Does Higher CIO Rank Serve as an Organizational Integration Mechanism?

Completed Research Paper

Eric C. Larson
University of Illinois, Urbana-Champaign
ecl@illinois.edu

Carl R. Adams
University of Minnesota
adams003@umn.edu

Abstract

Twenty years ago, ERP systems, Big Data and products embedded with information technology were not part of the IT landscape, but today these technologies are ubiquitous or at least top of mind for executives trying to remain competitive. Amidst this change, what firm level factors are critical to understanding the appropriate organizational response for the IT organization? We observe a previously unmeasured factor, the demand for integration, on the rank of the top IT executive, or CIO Rank. Using data on 186 Fortune 1000 firms over 17 years, we find that the demand for integration significantly influences the CIO Rank. Additional evidence suggests that a higher CIO Rank alleviates the generally harmful influence that the demand for integration has on firm performance, especially in recent years. The results illustrate the relevance of the demand for integration and that the CIO Rank may serve as an organizational integration mechanism for firms.

Keywords
demand for integration, Chief Information Officer, CIO, interdependence, IT Organization.

Introduction

While the Greek philosopher Heraclitus (535 BC-475 BC) was certainly not contemplating a world with ERP systems, Big Data, and products infused with embedded information technology, his claim that the only constant in life is change is certainly relevant for how IT has transformed the environment faced by firms in the past 20 years. In fact, change is so much the norm that even the link between IT and firm performance (Bharadwaj 2000; Santhanam and Hartono 2003) has recently been called into question on account of the dramatically changed IT landscape just in the past ten years (Chae, Koh and Prybutok 2014). We contribute to this discussion by considering one factor that has changed in the last two decades, the demand for integration. Though we find that that the demand for integration increased significantly among large firms from 1993-2009, the demand for integration's influence on the IT organization has not been studied.

We theorize that the IT organization, a functional organizational subunit of the firm, provides an organizational integration mechanism (Lawrence and Lorsch 1967; Barki and Pinsonneault, 2005) for the other units of the firm. We empirically explore this possibility by testing the impact of the demand for integration on the structure of the IT organization, and its relationship to firm performance. If the IT organization and its leadership is playing the role of integrator for the firm, we would expect that demand for integration would affect the IT organization structure and its relative position in the firm. Further, the ability to configure the organization to manage this demand is expected to ultimately impact organizational performance (Barki and Pinsonneault, 2005).

Using a compilation of data sources to develop measures for the demand for integration, CIO Rank and firm performance from 186 Fortune 1000 firms, we empirically test the proposed relationships. After controlling for numerous alternative explanations, we find that the demand for integration does impact the IT organization, specifically the CIO Rank. Our analysis further suggests that CIO Rank may alleviate the generally harmful influence that the demand for integration has on the performance of the firm.

The empirical analysis makes four primary contributions: 1) documents a significant shift in the IT organization (i.e. CIO Rank) over the period 1993-2009; 2) puts forth the conceptualization of the demand for integration - a new, but seemingly important factor that influences IT organization structure; 3) highlights the relationship between the demand for integration and the IT organization, providing evidence that suggests the IT organization may serve as an integrating device. 4) assesses the impact of demand for integration on firm performance.

The paper opens with a theoretical framework for conceptualizing the demand for integration and an explanation for the relationship between demand for integration and CIO Rank. Data and methodology is detailed, followed by the empirical results, and discussion and implications.

Theory and Hypotheses

Demand for Integration

Demand for integration is the need for organizational subunits of the firm to coordinate. Demand for integration is the result of high levels of interdependence among the subunits of the firm (Thompson 1967). Demand for integration is the felt pressure or economic motivation to share information, do work in a coordinated fashion and present a single face of the corporation to its environment. It is a general firm-level concept, not specific to the IT organization. The framework of demand for integration presented here considers two high-level sources of the demand for integration in the large multi-business firm: strategic (demand for integration comes from choices made by the firm) and operational (demand for integration comes from the normal activities of the firm). Table 1 shows the categorization of the component sources of demand for integration in a large firm according to this framework and provides a brief description of each of the components.

	Component	Description	References Describing the Impact on Demand for Integration
STRATEGIC DEMANDS	**Acquisition Growth**	Acquisition Growth is growth that occurs as the result of mergers and acquisitions.	Capron & Hulland 2004; Capron & Piste 2002
	Related Diversification	Related diversification measures the relative segmentation of the corporation into business segments that are in closely related industries.	Birkinshaw, Morrison & Hulland 1995; Dewan, Michael, & Min, 1998; Kim & Kogut, 1996
	Vertical Integration	Vertical integration is a measure of the scope of value chain activities that the firm performs, from raw materials acquisition to customer sales and support.	Jiang, Tao & Santoro 2010; Sahin & Robinson 2002; Xu & Beamon 2006
OPERATIONAL DEMANDS	**Regulatory Pressure**	Regulatory pressure is the pressure felt by the firm in response to regulatory compliance activities.	Damianides 2005; Sutton & Arnold 2005.
	Specialization	Specialization is the degree to which employees do unique tasks to accomplish the goals and objectives of the firm.	Becker & Murphy 1992; Heath & Staudenmayer, 2000; Malone & Crowston, 1994
	Brand Equity	Brand equity is the portion of all firm assets attributable to the brand or brands of the firm.	Aaker 2004; Aaker 2008; Kapferer 2004; Song, Droge, Hanvanich & Calantone 2005

Table 1. Components of the Demand for Integration

The three strategic demands for integration are: (1) acquisition growth - the level of growth that a firm experiences via acquisitions (e.g. Kusewitt 1985) ; (2) related diversification - the extent to which a firm is composed of closely related industry segments (Markides and Williamson 1994); and (3) vertical integration – the extent to which a firm produces its own inputs and internally distributes its products (Hitt, Ireland, and Hoskisson, 2001). Acquisition growth drives the demand for integration by requiring the combination of resources to improve scale (Mitchell and Shaver 2003), achieve synergy (Seth 1990), consolidate operations (Schweiger 2002) and allow the flow of resources between target and acquirer (Capron and Piste 2002). Related diversification drives demand for integration through the economy of using common practices and participating in similar market segments (Birkinshaw, Morrison and Hulland 1995) and leveraging related knowledge across the businesses (Kim and Kogut 1996; Tanriverdi and Venkatraman 2005). Vertical integration drives the demand for integration by necessitating the minimization of inventory and stabilization of the subsequent effect on entities downstream in the firm (Lee, Padmanabhan and Whang 1997) and management of the sequential and reciprocal interdependence of manufacturing (Clemmons and Simon, 2001) and various stages of the supply chain (Harrigan 1984; Rothaermel, Hitt and Jobe 2006).

The three operational demands for integration are: (1) regulatory pressure - the scale of governmental regulation and anticipated level of enforcement (Langevoort 2009); (2) specialization – the extent that the organization's tasks are divided into diverse jobs (Pugh et al. 1968); and (3) brand equity – the value or relative importance of the firm's brand(s) (Simon and Sullivan 1993). Regulatory pressure drives the demand for integration because of the continuously coordinated effort required of finance, IT, corporate risk management, and the business units of the firm for financial reporting (Damianides 2005), dependence on coordinated internal controls (Langevoort 2009), the financial benefits of a coordinated

approach to compliance (Financial Executives International 2006), and top executive and board demands for accurate and timely corporate level reporting (Kaplan and Norton 1996; Carter and Lorsch 2004). Specialization drives the demand for integration as a result of a lack of a broad understanding of the organization's overall task (Feldman 2000), communication and translation when specialists may not share common language (Heath and Staudenmayer, 2000), and management of a diverse set of tools for communication and coordination (Scott and Davis 2007; Okhuysen and Bechky 2009). Brand equity drives the demand for integration by creating interdependence among marketing activities common to a shared brand (Malone and Crowston 1994), the need for consistent and coordinated product or service across a portfolio that crosses markets and geographies (Schmitt and Simonson, 1997; Aaker 2008; Kapferer 2004), additional requirements for coordination across functions (Cravens and Guilding, 2000), and additional requirements of new uniquely interdependent marketing platforms such as social media (Mangold and Faulds 2009).

Demand for Integration and CIO Rank

One aspect of the structure of the IT organization is the relative position of the top IT executive, or CIO Rank. CIO Rank measures the degree to which the CIO takes a corporate-wide perspective vs. business-unit focus in IT. This is a measure of the structure of the IT organization in the sense that it measures the centrality of decision making regarding IT (ie. a CIO that is among the top executives in the firm is an indication that decision making in IT is made among the top leadership of the firm and from a corporate perspective rather than locally within each of the business units). CIO Rank is also a measure that represents the configuration dimension (Pugh et al., 1968) of structure. A higher CIO Rank is indicative of a configuration in which IT plays a more prominent role in the firm (Raghunathan and Raghunathan 1989) and is indicative of where the IT organization reports in the firm's hierarchy.

The idea that an organizational unit may serve as an integrating device is taken from the classical organizational literature (Lawrence and Lorsch 1967) and extends the notion that IT serves as a technological facilitator for the coordination of the firm (e.g., Christiaanse and Venkatraman 2002; Mukhopadhyay and Kekre 2002; Rai, Patnayakuni and Seth 2006; Zaheer and Venkatraman 1994) to include the additional concept that IT employees and the IT organization, with unique global and systems perspective that comes about from constant interaction between IT and the business units of the firm, play a significant organizational role in linking and coordinating the separate subunits of the firm.

IT plays the role of integrator for the firm through many coordinating mechanisms including IT-business, architecture and alignment linkages (Fonstad and Robertson 2006). While at first glance architecture appears to be a deeply technical realm, IT plays a key role in ensuring the congruence of business processes with the technical infrastructure of the firm, to drive the appropriate level of business process integration for the firm (Ross, Weill and Robertson 2006). A centralized IT organization is in a unique position in the firm to leverage its knowledge of the various subunits of the firm. A centralized corporate level IT organization maintains direct relationships between the IT organization and all of the businesses. By the nature of its work across the firm, the IT organization has a global understanding of the various requirements of the diverse businesses of the firm. The IT organization's unique position allows its employees to facilitate negotiation or coordination among the various business units because IT employees have ongoing relationships with each of the subunits of the firm and an understanding of each unit's language and culture. A decentralized IT organization is unlikely to have these types of relationships and understanding across the subunits of the firm. So, demand for integration is likely to directly impact the most appropriate structure of the IT organization and therefore the relative position of the top IT executive in the firm. As a result, we hypothesize:

H1: High demand for integration in the firm is associated with high CIO Rank.

Effect of Demand for Integration and CIO Rank on Firm Performance

Our strategic interest in pursuing this line of research is to understand how the organization structure of IT influences the performance of the firm, contingent on the extent of demand for integration in the firm. The normative expectation is that the IT organization would choose its organization structure to fit the level of the demand for integration in the firm, but that the IT organization not be excessively centralized

to maintain responsiveness. Integration of the business units of the firm is generally associated with both improved IT performance (Harris and Katz 1991) and improved overall firm performance (Birkinshaw, Morrison & Hulland 1995). Research has demonstrated that the best performing IT firms are those that are able to "integrate and coordinate the activities of the firm" (Harris and Katz 1991). However, there is also an ongoing concern that integration when unnecessary creates uncertainty and leads to high information processing requirements without any performance benefits (Hill, Hitt, Hoskisson 1992) and reduced innovativeness (Orlikowski 2000). At the same time, bureaucratic structures (more centralized control) may adversely affect performance (Donaldson 2001), especially if such structure is not required by the organization. We therefore argue that a more corporate orientation of the CIO benefits the firm in the context of high demand for integration, but has a negative impact when demand for integration is low:

H2: CIO Rank moderates the effect of the demand for integration on firm performance.

Data and Methodology

Sample Characteristics

The research design utilizes primary data from a multitude of sources. 186 Companies were selected at random from the 2008 Fortune 1000 list (Fortune 2008), the largest 1000 American firms by annual revenue for which revenue information is publicly available. This population of firms is chosen due to the high degree of global interest in these firms, but more importantly because these fims generally comprise multiple business units, geographies and/or product markets. Firms with multiple business units afford a better context to test for the impact of integration demands across subunits of the firm.

Measuring CIO Rank

The measure CIO Rank comes from annual rankings of the top executives in each firm by Corporate Affiliations. The names and titles of the top ten executives in the sample of firms were collected from Corporate Affiliations for each of the years 1993 to 2009. Corporate Affiliations develops the list of the top executives in the firm based on compensation, prominence and overall influence in the firm. For the purpose of creating the CIO Rank, the top IT executive (if present) was identified from among the top ten executives. The top ranked executive, normally the CEO, President or Chairman of the Board, was assigned a value of 10, while the tenth highest ranked executive was assigned a value of 1. The top IT executive was identified in 40.5% of the firm/years in the study. In the remaining firm/years where no IT executive was among the list of top executives, the firm/year is assigned a value of 0 for CIO Rank. This measure serves as a conservative measure of the change in IT structure because actual changes may be greater than we are able to observe. Because the rank of individuals outside the top ten executives is unobserved, the distribution of CIO Rank is also right-censored. As a result, a Tobit regression model (Tobin 1958) is used to enable estimation given that the value of CIO Rank is not precisely known for that portion of the sample that is censored (ie. in cases where the IT executive is unobserved).

Measuring the Demand for Integration

The demand for integration is measured as a formative construct composed of acquisition growth, related diversification, vertical integration, regulatory pressure, specialization, and brand equity. The construction of demand for integration as formative enables us to measure a variety of unique demands that all contribute to interdependence among subunits of the firm. Because of the formative nature of the construct, the relative weights of the variables constituting the demand for integration cannot be determined by common factor analysis (Edwards, 2001; Petter, Straub and Rai, 2007). A technique recommended by Treiblmaier, Bentler and Mair (2011) was used to establish the relative weights of each of the variables comprising the demand for integration based on a canonical correlation analysis. The results reported in this study are based on the loadings determined from this technique. However, the same analyses were performed using equal unit loadings for each of the components of the demand for integration. The results were not sensitive to this alternative specification.

The level of *acquisition growth* is specified by the dollar value of acquisitions by the focal firm during the fiscal year as reported by Compustat, deflated to 1993 equivalent dollars based on the Bureau of Labor Statistics' Consumer Price Index.

Related diversification is based on the entropy measure (Jacquemin and Berry 1979; Palepu 1985) using the contemporary 2-digit NAICS codes.

Vertical integration is measured by Fan and Lang's (2000) measure, deploying the Bureau of Economic Analysis' (BEA) benchmark input-output tables to capture the extent to which industries use products produced by other industries.

Regulatory pressure felt by the firm is measured by the dollar amount of audit fees paid by the firm for a given fiscal year. Significant financial regulation places additional financial reporting requirements on the firm and increases the expenditure by the firm on audit fees, among other expenses incurred to manage the increased regulatory burden (Carney 2006). Audit fees are observed by inspection of the definitive proxy statement 14A reported annually by the firm, deflated to equivalent dollar values.

Specialization is a measure of the number of different tasks that an organization performs to achieve its objectives. Specialization exists when decisions are made by individuals in the organization with local expertise (Hart and Moore 2005), expertise that is unique to each individual due to the nature of their job requirements. The Occupational Employment Statistics from the Bureau of Labor Statistics are used to measure the level of specialization by industry and then to derive a firm level measure for specialization. The Bureau of Labor Statistics estimates the number of people employed in each of over 800 specific occupations in the U.S. by NAICS code (or industry). The Bureau of Labor Statistics samples 1.2 million companies on a three-year rolling basis in reporting employment by occupation. Industry specialization is a count of the number of unique occupation codes reported in each 2-digit NAICS code industry. Then the industry level specialization measure is weighted by the proportion of firm sales in each industry in which the firm participates to arrive at a firm level measure of specialization.

The estimate of *brand equity* for each firm-year in the sample is adapted from the classic methodology from the marketing literature that uses publicly available data to estimate brand equity (Simon and Sullivan, 1993) by separating tangible and intangible assets of the firm and then further estimating the portion of intangible assets resulting from brand.

Control Variables

We account for a series of factors that have been found to influence the structure of IT including firm size, the business strategy of the firm, corporate structure, industry environmental conditions, knowledge intensity, and the economic conditions faced by the firm. *Firm size*, because larger firms tend to decentralize their IT organization according to business or product lines *(*Ein-Dor and Segev 1982; Sambamurthy and Zmud 1999), is operationalized as the natural log of the annual revenues of the firm. *Business strategy* is expected to influence the structure of the IT organization and CIO (Banker et al. 2011) Business strategy is accounted for by the inclusion of two control variables: differentiation strategy as measured by the return on sales, the ratio of operating income over sales, and low cost leadership strategy as measured by a ratio of sales over assets, consistent with the approach of Banker et al. (2011). A centralized corporate structure is expected to be associated with centralized decision making in IT, while a more decentralized corporate structure is expected to be associated with a business unit orientation in IT decision making (Sambamurthy & Zmud 1999) so we control for *corporate structure* by measuring the degree of headquarters' control on subsidiaries (Collis, Young and Goold, 2007). The relative difficulty of the environment is measured by three measures: *dynamism* (the extent of change in the environment over time), *munificence* (the level of industry growth) and *complexity* (the level of competition) according to the measures by Dess and Beard (1984). These industry level values are weighted by the firm's sales volumes in each industry. *Knowledge intensity* is specified to control for the relative reliance on information assets as opposed to physical assets in the creation of value for the firm. It may be thought of as the "ratio of time spent in dealing with information in an activity to the total time spent in that activity" (Apte and Mason, 1995: 1255). Knowledge intensity is operationalized as the proportion of a firm's employees that are doing knowledge intensive activities. Bureau of Labor Statistics data regarding occupations in a given industry are used in combination with Beck and Connolly's (1996) formulation of knowledge ratio to arrive at industry level knowledge intensity. We control for the possibility that current

economic conditions influence the structure of IT. While some studies that consider IT structure as the dependent variable in a longitudinal setting apply year dummies to account for changes in overall economic conditions (e.g., Xue, Ray, Gu 2011), the specification in this study requires a more nuanced account of economic conditions in order to separate the time variant variable of interest, demand for integration, from the cyclicality of the overall economy. We regress the quarterly closing price of the S&P 500 index, a broad reflection of U.S. market conditions, over the time period from 1993-2009. Then, the residual is used for each year to arrive at a relative measure of economic conditions as compared to the overall economic trend.

Descriptive statistics for variables are shown in Table 2 for three representative years in the study.

	1994		2000		2008	
Variable	Mean	sd	Mean	sd	Mean	sd
CIO Rank	9.98	2.10	8.67	3.08	7.72	3.29
Related Diversification	0.19	0.32	0.40	0.42	0.50	0.48
Acquisition Growth ($000)	$63	$218	$921	$5,063	$166	$665
Regulatory Pressure (Audit Fees $M)			1.31	1.92	3.42	3.69
Vertical Integration	0.87	0.79	0.98	0.76	1.10	0.74
Brand Equity (% of total assets)	0.12	0.27	0.02	0.09	0.08	0.24
Specialization	218.8	56.3	338.6	66.6	416.4	113.9
Sales ($US million)	$5,444	$15,116	$8,317	$21,773	$15,895	$43,411
Differentiation Strategy (Return on Sales)	0.06	0.06	0.06	0.10	0.03	0.15
Cost Leadership Strategy (Asset Turnover)	1.22	0.82	1.18	0.87	1.22	0.89
Knowledge Intensity	0.12	0.06	0.14	0.08	0.15	0.09
Corporate Structure	0.82	0.23	0.84	0.21	0.80	0.24

Table 2. Descriptive Statistics

Results

Three observations may be made by inspection of Figure 1 and associated statistical analyses. First, CIO Rank has increased significantly ($\beta_{year} = 0.161$, $p < 0.01$) from 1993-2009 from approximately 10 in 1993 to near 8 in 2009. Second, while the CIO has risen in position over time, the CIO is not nearly approaching the top executive in the typical firm. Finally, on a qualitative basis, the heightened influence of IT and subsequent collapse associated with the dot.com bubble appears to be visible in the CIO Rank data, although the statistical verification of that is beyond the scope of this research.

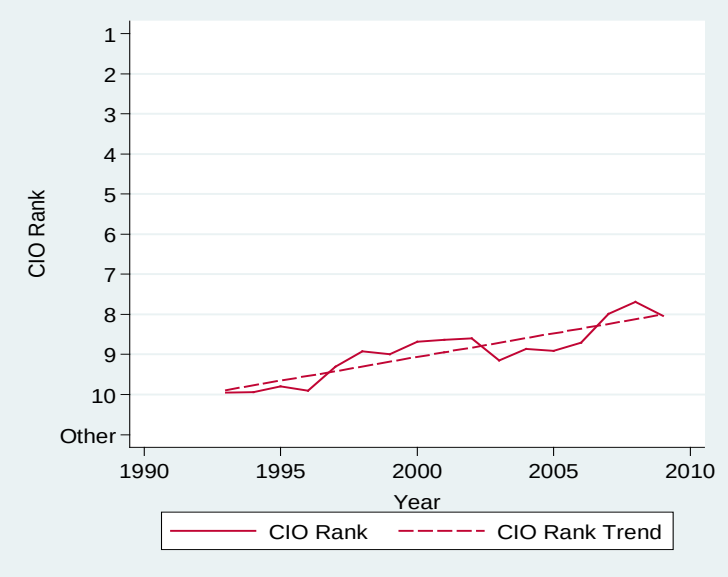

Figure 1. Trend in CIO Rank 1993-2009

Relating Demand for Integration to IT Organization Structure

A random-effects Tobit regression model is used to account for the right-censored distribution of the measure for CIO Rank. We find that the demand for integration is related to the CIO Rank ($\beta_{DemandforIntegration}$ = 0.794, $p < 0.01$) indicating that a one standard deviation increase in the demand for integration is associated with a 0.794 increase in the CIO Rank across all firm/years in the sample, shown in Table 3, column (A). A company realizing a differentiation business strategy has lower CIO Rank while a company realizing a cost leadership strategy has a higher CIO Rank on average. Larger size firms and firms with higher levels of knowledge intensity have a higher CIO Rank. A more decentralized overall corporate structure is associated with higher CIO Rank on average. CIO Rank also benefits marginally from the prevailing overall economic conditions with the CIO Rank being higher in years when the stock market is above its average trend. A second specification, as shown in column (B), controls for industry membership rather than industry level variables. This alternative specification produces a similar result, especially in terms of the effect of demand for integration ($\beta_{DemandforIntegration}$ = 0.934, $p < 0.01$). After controlling for a broad set of potential alternative factors and alternative specifications, the demand for integration persists as related to the CIO Rank.

	(A) CIO Rank 1993-2009	(B) CIO Rank 1993-2009 Industry Controls
	Random Effects Tobit	Random Effects Tobit
Demand for Integration [1]	0.794 ***	0.934 ***
Size = ln(Sales)	0.629 ***	0.754 ***
Differentiation Strategy	-0.296 **	-0.413 ***
Cost Leadership Strategy	0.654 **	0.483
Corporate Structure	-0.450 ***	-0.477 ***
Dynamism	-0.048	
Munificence	-0.064	
Complexity	-0.315	
Knowledge Intensity	0.968 ***	
Economic Conditions	0.211 *	0.183
Constant	-6.512 ***	-9.145 **
σ_u	4.715	4.206
σ_e	4.528	4.524
ρ	0.520	0.464
Firm Fixed Effects [2]	No	No
Industry Fixed Effects [3]	No	Yes
Firms	178	179
Left-Censored Observations	1310	1330
Uncensored Observations	920	948
-2LL	-3494.59	-3578.82
Wald χ^2	84.15	102.17
Wald df	10	25
Model Fit p-value	<0.01	<0.01

Notes:

1) All variables are standardized to mean of zero and standard deviation of one, so, standardized coefficients are reported.
2) There is no consistent estimator for estimating firm fixed effects with a Tobit model, so Random Effects is specified instead.
3) Model (B) contains dummy variables for two-digit industry. This is in lieu of industry level controls for dynamism, munificence, complexity and knowledge intensity to avoid multi-collinearity.
* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Table 3. Regression Estimates of the Impact of the Demand for Integration on CIO Rank

IT Organization as a Moderator of Performance

Hypothesis 2 is tested by estimating the effect on firm performance of the interaction of the demand for integration x IT organization structure. The interaction effect tests whether the IT organization structure moderates the relationship between the demand for integration and firm performance. The analysis considers the relative stock market valuation of the firm (i.e., Tobin's q). Results are reported in Table 4 (column A).

After controlling for firm size, corporate structure, industry and the relative economic conditions, the analysis suggests three important findings. First, CIO Rank does not relate directly to performance ($\beta_{CIORank}$ = -0.015, p = 0.22). Second, the demand for integration is challenging to the average large, multi-business unit firm. A firm that faces higher than average demand for integration has lower Tobin's q than the average firm ($\beta_{Demand\ for\ Integration}$ = -0.137, p < 0.01). Third, we find that while demand for integration is generally problematic for the firm, firms with a higher CIO Rank are not adversely affected as much as firms with lower CIO Rank ($\beta_{Moderation}$ = 0.029, p = 0.016).

	(A) Performance (Tobin's q) [1] 1993-2009	(B) Performance (Tobin's q) 1995-1999	(C) Performance (Tobin's q) 2000-2004	(D) Performance (Tobin's q) 2005-2009
	Robust OLS	Robust OLS	Robust OLS	Robust OLS
CIO Rank	-0.015	0.029	-0.020	-0.060 ***
Demand for Integration	-0.137 ***	-0.121 ***	-0.110 ***	-0.163 ***
CIO Rank x Demand for Integration	0.029 **	0.008	0.035	0.037 **
Size - ln(Employees) [2]	0.017	0.046 **	0.018	0.047 **
Corporate Structure	0.364 ***	0.489 ***	0.532 ***	0.348 ***
Industry Controls [3]	Yes	Yes	Yes	Yes
Year Dummies [4]	Yes	Yes	Yes	Yes
Observations	2254	669	719	806
F	22.58	11.42	7.42	15.43
df1	40	28	28	28
df2	2213	639	690	777
p	< 0.001	< 0.001	< 0.001	< 0.001

Notes:

1) The dependent variable is the natural-log of Tobin's q to normalize the distribution.

2) Number of employees is used to proxy firm size to avoid the direct link between gross sales and performance.

3) Industry dummy variables at the two-digit NAICS level were specified as control variables on performance in all cases, but specific industry effects are not reported here.

4) Year dummies are added to control for fluctuations in the overall economy in all cases. They are not reported here for brevity.

* p < 0.10; ** p < 0.05; *** p < 0.01

Table 4. Effects of Demand for Integration and CIO Rank on Firm Performance

We further split the sample in order to isolate the moderation effect to a specific time period. We find that the moderation effect holds during the most recent 5 year period tested shown in column D, but does not reach significance in either of the previous 5 year windows (column B or C). While the CIO Rank ($\beta_{CIORank}$ = -0.060, p < 0.01) and demand for integration ($\beta_{DemandforIntegration}$ = -0.163, p < 0.01) are both negatively related to performance, their interaction is positive ($\beta_{Moderation}$ = 0.037, p < 0.05) indicating that a high ranked CIO may be especially beneficial to the firm facing high demand for integration in recent years.

Overall, the analysis regarding the interaction of CIO Rank with demand for integration is supportive of the moderation expectation of H2. The CIO Rank moderates the negative influence of the demand for integration on firm performance. This finding is consistent with the idea that a CIO in an elevated position is able to provide coordination capabilities for a firm that is experiencing high demand for integration.

Discussion and Implications

The demand for integration was tested alongside potential alternative explanations for the IT organization structure such as business strategy (Sabherwal and Chan 2001), firm size, corporate structure (Sambamurthy and Zmud 1999), and knowledge intensity, and found to indeed be related to CIO Rank. Our analysis complements and extends existing work by developing and testing a new factor, the demand for integration, as an important predictor of the structure of IT. This new factor allows us to theorize about overall demands of the enterprise, considering the impact of this factor on the structure of IT rather than considering the impact of its components independently. This new factor allows us to consider the influence of a number of separate factors that may act in similar ways to modify the IT organization.

While demand for integration is associated with low performance (i.e. the demand for integration appears to burden the organization), the analysis suggests that the IT organization structure, i.e. CIO Rank, moderates the relationship between the demand for integration and performance and may help to reduce this burden, implying that firms may respond to the challenges presented by the demand for integration.

Managerial Implications

Organizational challenges are plenty for IT managers regarding the successful implementation and use of IT. Information about what factors matter to the creation of value from IT investments is critical when considering the appropriate way to structure and manage the IT operations of their firm. The demand for integration provides a focal point for such managers to assess the context in which their firm and their IT organization operate. But this information is also important for general managers as they seek to understand the leverage points in creating value from IT. There may be significant economic reasons for centralizing IT for efficiency and when integration demands are particularly acute. However, taking this approach when the demand for integration does not warrant doing so may reduce innovation and impact the overall performance of the firm.

The implication for the IT organization and CIO is that the role of organizational integrator is perhaps an unmentioned role that the organization plays in the firm. The CIO and the rest of the IT organization must recognize the demand for integration, develop the business savvy required to manage the demand, and train or hire the communication skills required of individuals linking the firm's business units.

Limitations and Future Research

We present a novel approach to thinking about the role of the IT organization in the large, multi-business unit firm, one congruent with the principle of an organizational integration mechanism. The IT organization is characterized as an integrating device, an organizational link, connecting the subunits of the firm. While our present analysis only provides indirect evidence of the CIO and IT organization as an integrative device, our finding that the CIO Rank is related to the demand for integration in the rest of the firm is consistent with this notion. Further testing of this theoretical concept is warranted. It is also quite possible that the IT organization is unique among functions of the corporation in its ability to coordinate, so generalization to any type of function will require additional research as well.

An important next step in learning more about the impacts of contingency factors on the structure of the IT organization is to improve our ability to measure the IT organizational structure beyond the CIO Rank. Potentially fruitful data regarding the geographic centrality of both the IT organization and the firm as a whole exists in professional networking web sites and may provide an excellent additional perspective on the organizational structure of the IT function. Firms also amass immense stores of data regarding the email traffic among firm employees. Identifying the volume and types of linking that occur among IT employees and the users that they support is likely to provide rich data on the specific organizational links that exist among employees in multiple business units and the IT organization in the firm. This would

enable researchers to further probe whether IT organizations serve as integrating devices in large multi-business unit firms.

A common concern among managers regarding centralization of the IT organization is the impact that such structure has on the innovativeness of the firm. Does the demand for integration and the IT organization structure that may accompany such a requirement cause the firm to be unduly constrained? Given that innovativeness may be thought of as two parts, the ability to generate good ideas and the ability to execute effectively on those good ideas, what is the impact of centralization of IT on the innovation of the firm? If good ideas are squelched or never surface due to a highly controlled, corporate IT environment, this is problematic for firms, especially when new ideas are key to competitiveness. However, if a coordinated and standardized approach to the management of IT allows the firm to execute more quickly on its ideas, it is possible that a more centralized approach to IT may provide considerable benefit regarding innovation. Exploring these concerns is another important avenue for future research.

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