transform, Informate, or automate industry, (3) IT intensity, measured by annual IT spending divided by number of employees, (4) IT orientation, i.e., whether the firm views IT as strategic (versus operational), and (5) Three conditions representing IT reporting structure, that is, whether the IT head

reports to the CEO, CFO, or COO. A recent survey indicate that 88.5% of CIOs reported to CEOs, CFOs or COOs (Kappelman et al. 2018). Therefore, there are nine conditions used to build the possible configurations. The outcome is the firm's financial performance, measured by return on assets (ROA).

We first *calibrated* all continuous variables using three anchors (full exclusion, crossover, and full inclusion) to transform all variables into set membership values between 0 and 1. The models are set up and run using the QCA package in R. The algorithm generates a *truth table* that indicates which configurations are associated with high performance. The truth table function has two key parameters: inclusion cut-off and frequency cut-off. The inclusion cut-off indicates the minimum row consistency such that a configuration can be considered as a consistently sufficient condition. The inclusion cut-off is set as 0.8. The frequency cut-off, set as three, indicates minimum number of cases from each row (configuration) such that a configuration is considered as empirically observed. All configurations below this threshold are considered as remainders that do not enter the conservative solution but may be used in counterfactual analysis to produce the parsimonious solutions as we explain below.

The next step is the *minimization* process, which simplifies the solution extracted from the truth table by combining configurations and removing redundant configurations to generate simpler solutions. We start with the most complex *"conservative" solution*, which relies on empirically observed configurations and does not use any remainders in the minimization process. In contrast, the simplest type of solution, referred to as the *pure parsimonious solution*, utilizes all available remainders in the minimization process. A more conservative solution is the one that removes any contradictory simplifying assumptions from the minimization process (Duşa 2018). Contradictory simplifying assumptions are those remainders that end up being utilized for both the outcome and its negation. This solution is called the *enhanced parsimonious solution*. While the standard QCA analysis typically includes an *intermediate solution*, which evaluates remainders based on directional expectations of the relationships between the conditions and outcome, our analysis does not include such solution because we do not make any assumptions about direction of the relationship between each of the conditions and firm performance.

One of the main characteristics of the set-theoretic configurational methods is that, unlike correlational-based methods, they do not assume symmetric relationships between causal conditions and outcomes. That is, the existence of a causal relationship between specific configurations and an outcome does not imply that the absence of these configurations are associated with low levels of the outcomes. Therefore, we repeat the previous steps (truth table analysis and minimization) for a model where the outcome is the set negation of ROA. The parsimonious solution consists of eight configurations that lead to "not high" financial performance.

Tables 1 and 2 provide graphical representations of the configurations leading to high ROA and configurations leading to not high ROA. In Tables 1 and 2, the configurations that share similar conditions are grouped together. For example, configurations N2A and N2B have the same conditions except that N2A has ~Transform "the negation of the Transform set" and N2B has Automate. The only difference between these two configurations is that the former includes firms in Automate and Informate industries while the later only includes firms in Automate industries.

Results Analysis

The fsQCA results demonstrate that multiple configurations are sufficient for high financial performance, a phenomenon known in the configurational analysis as *equifinality*. This indicates that several "organizational recipes" can lead to the same outcome, which is high financial performance. In addition, the results confirm asymmetric relationships between configurations and outcome as proven by the diverse solutions of the high ROA and "not high" ROA models. Most importantly, the different configurations confirm the argument that there is no straightforward optimal IT reporting structure. Instead, whether an IT head of a firm should report to the CEO, CFO, or COO appears as one of the dimensions of different organization configurations that are associated with high financial performance. In other words, the optimal reporting structure depends on multiple firm-level and environmental factors.

Table 1 shows the three groups of configurations that are sufficient for achieving high financial performance. The first set of configurations (H1-A and H1-B) suggests that IT intensive firms in Automate industries, whose IT investments are viewed as strategic will have high financial performance if the IT head reports directly to the CEO. The second configuration, in contrast, shows that regardless of the industry,

smaller firms with low IT investment intensity and whose IT heads do not report to their CEOs or COOs can also have high performance. The last configuration of high financial performance shows that smaller firms that use IT mainly to achieve operational efficiencies (as opposed to those using IT for strategic purposes) are better off not having their IT head reporting to none of the CEO, CFO, and the COO. This may indicate that high performing firms of this type have their IT manager reporting to another manager below the TMT level.

Conditions	**Configurations of High Performance**			
	H1-A	**H1-B**	**H2**	**H3**
Transform	⊗	⊗		
Automate	●	●		
Informate				
ITtoCEO	●	●	⊗	⊗
ITtoCFO	⊗	⊗		⊗
ITtoCOO			⊗	⊗
IT Strategic	●	●		⊗
Large			⊗	⊗
IT Intensive	●	●	⊗	
Consistency	0.743	0.720	0.406	0.811
Raw coverage	0.184	0.163	0.061	0.027
Unique coverage	0.021	0.000	0.034	0.001

● = presence of a condition; ⊗ = negation of a condition;
big circle = core element; small circle = peripheral element

Table 1. Configurations for High Financial Performance

Table 2 presents the five groups of configurations that are associated with lower ROA. A quick comparison between these configurations and those associated with high performance demonstrates that the two sets of configurations are different, which confirms the *causal asymmetry* in the relationship between the conditions and the outcome. The first configuration for "not high" performance (N1) represents firms with low IT intensity whose IT heads report to the CFOs. This rare parsimonious configuration points out that firms with lower IT budgets may be better of not having their IT head reports to their CFOs. Configurations N5-A and N5-B for low performance, on the other hand, suggest that large, IT-intensive firms operating in "transform" industries might be in bad positions if their IT heads report to their CEOs or COOs. Configurations N3 and N4 apply to large firms that view their IT investments as strategic but do not have their IT heads report to their CEOs. The two configurations suggest that this combination can be worrying specifically for firms with low IT intensity (configuration N3) and those in "Automate" industries (configuration N4). The second set of configurations (N2-A and N2-B) suggests that large firms operating in Automate or Informate industries and having an IT-to-CFO reporting structure are low performing.

Conditions	Configurations of Not High Performance							
	N1	**N2-A**	**N2-B**	**N3**	**N4-A**	**N4-B**	**N5-A**	**N5-B**
Transform		⊗			⊗		●	●
Automate			●			●	⊗	⊗
Informate								
ITtoCEO		⊗	⊗	⊗	⊗	⊗		
ITtoCFO	●	●	●				⊗	⊗
ITtoCOO							⊗	⊗
IT Strategic				●	●	●		
Large		●	●	●	●	●	●	●
IT Intensive	⊗			⊗			●	●
Consistency	0.785	0.678	0.601	0.740	0.697	0.651	0.866	0.836
Raw coverage	0.110	0.091	0.059	0.127	0.080	0.057	0.118	0.138
Unique coverage	0.030	0.009	0.000	0.042	0.000	0.000	0.000	0.020

● = presence of a condition; ⊗ = negation of a condition; big circle = core element; small circle = peripheral element

Table 2. Configurations for "Not High" Financial Performance

Discussion

In this section, we summarize our observations from the QCA model results, inspect how IT reporting structure interacts with each of the other firm-level and industry level conditions (IT orientation, IT intensity, industry category, and firm size), and introduce propositions that build a middle-range theory on the optimal reporting structure under different organizational configurations.

IT Reporting Structure and IT Orientation

We classify firms based on their IT orientation into two categories: (a) those that view their IT spending as strategic investments that can lead to competitive advantages, and (b) those that mainly use their IT investments to achieve operational efficiencies.

The IT orientation condition (IT Strategic) appears with IT reporting structure conditions in two of the three configurations of high performance as well as two of the five configurations of lower performance, which highlights the important interactions between IT orientation and IT reporting structure. Although these configurations specify different types of conditions in term of industry, firm size, and IT intensity, a common observation from all these configuration is that firms with strategic IT orientation are better off with a direct CIO-CEO reporting structure. This observation is highly expected as such type of firms tends to pursue IT initiatives with strategic impact on the firm's competitive landscape. The purpose of such IT initiatives is to attain differentiation advantage through innovation and customer intimacy. This is better achieved by having the IT head (or the CIO) in a closer relationship to the CEO who has a broader view of

the firm and its needs for customer intimacy and innovative products (Banker et al. 2011). This idea also confirms the practitioners' view that a direct reporting relationship gives the CIO more influence on the overall business strategy, which gives a better chance for leading IT-driven business changes (Kuebler 2011). Hence, we propose the following:

Proposition 1 (P1). Firms with a strategic IT orientation are better off having their IT heads report directly to the CEO. This relationship between IT orientation and IT reporting structure is specifically important in the following situations: (a) IT intensive firms in Automate industries, (b) large firms in Automate industries, (c) non-IT intensive firms in any industry.

IT Reporting Structure and IT Intensity

The IT intensity condition appears in conjunction with IT reporting structure conditions in one configuration of high performance and three configurations of "not high" performance. Despite being highly diverse in terms of other conditions, these four configurations agree on a couple of observations. First, we saw that if a firm has a strategic IT orientation, then the optimal reporting structure is a direct CIO-CEO reporting even for firms with high IT intensity (configurations H1-A and H1-B). Otherwise, IT intensive firms are better off having their IT heads report to the CFO or another senior executive other than the CEO. The models find evidence supporting this relationship for large firms in Transform industries (refer to configurations N5-A and N5-B). If the firm is not IT intensive, then CIO-CFO reporting is associated with lower financial performance regardless of all other conditions (configurations N1 and N3). The overall conclusion is that IT intensive firms that use IT to achieve operational efficiencies are better off having their IT heads report to the CFO. This finding endorses the view that one of the advantages of having the IT head (or CIO) reporting to the CFO is to control IT spending and remedy a reported weakness of IT leaders, which is their underestimation of costs. This issue is naturally more critical in firms with large IT budgets (i.e. IT intensive firms). However, as some IS researchers and practitioners suggest that a drawback of the CIO-CFO reporting structure is that it limits the strategic and transformational role of IT, we notice when IT is viewed by the firm as strategic then the optimal reporting structure is the direct reporting to the CEO. Therefore, the advantages of the CIO-CFO reporting structure in guiding IT investments only present for firms that use its IT investments for operational efficiencies and therefore there is no potential strategic role of IT that is feared to be limited. This view is also supported by two of the configurations associated with not-high performance (N3 and N4). The two configurations indicate that when firms with strategic orientation of IT do not have their IT heads reporting to the CEO, this can lead to low financial performance in two specific situations. The first, according to N3, is when a firm is not IT intensive, as IT budgets are not large enough to be required to be supervised by the CFO. The second situation, according to N4, is when a firm is large and in an Automate industry such as manufacturing. Therefore, we propose the following:

Proposition 2 (P2). Firms with high IT intensity are worse off having the IT heads report to the CEOs, specifically for large firms in Transform industries.

Proposition 3 (P3). Firms with low IT intensity are worse off having the IT heads report to the CFOs, regardless of all other conditions.

IT Reporting Structure, Industry, and Firm Size

In this study, industries are classified into three categories based on the role IT plays in firms in each industry: Automate, Informate, and Transform (Chatterjee et al. 2001). Most of the configurations that appear in the two solutions belong to the Automate industry, while there is only one configuration with the Transform industry (configuration N5). The reason for this low diversity is that most firms in the sample belong to Automate industries (56%), while only 33% and 11% belong to Transform and Informate industries, respectively. A similar issue appears with the firm size condition where two of the three configurations of high performance include the negated "Large" condition while four of the five configurations of "not high" performance appear with the presence of "Large". Nonetheless, we find that firm size and industry categories are factors that influence the relationship between IT reporting structure and IT orientation (refer to P1) and the relationship between IT reporting structure and IT spending intensity (refer to P2).

In addition, regardless of IT orientation and IT intensity, the second configuration of "not high" performance (N2) provides evidence to an interesting and unexpected finding. This configuration shows

that large firms in the Automate industry with the IT-CFO reporting structure are bad performers. For firms in Automate industries such as manufacturing, the main role of IT is to replace human labor by automating business processes. Therefore, Automate represents no IT-driven transformation efforts (Chatterjee et al. 2001), so we would expect that the IT-CFO is the most suitable reporting structure for such firms. However, the results show that if firms in the Automate industries are large, then their IT heads should not report to the CFO. Large firms in the Automate industries also appear as one of the special cases in Proposition 1 where firms with strategic IT orientation should have their IT heads report to the CEO. The next proposition recommends the IT reporting structure for large firms in the Automate industries regardless of their IT orientation.

Proposition 4 (P4). Large firms in Automate industries are worse off having their IT heads report to the CFO.

Finally, the second and third configurations of high performance provide some insight for small firms. H3 show that small firms where IT is used to achieve operational efficiencies are better off having their IT heads reporting to none of the CEO, CFO, or the COO. While this configuration does not specify the optimal reporting structure, it is likely that the IT head should report to a manager outside the TMT level. Similarly, H2 show that small, non-IT-intensive firms are better off having their IT heads reporting to none of the CEO or the COO. We know from configuration N1 that firms with low IT intensity of any size are worse off with the IT-CFO reporting structure. Therefore, it appears that small firms with no IT focus, either through low IT investment intensity or operational IT orientation, should have their IT heads reporting to a non-executive manager.

Proposition 5 (P5). Small firms with operational IT orientation or low IT intensity are better off not having their IT heads report to C-level executives.

Conclusion

The IT reporting structure is a complex problem where the optimal solution depends on several factors such as firm size, industry category, IT investment intensity, and IT orientation. Our results demonstrate that different combinations of causal conditions have different optimal IT reporting structure. In addition, the results also show cases where the IT reporting structure is critical to the solution and cases where it is a minor factor that does not strongly impact firm performance. These findings challenge the common one-dimensional recommendations on the optimal IT reporting structure and highlight the complexity of this problem. In addition, the research contributes to the IS literature by implementing an emerging configurational methodology that is designed to address complexities that are pervasive in real organizations (Park and Mithas 2019).

REFERENCES

Banker, R.D., Hu, N., Pavlou, P.A., and Luftman, J. 2011. "CIO reporting structure, strategic positioning, and firm performance," *MIS Quarterly* (35:2), pp. 487-504.

Brans, P. 2014. "Leading French CFO says CIOs should never report to the CEO." from https://www.cio.co.uk/it-leadership/leading-french-cfo-says-cios-should-never-report-ceo-3583811/

Chatterjee, D., Richardson, V.J., and Zmud, R.W. 2001. "Examining the shareholder wealth effects of announcements of newly created CIO positions," *MIS Quarterly* (25:1), pp. 43-70.

De Haes, S., and Van Grembergen, W. 2009. "An exploratory study into IT governance implementations and its impact on business/IT alignment," *Information Systems Management* (26:2), pp. 123-137.

Duşa, A. 2018. *QCA with R: A Comprehensive Resource*. Springer.

Han, K., and Mithas, S. 2013. "Information technology outsourcing and non-IT operating costs: An empirical investigation," *MIS Quarterly* (37:1), pp. 315-331.

Joshi, A., Van Peteghem, M., Bollen, L., Haes, S. d., and Mithas, S. 2019. "Board IT Competence, IT Capability, and Firm Performance," *European Accounting Association (EAA) Annual Congress 2019* Paphos, Cyprus.

Kappelman, L., Johnson, V., Maurer, C., McLean, E., Torres, R., David, A., and Nguyen, Q. 2018. "The 2017 SIM IT Issues and Trends Study," *MIS Quarterly Executive* (17:1).

Kim, K., Mithas, S., and Kimbrough, M. 2017. "Information Technology Investments, and Firm Risk Across Industries: Evidence from the Bond Market " *MIS Quarterly* (41:4), pp. 1347-1367.

Kuebler, A. 2011. "It's the age-old question: To whom should the CIO report?", from https://www.computerworld.com/article/2507512/it-management/it-s-the-age-old-question--to-whom-should-the-cio-report-.html

Lee, D., and Mithas, S. 2014. "IT Investments, Alignment and Firm Performance: Evidence from an Emerging Economy," *Proceedings of the 34th International Conference on Information Systems (Dec 14-17)*, A. Srinivasan, B. Tan and E. Karahanna (eds.), Auckland, New Zealand: Association for Information Systems.

Leonhardt, D., Hanelt, A., Huang, P., and Mithas, S. 2018. "Does One Size Fit All? Theorizing Governance Configurations for Digital Innovation " *Proceedings of the 39th International Conference on Information Systems*, San Francisco: Association for Information Systems.

Lim, J.-H., Han, K., and Mithas, S. 2013. "How CIO Position Influences IT Investments and Firm Performance," *Proceedings of the 33rd International Conference on Information Systems (Dec 15-18)*, R. Baskerville and M. Chau (eds.), Milan, Italy: Association for Information Systems.

Liu, C.-W., Kude, T., and Mithas, S. 2015. "How Strategy and Governance Choices Influence Innovation Success in Software Products and Services," *Proceedings of the 35th International Conference on Information Systems (Dec 13-16)*, T. Carte, A. Heinzl and C. Urquhart (eds.), Forth Worth, Texas: Association for Information Systems, pp. 1-18.

Luftman, J., and Kempaiah, R. 2007. "An update on business-IT alignment:“A line” has been drawn," *MIS Quarterly Executive* (6:3), pp. 165-177.

Mithas, S., and McFarlan, F.W. 2017. "What is Digital Intelligence?, https://www.computer.org/csdl/mags/it/2017/04/mit2017040003.html," *IEEE IT Professional* (19:4), pp. 3-6.

Mithas, S., and Rust, R.T. 2016. "How Information Technology Strategy and Investments Influence Firm Performance: Conjecture and Empirical Evidence," *MIS Quarterly* (40:1), pp. 223-245.

Park, Y., and Mithas, S. 2019. "Organized Complexity of Digital Business Strategy: A Configurational Perspective," *MIS Quarterly* (Forthcoming).

Preston, D., and Karahanna, E. 2009. "How to develop a shared vision: The key to IS strategic alignment," *MIS Quarterly Executive* (8:1).

Raghunathan, B., and Raghunathan, T. 1989. "Relationship of the rank of information systems executive to the organizational role and planning dimensions of information systems," *Journal of Management Information Systems* (6:1), pp. 111-126.

Raghunathan, B., and Raghunathan, T. 1993. "Does the reporting level of the information systems executive make a difference?," *The Journal of Strategic Information Systems* (2:1), pp. 27-38.

Ragin, C.C. 2008. *Redesigning social inquiry: Fuzzy sets and beyond*. University of Chicago Press.

Saldanha, T., and Krishnan, M. 2011. "Leveraging IT for business innovation: Does the role of the CIO matter?," *International Conference on Information Systems (ICIS)*.

Shiver, B. 2017. "CFO or CEO: To whom should IT report?", from https://www.cio.com/article/3200225/leadership-management/cfo-or-ceo-to-whom-should-it-report.html

Watson, R.T. 1990. "Influences on the IS manager's perceptions of key issues: information scanning and the relationship with the CEO," *MIS Quarterly* (14:2), pp. 217-231.

Weill, P., and Ross, J. 2004. *IT governance*. Boston, MA: Harvard Business School Press.

Xue, L., Mithas, S., and Ray, G. 2014. "Earnings Management and IT Investments: An Examination of IT Infrastructure Development, http://aisel.aisnet.org/icis2014/proceedings/ISGovernance/6/," *Proceedings of the 34th International Conference on Information Systems (Dec 14-17)*, A. Srinivasan, B. Tan and E. Karahanna (eds.), Auckland, New Zealand: Association for Information Systems, pp. 1-18.

Zafar, H., Ko, M.S., and Osei-Bryson, K.-M. 2016. "The value of the CIO in the top management team on performance in the case of information security breaches," *Information Systems Frontiers* (18:6), pp. 1205-1215.