

HOW INFORMATION TECHNOLOGY STRATEGY AND INVESTMENTS INFLUENCE FIRM PERFORMANCE: CONJECTURE AND EMPIRICAL EVIDENCE¹

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In this paper, we develop conjectures for understanding how information technology (IT) strategy and IT investments jointly influence profitability and the market value of the firm. We view IT strategy as an expression of the dominant strategic objective that the firm chooses to emphasize, which can be revenue expansion, cost reduction, or a dual emphasis in which both goals are pursued. Using data from more than 300 firms in the United States, we find that at the mean value of IT investments, firms with a dual IT strategic emphasis have a higher market value as measured by Tobin's Q than firms with a revenue or a cost emphasis, but they have similar levels of profitability. Of greater importance, IT strategic emphasis plays a significant role in moderating the relationship between IT investments and firm performance. Dual-emphasis firms have a stronger IT–Tobin's Q relationship than revenue-emphasis firms. Dual-emphasis firms also have a stronger IT–profitability relationship than either revenue- or cost-emphasis firms. Overall, these findings imply that, at low levels of IT investment, the firm may need to choose between revenue expansion and cost reduction, but at higher levels of IT investment, dual-emphasis in IT strategy or IT strategic ambidexterity increasingly pays off.

Keywords: Information technology strategic emphasis, IT ambidexterity, IT strategic ambidexterity, firm performance, profitability, IT investments, revenue growth, cost reduction, dual emphasis

Introduction

Firms spend significant sums of money on information technology (IT) resources, yet they are often challenged in developing appropriate strategies to direct these resources to realize business value (for a discussion, see Kohli and Devaraj 2004). Previous research has studied either the impact of IT investments on firm performance (e.g., Barua and Mukhopadhyay 2000; Dedrick et al. 2003; Hoadley and Kohli 2014; Kohli and Devaraj 2003; Kohli et al. 2012) or the effect of IT strategic emphasis on firm performance (e.g., Leidner et al. 2011; Oh and Pinsonneault 2007; Tallon 2007; Tallon et

al. 2000). However, few studies focus on the effect of IT investments and IT strategic emphasis simultaneously. Given that profit is equal to revenue minus cost, it is clear that there are three strategic paths from IT to firm performance: IT can be used to (1) *reduce costs* by improving productivity and efficiency; (2) *increase revenues* by fully exploiting opportunities through existing customers, channels, and products/services and by finding or creating new customers, channels, and products/services; or (3) *reduce costs and increase revenues* simultaneously. What is not clear is the relative degree to which these strategies and IT investments jointly influence firm performance. In other words, despite significant progress in the literature with regard to understanding the business value of IT, little is known about how IT strategy moderates the relationship between IT investments and firm performance.

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This study seeks to answer the following research question: How do IT strategic emphasis and investments in IT resources affect firm performance? To answer this question, we propose conjectures that link IT strategy and IT investments with firm performance. Although firm performance is a multi-dimensional concept (Richard et al. 2009), following recent work (Kohli et al. 2012), we use two complementary measures of firm performance in this study (profitability and market value) which relate to both *fundamentals* and *stock market assessment* (for a discussion, see Blanchard et al. 1993; Henwood 1997). We empirically test the conjectures using archival data from more than 300 U.S. firms.

Our work is related to but distinct from prior research linking IT investments with profitability and Tobin's Q (Bharadwaj et al. 1999; Kohli et al. 2012; Mithas et al. 2012; Tafti et al. 2013) because we also consider the effect of IT strategy, perhaps for the first time using a data set that has information on both IT investments and IT strategy. Our contribution is to show that the firm's IT strategic emphasis moderates the relationship between IT investments and firm performance; firms with a dual emphasis have higher profitability and market value at higher levels of IT investments. In other words, successful dual IT emphasis appears to require higher levels of IT investments. A key insight from our results is that IT investments and IT strategy should not be viewed separately from each other and that firms need to synchronize their IT investment levels and their IT strategies for improved performance. The study has implications for firms as they consider adopting dual strategies in increasingly turbulent markets. Thus, this study not only answers an interesting and managerially relevant empirical research question but also provides directions for motivating a program of research to clarify and elaborate the findings through further theoretical or empirical work.

Background and Theory

Background

Our review of prior literature suggests that despite much progress in the business value of IT literature, two opportunities for contributions remain. First, although prior studies have discussed the relationship between IT strategy and performance, and IT investments and performance, few studies focus on how IT strategic emphasis and investment level jointly affect performance. We define IT strategic emphasis as the dominant strategic objective that the firm chooses to emphasize in its IT strategy, which can be revenue expansion, cost reduction, or a dual-emphasis in which both goals are pursued. Other studies have used other terms such as *IT*

strategic orientation and *IT strategic focus* to refer to similar ideas. Among prior information systems (IS) research on the direct effects of strategic emphasis on firm performance, Tallon et al. (2000) find that executives in firms with more focused IT goals (e.g., operations focus, market focus, dual focus) perceive greater payoffs from IT across the value chain. Subsequently, Tallon (2007) uses Treacy and Wiersema's (1993) typology (operational excellence, customer intimacy, and product leadership) and finds that IT business value is the highest in firms with a multifocused business strategy and lowest in those with a single focus. Oh and Pinsoneault (2007) study the strategic value of IT in terms of the deployment of IT applications (cost reduction, quality improvement, and revenue growth) and find that contingency approaches better explain the impact of cost-related applications while a resource-centered perspective better predicts the impact of IT on revenue and perceived profitability; however, they do not study the effect of dual or mixed emphases. Leidner et al.'s (2011) exploratory results suggest that IS ambidextrous firms (firms pursuing an IS innovator and an IS conservative strategy at the same time) had higher perceived organizational performance. None of these studies investigates how IT strategic focus moderates the relationship between IT investments and firm performance, which is the focus of the current study.

Second, although prior research in marketing provides useful insights for the effect of strategic emphases in terms of quality strategy or customer focus on firm performance, the extent to which their findings apply to IT strategy is an open empirical question. For example, Rust et al. (2002) show that firms with a revenue growth emphasis in their quality strategy outperform firms with a cost reduction emphasis, and firms with a primary emphasis on either revenue growth or cost reduction outperform firms that attempt a dual emphasis. Further research (Rust et al. 2016) shows that a revenue emphasis and cost emphasis are cultivated in different ways, with a revenue emphasis propagating "bottom up" and a cost emphasis propagating "top down." These results illustrate the complexities of quality management, and are generally consistent with the notion of trade-offs among different strategic emphases in the strategy literature (Porter 1980). Mittal et al. (2005) study the moderating effect of dual emphasis on the association between customer satisfaction and long-term performance and report that association between customer satisfaction and Tobin's Q is positive and relatively stronger for firms that successfully achieve a dual emphasis.

With this backdrop, our work seeks to advance our understanding of how IT strategic emphasis and investments in IT resources affect firm performance. We conceptualize IT strategy in terms of revenue focus and cost focus. Our approach is consistent with recent studies that have articulated

strategic focus in terms of objective metrics, such as revenues or costs in a firm's income statement, to more directly assess the impact of such cost- or revenue-focused strategies on firm performance (Kohli 2007; Oh and Pinsonneault 2007; Rust et al. 2002). Chief information officers (CIOs) also find this revenue and cost typology more useful, as reflected in comments by AstraZeneca's CIO (Hickins 2012):

The key to winning approval from executive management and boards...is to talk about IT projects in terms of the business opportunities they afford. "Are you going to generate additional revenue or are you going to reduce the cost structure" of the organization.

Recent IS research has acknowledged this need to use business-oriented metrics as IT increasingly takes on a more strategic role in corporations, and research suggests that use of business terms "helps IT personnel focus even more clearly on business value" (Mittra et al. 2011, p. 57). Besides, such objective metrics lend themselves for better target-setting and monitoring of progress to enable timely corrective actions that are directly tied to firm performance.

Although IT, being a general-purpose technology, can be viewed as being capable of both increasing revenues and reducing costs, does this mean that firms no longer have to choose a strategic emphasis? Choosing a particular strategy implies making some trade-offs (Hindo 2007; Skinner 1986)—that is, choosing some goals and functionalities while forsaking others in the hope that the overall combination of choices will ensure a better fit for organizational activities in the value chain and will make that fit less replicable for competitors (Porter 1996). Accordingly, firms often choose between revenue expansion or cost reduction in their strategic IT emphasis. For example, the CIO of FedEx, Robert Carter, contrasts FedEx's approach to IT with that of UPS in the following way:

We tend to focus slightly less on operational technology. We focus a little more on revenue-generating, customer-satisfaction-generating, strategic-advantage technology. The key focus of my job is driving technology that increases the top line (Colvin 2006).

In other words, in Carter's view, FedEx has a revenue emphasis while UPS has a cost emphasis. Kohli's (2007) work with UPS suggests that the company may be using IT for revenue growth as well. However, at the 2014 Frontiers in Service Conference, Romaine Seguin, President of UPS Americas Region, indicated in a question-and-answer session following her keynote presentation that the FedEx (revenue

emphasis) versus UPS (cost emphasis) distinction was essentially correct, lending credence to Carter's view. There are other firms, such as Johnson & Johnson (Mithas and Agarwal 2010) and Coca-Cola (see Levin 2013), in which CIOs have tried to emphasize revenue growth in their IT strategy. As we have noted, FedEx and UPS do not have to restrict themselves to either revenue growth or cost reduction; alternatively, they can adopt a dual emphasis.

Consider some examples. While customer relationship management (CRM) systems can enable some cost savings if they help reduce the costs of maintaining customer relationships, the primary reason for deploying these systems is often to increase revenues by either attracting new customers or enabling cross-selling, upselling, or repeat sales from existing customers (Mithas et al. 2005, 2016; Saldanha et al. 2016). If firms use CRM systems to help with revenue growth and cost reduction in equal measure, then such an approach could be characterized as a dual-focus investment. Likewise, in an academic setting, systems used to maintain alumni development and relationships may be characterized primarily as revenue enhancing, while systems related to the automation of class scheduling or course bidding systems (as opposed to manual processes) can be viewed as cost reducing (Kohli and Melville 2009).

Among cost-focused applications, firms often use reverse auctions and many other supply chain management applications primarily to reduce their procurement costs (Mithas and Jones 2007). As another example of a cost-focused project, UPS linked bar-code data on its packages (called Package Level Detail) but retained the capability to provide seamless tracking information to its customers while outsourcing some rural deliveries to the U.S. Postal Service (USPS) to lower its overall costs (Kohli 2007). A similar opportunity for cost reduction was provided by UPS's Geographical Information Systems, which enabled the firm to get its customers to do some data entry themselves, further reducing UPS's costs. UPS also used its integrated supply chain assets to do customers' work for them, which helped realize revenue opportunities; in this case, we could characterize the investment as being revenue-focused (Kohli 2007). It is also likely that some systems can initially be deployed for their cost-saving potential or to streamline internal processes, but later they may provide revenue benefits. For example, UPS's Delivery Intercept Service, which has the capability to locate and intercept any package within 15 minutes, was initially deployed to improve UPS's internal processes through the use of XML, but it also enabled revenue growth over time through additional fee-based services (Kohli 2007).

We argue that it is not so much which applications firms use but rather what their strategic objectives are for deploying

those applications, in that managerial beliefs and strategic posture shape an organization's IT governance and management of IT projects to create business value. This logic applies to IT assets, which are mostly general in nature and, with some customization and appropriate changes in business processes, training, and incentive structures, can be targeted to achieve strategic objectives defined by managers. These changes in business processes and reengineering efforts are often shaped by the firm's overarching IT strategic objectives (Barua et al. 1996; Cederlund et al. 2007; Kohli and Grover 2008; Kohli and Hoadley 2006; Kohli and Johnson 2011). In other words, while any individual IT system presents potential opportunities to reduce costs or to enhance revenue, or both, we argue that it is perhaps more useful to think of the portfolio of IT applications that firms want to create to operationalize their strategic emphasis by instantiating necessary configurations of individual IT applications.

Why IT Strategic Emphasis Moderates the Relationship Between IT Investments and Firm Performance

To understand how IT strategic emphasis and IT investments jointly influence profitability and market value, we first articulate why we expect a firm's IT strategic emphasis to affect firm performance at typical levels of IT investments. A firm's strategic emphasis affects the firm's choices with respect to the types of technologies and applications it acquires and the types of governance processes and firm performance metrics it uses. The comment of the CIO of FedEx, referred to previously, provides support for this idea (see Colvin 2006). We recognize that, ultimately, any strategy needs to be instantiated through appropriate combinations of IT systems to result in firm performance. In other words, strategy execution can be viewed as the actualization of a specific configuration of systems.

We argue that a dual emphasis in IT strategy may lead to better firm performance than a single emphasis in IT strategy, despite some risks in executing a dual-emphasis strategy. We draw on prior theories in the IS literature such as the resource-based view, the accounting literature (Dehning et al. 2006), and the emerging literature on ambidexterity which emphasizes the power of stretch targets (Bartlett and Ghoshal 1995; Birkinshaw and Gibson 2004; Gibson and Birkinshaw 2004; Im and Rai 2008; Markides 2013; Raisch and Birkinshaw 2008) to frame our arguments (see Table 1). We use a broader conceptualization of ambidexterity here, similar to such usage by Markides (2013) and Kude et al. (2015), as a way to frame the simultaneous pursuit of two seemingly opposing ideas.

First, following RBV (Barua et al. 1996; Barua and Mukhopadhyay 2000; Piccoli and Ives 2005), a dual-emphasis IT strategy (compared with either a revenue- or a cost-emphasis IT strategy) is likely to lead to potentially superior firm performance due to (1) greater social complexity, (2) greater causal ambiguity, (2) greater path dependence, and (4) organizational learning. Let us consider these four mechanisms (social complexity, causal ambiguity, path dependence, and organizational learning) based on RBV in turn.

- **Social Complexity:** The social complexity of a dual-emphasis strategy comes from its relatively ambitious scope of trying to achieve two goals at the same time. Because of the complexity and breadth of applications that a dual-emphasis strategy requires, it is much more difficult for competitors to replicate the successful execution of such a strategy than it is to replicate a revenue- or a cost-emphasis strategy. Prior research in the quality management literature provides support for this idea. As Flynn et al. (1995, p. 666) note, "simultaneous pursuit" of several competitive advantages can lead to a stronger performance because competing on "several fronts simultaneously" makes it more difficult for competitors to replicate such configurations. In addition to the breadth and variety of IT applications needed in a dual-emphasis IT strategy, it also requires much more reconfiguration or restructuring of business processes, thus contributing to the greater social complexity inherent in such an emphasis.
- **Causal Ambiguity:** It may be more difficult to disentangle and attribute the advantages resulting from a dual-emphasis IT strategy from publicly available information because firms following a dual-emphasis strategy defy conventional logic and their initiatives and resulting competitive advantages are harder to classify or are more ambiguous to decipher for competitors.
- **Path Dependence:** A dual strategic emphasis may have an inherent path dependence that is relatively more difficult to replicate compared with that in either a revenue or a cost emphasis. For example, for a firm employing a dual strategic emphasis, cost-reduction efforts may provide opportunities to target new market segments, such as the bottom of the pyramid, which in turn could enable the firm to realize higher revenue growth than if it were to focus only on cost reduction without a link to its revenue growth strategy or only on revenue growth by focusing on premium market segments. Tighter coupling between strategic options, such as revenue growth and cost reduction, is much less replicable by competitors than only one such option. Likewise, firms with a dual

Table 1. Risks and Rewards of a Dual IT Strategic Emphasis

Key Mechanisms	Rewards of a Dual IT Strategic Emphasis	Risks of a Dual IT Strategic Emphasis	Relevant literature
1. Resource-based view (RBV) <ul style="list-style-type: none"> • Social Complexity • Barriers to the Erosion of Competitive Advantage • Path Dependence and/or Asset Stock Accumulation • Organizational Learning 	<p>Much higher social complexity of IT because of its role in enhancing the breadth and depth of relationships. For example, firms will need to work on both the front end with customers to create one-to-one customer relationships through CRM and on the back end with suppliers to create highly responsive yet low-cost delivery mechanisms.</p> <p>The scope of activities spanning business processes that touch customers and suppliers create higher barriers to erosion along several dimensions simultaneously due to the cross-functional nature of IT initiatives</p> <p>Much greater path dependence and/or asset stock accumulation because IT capabilities that evolve gradually through integration with many business processes are likely to be more tacit and sustainable over a longer time.</p> <p>Higher levels of organizational learning because learning spans many more inter-related business processes, routines, and IT systems that are more tacit, complex, and novel than that for a single-emphasis strategy.</p>	<p>Firms may not be able to realize complex interrelationships among IT systems.</p> <p>Cross-functional IT projects are more prone to coordination problems.</p> <p>Firms may get locked into poor and incompatible systems due to inertia.</p> <p>The organization may suffer from information overload, leading to reduced learning.</p>	<p>Resource-based view (RBV) (Barney 1991)</p> <p>RBV (Cederlund et al. 2007; Grover et al. 2009; Piccoli and Ives 2005)</p> <p>RBV (Eisenhardt and Martin 2000; Teece et al. 1997)</p> <p>RBV (Bharadwaj 2000; Cederlund et al. 2007; Dierickx and Cool 1989)</p>
2. Reduced Diminishing Returns in Opportunity Space	Plentiful "low-hanging fruit" to increase revenues and reduce costs.	Firms may lose the ability to spot fundamental transformations or avoid reaching for "higher-hanging fruit" that may be rewarding in the long run.	Accounting literature (Dehning et al. 2006)
3. Stretch Targets	Stretch targets can motivate managers toward high performance.	Too much stretch can be debilitating.	Ambidexterity literature (e.g., Bartlett and Ghoshal 1995; Gibson and Birkinshaw 2004)

strategic emphasis can use outsourcing and offshoring for both cost reduction (through arbitrage) and revenue expansion (through sales in foreign markets by adapting offerings in those markets) (Ghemawat 2007).

- **Organizational Learning:** Dual emphasis firms may have higher levels of organizational learning because learning spans many more interrelated business processes, routines, and IT systems that are more tacit,

complex, and novel than that for a single-emphasis strategy (Cederlund et al. 2007). Together, the greater social complexity, causal ambiguity, path dependence, and organizational learning of a dual-emphasis IT strategy can provide effective *ex post* limits to competition and can protect a firm against resource imitation, transfer, and substitution (Barney 1991; Wade and Hulland 2004), thereby making firms with a dual strategic emphasis more profitable and more valuable.

Second, a dual emphasis opens up many more “low-hanging” positive-return investment opportunities than either single emphasis would, thereby creating more options for profitable growth (see Dehning et al. 2006). Firms with a dual emphasis are likely to have lower cycle times in product development, supply chain management, and customer relationship management processes for realizing their revenue and cost targets and thereby have accelerated cash flows. Finally, dual-emphasis firms may have less variability in cash flows because their IT-enabled cash flows have two sources (both revenue growth and cost reduction), while firms with a primary emphasis on either revenue growth or cost reduction have only one source of IT-enabled cash flow (Porter 1985).

Third, a dual strategic emphasis, being more ambitious in its scope, might provide stretch targets to employees and implementation partners for higher revenues and lower costs, thereby improving the chances of getting more from the same levels of investments (Gibson and Birkinshaw 2004; Kaplan and Norton 2006). In turn, that will lead to higher levels of cash flows, profits, and market value.

There are, however, potential risks inherent to a dual strategic emphasis, and despite the potential of IT to enable firms to achieve both revenue growth and cost reduction goals, there are reasons firms may be better off focusing on only one of these overarching goals. Compared with revenue expansion or cost reduction strategic emphases, it may be more difficult for firms to follow a dual strategic emphasis because the latter entails greater complexity and risk in ensuring fit between all of the IT-related decisions the firm must make. First, focusing on two goals simultaneously can be confusing in terms of target setting and performance metrics that managers across business units pursue. Second, dual-emphasis firms may end up having a portfolio of IT systems that do not allow seamless integration of data and information flow. One example of this comes from the financial services industry: Some observers argue that one reason for the credit crisis may be that while firms were pursuing revenue growth from a business perspective as reflected in their quest for additional revenues, even with some disregard for prudent risk management, they were emphasizing cost reduction in the IT function (Sviokla and McGilloway 2008). Finally, focusing on two goals simultaneously can make it difficult for managers to agree on prioritizing IT projects (Ross and Beath 2002).

Ultimately, whether the advantages of a dual strategic emphasis outweigh the disadvantages and risks is largely an empirical question; we do not make a specific prediction at typical levels of IT investments because we argue that a more complete understanding of the effect of IT strategic emphasis requires taking into consideration how a dual strategic emphasis moderates the relationship between IT investments and firm performance.

We first consider profitability. Why will a firm’s strategic emphasis affect the relationship between IT investments and firm profitability? As we noted previously, a firm’s strategic emphasis affects its choices with respect to the types of technologies and applications it acquires, its IT governance mechanisms, and its metrics for firm performance. Firms with a dual emphasis may have more diverse IT resources for revenue growth as well as cost reduction. Managing these diverse resources requires hiring a larger number of IT employees and having greater managerial expertise in managing diverse projects, which in turn may require using a more diverse network of external IT implementation partners. Together, managing diverse IT infrastructure elements and IT human resources in dual-emphasis firms will require a higher degree of management attention, bandwidth, and focus than if the firm were to focus on only revenue growth or cost reduction. However, despite these challenges and risks, firms are likely to benefit more from IT spending if they adopt a dual strategic emphasis (than if they adopt only a revenue growth or a cost reduction emphasis) because of differences in expectations and targets that managers set for their IT implementations.

Next, we consider the moderating effect of a firm’s strategic emphasis on the relationship between IT investments and market value (measured by Tobin’s Q). The strategic emphasis of a firm can moderate the influence of IT investments on market value because of the types of technologies and risks associated with each strategic emphasis. We argue that firms with a dual emphasis are likely to have lower cycle times in product development, supply chain management, and customer relationship management processes for realizing their revenue and cost targets and thereby have accelerated cash flows. Dual-emphasis firms may also have higher levels of cash flows because of simultaneous targets for higher revenues and lower costs. Finally, dual-emphasis firms may have less variability in cash flows because their IT-enabled cash flows have two sources (both revenue growth and cost reduction), while firms with a primary emphasis on either revenue growth or cost reduction have only one source of IT-enabled cash flow (Porter 1985). Due to the diversification of sources of cash flows, the overall variability of cash flows is likely to be lower for dual-emphasis firms.

On the basis of the foregoing discussion, we offer the following formal conjectures: We expect that (1) IT investments will have a stronger positive association with profitability for firms with a dual strategic emphasis than for firms with a single strategic emphasis, and (2) IT investments will have a stronger positive association with Tobin’s Q for firms with a dual strategic emphasis than for firms with a single strategic emphasis. As a corollary, we also expect these effects to apply when we disaggregate single strategic emphasis into revenue or cost emphasis.

Method

Data

We obtained our independent and dependent variables from separate sources: an *InformationWeek* survey and Compustat. We obtained data collected by *InformationWeek*, a leading and widely circulated IT publication in the United States, from their survey of top IT managers (e.g., vice presidents, CIOs, directors) of more than 300 *Fortune* 500 firms in North America. *InformationWeek* has published reports of its annual surveys since 1986. Although in the initial years these reports provided firm-level IT spending data, since 1997, due to confidentiality reasons, *InformationWeek* publishes only aggregate data at the industry level. The data used in this study include information about firms' IT spending and IT strategic emphases during the 2003–2004 period. *InformationWeek* is considered a reliable source of information, and prior academic studies have also used data from *InformationWeek* surveys (e.g., Bharadwaj et al. 1999; Mithas et al. 2005; Rai et al. 1997). We complemented the *InformationWeek* data with firm performance (Tobin's Q, profitability) and industry data from Compustat.

Table 2 provides the definitions, variable constructions, and sources for all of the variables used in this research.

Table 3 provides descriptive statistics by IT strategic emphasis. It shows that, on average, firms spend approximately 4.1 percent of their revenue on IT investments and have a profitability (operating income before depreciation as a percentage of sales revenue) of approximately 17 percent and a Tobin's Q of 1.4 during the study period. In addition, approximately 90 percent of the firms have either a dual emphasis or a cost reduction emphasis in their IT strategy (with almost equal distribution of firms among these emphases) while the remaining firms have a revenue-enhancing emphasis. On average, firms with a revenue or dual emphasis have higher values of Tobin's Q, profitability, and IT expenses (as a percentage of revenue) than firms with a cost emphasis.

Table 4 shows correlations among variables. As expected, IT investments show a positive correlation with profits and Tobin's Q. We also observe that a dual emphasis has a positive correlation with Tobin's Q but a statistically insignificant correlation with profit.

Empirical Models and Econometric Considerations

We specify standard cross-sectional models of the following form:

$$Y_i = X_i\beta + \varepsilon_i \quad (1)$$

where Y represents endogenous variables such as Tobin's Q or profitability; X represents a vector of firm characteristics, such as IT strategic emphasis, IT investments, and control variables; β is a vector of the parameters to be estimated; and ε is the error term associated with each observation i .

We follow relevant prior literature subject to availability of data and use parsimonious models similar to Oh and Pinsonneault (2007), Rust et al. (2002), Tallon (2007), and Tallon et al. (2000) to retain comparability of findings to the extent possible and for clear interpretation of results. We account for firm-level heterogeneity by including relevant factors such as firm size, industry sector, industry concentration, and time period in our models, and we provide an extensive discussion of other robustness checks to provide confidence in our findings. We implicitly control for firm size in our models because we use IT investments normalized by sales revenues of firms as our measure of IT Investments. We control for sector differences (manufacturing versus services) to account for sectoral differences in IT investments, IT strategies, and firm performance. We also include a dummy for the year 2004 to account for any systematic difference across the two years studied (2003 and 2004) in *InformationWeek* survey data or firm performance. Subsequently, we report robustness checks when we include additional and/or alternative control variables in our models such as research-and-development (R&D) and advertising intensity; non-IT sales; selling, general, and administrative (SG&A) expenditures; industry concentration; and one-digit North American Industry Classification System (NAICS) industry dummies (instead of a service-sector dummy variable), which indirectly account for many industry-level variables, such as industry capital intensity, industry concentration, average Tobin's Q, and industry regulation.

Accordingly, we specify our empirical models for testing our conjectures for a dual versus single strategic emphasis as follows:

$$\begin{aligned} \text{Profitability}_i &= \beta_{10} + \beta_{11}\text{Dual Emphasis}_i + \beta_{12}\text{IT} \\ \text{Investments}_{i-1} &\times \text{Dual Emphasis}_i + \beta_{13}\text{IT} \\ \text{Investments}_{i-1} &+ \beta_{14}\text{Service} + \beta_{15}\text{Year Dummy} + \varepsilon_i \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Tobin's } Q_i &= \beta_{20} + \beta_{21}\text{Dual Emphasis}_i + \beta_{22}\text{IT} \\ \text{Investments}_{i-1} &\times \text{Dual Emphasis}_i + \beta_{23}\text{IT} \\ \text{Investments}_{i-1} &+ \beta_{24}\text{Service} + \beta_{25}\text{Year Dummy} + \varepsilon_i \end{aligned} \quad (3)$$

We disaggregate the single IT strategic emphasis further into revenue or cost strategic emphasis to test our conjectures at a more granular level:

Table 2. Variable Definitions and Data Sources

Variable Name	Variable Construction/ Definition	Source
Tobin's Q	Ratio of the market value of the firm divided by the replacement cost of assets. We calculated the market value of a firm by adding the market value of its common equity, the liquidated value of preferential stock, and total debt. We used total assets as a measure of replacement cost of assets.	Compustat
Profit	Operating income before depreciation divided by sales (expressed in percentage)	Compustat
IT Investment	The level of IT investment as a percentage of the firm's sales revenue	InformationWeek
IT Strategic Emphasis	<p>"Has your organization's business-technology strategy in the past 12 months been primarily focused on generating new revenue, or on cost cutting and streamlining operations?" (choose one)</p> <ul style="list-style-type: none"> Cost emphasis = 1 if the firm chooses "cost cutting/streamlining operations" and zero otherwise. Revenue emphasis = 1 if the firm chooses "generating new revenue" and zero otherwise. Dual emphasis = 1 if the firm chooses "about the same emphasis on both" and zero otherwise. 	InformationWeek
Service	Whether the firm belongs to the manufacturing or the services sector (services = 1, manufacturing = 0).	Based on NAICS classification

Table 3. Descriptive Statistics by IT Strategic Emphasis

		Tobin's Q	Profit	IT Investment	Service
Revenue Emphasis	Mean	1.65	20.45	6.97	0.79
	SD	0.86	19.39	15.06	0.41
	N	43	61	61	61
Cost Emphasis	Mean	1.18	15.53	3.25	0.48
	SD	0.79	11.75	5.31	0.5
	N	188	210	210	210
Dual Emphasis	Mean	1.53	17.97	4.09	0.65
	SD	1.04	14.3	3.86	0.48
	N	185	240	240	240
Total	Mean	1.38	17.26	4.09	0.6
	SD	0.94	14.12	6.82	0.49
	N	416	511	511	511

Table 4. Pairwise Correlations Among Variables

		1	2	3	4	5	6
1.	Profit	1.00					
2.	Tobin's Q	0.42*	1.00				
3.	Dual Emphasis	0.00	0.14*	1.00			
4.	IT Investments	0.19*	0.12*	-0.01	1.00		
5.	Service	0.04*	-0.08	0.08*	0.13*	1.00	
6.	Year Dummy for 2004	0.03	0.01	0.13*	0.03	0.01	1.00
7.	Industry Concentration	-0.13*	0.02	0.14	0.02	0.37*	-0.01

*Significant at the 5% level.

$$\begin{aligned} \text{Profitability}_t = & \beta_{31} \text{Dual Emphasis}_t + \beta_{32} \text{Revenue} \\ & \text{Emphasis}_t + \beta_{33} \text{Cost Emphasis}_t + \beta_{34} \text{IT Investments}_{t-1} \\ & \times \text{Dual Emphasis}_t + \beta_{35} \text{IT Investments}_{t-1} \times \text{Revenue} \\ & \text{Emphasis}_t + \beta_{36} \text{IT Investments}_{t-1} \times \text{Cost Emphasis}_t + \\ & \beta_{37} \text{Service} + \beta_{38} \text{Year Dummy} + \varepsilon_3 \end{aligned} \quad (4)$$

$$\begin{aligned} \text{Tobin's } Q_t = & \beta_{41} \text{Dual Emphasis}_t + \beta_{42} \text{Revenue} \\ & \text{Emphasis}_t + \beta_{43} \text{Cost Emphasis}_t + \beta_{44} \text{IT Investments}_{t-1} \\ & \times \text{Dual Emphasis}_t + \beta_{45} \text{IT Investments}_{t-1} \times \text{Revenue} \\ & \text{Emphasis}_t + \beta_{46} \text{IT Investments}_{t-1} \times \text{Cost Emphasis}_t + \\ & \beta_{47} \text{Service} + \beta_{48} \text{Year Dummy} + \varepsilon_4 \end{aligned} \quad (5)$$

We use ordinary least squares (OLS) to estimate Equations 2–5 because the focal explanatory variables (i.e., IT strategic emphasis and IT investments) are exogenous in an econometric sense (Wooldridge 2003b).

We do not assume that IT strategic emphasis and IT investments are independent of each other, and our models account for any potential correlation between these variables. These correlations are relatively small in our sample. Table 4 shows that the correlation between a dual-emphasis strategy and profitability is zero and between a dual-emphasis strategy and Tobin's Q is 0.14. Such correlations do not create endogeneity, because regression models account for correlations among explanatory variables (including the variables involved in interaction terms).

Because of the presence of interaction terms in our models, we mean-centered the value of IT investments for easier interpretation of results. To estimate Equations 4 and 5, instead of omitting one of the dummy variables for a strategic emphasis (as is commonly done in estimating regression models with dummy variables), we retain all three dummy variables and the interactions involving IT investments with these dummy variables in Equations 4 and 5, but we suppress the constant term. This estimation strategy lends itself to a more direct interpretation of results without affecting parameter estimates or their statistical significance (for a similar approach, see Anderson et al. 2006). Note that suppression of constant results in increased R-squared value for models in Table 5 but it does not affect hypothesis tests for our key parameters of interest.

Table 5 shows the results of our estimation of Equations 2 and 3, and Table 6 shows the results of our estimation of Equations 4 and 5. We used heteroskedasticity-consistent robust standard errors for statistical tests (Froot 1989; Rogers 1993; Williams 2000; Wooldridge 2003a). Use of the robust standard errors, coupled with a large sample size to justify the assumption of asymptotic normality of residuals, is likely to

yield conservative tests of statistical significance. We tested for multicollinearity by computing the variance inflation factors and condition indices. The highest variation inflation factor and condition index in our models were less than 2.7 and 4.3, respectively, indicating that multicollinearity is not a serious concern.

We performed several diagnostic and robustness checks to ascertain the stability of our results. First, although we use conservative heteroskedasticity-consistent robust standard errors for statistical testing, we nevertheless evaluated kernel density plots of residuals, and while they show positive skewness and kurtosis, they appear to be approximately normally distributed.

Second, we evaluated the stability of our results by removing approximately 1 percent of observations that have IT investments in excess of three standard deviations. While this leads to a loss in efficiency of estimates as one would expect, the results remain qualitatively similar to the ones reported previously. Third, we included a squared term for IT investments in our profitability models to avoid omitted variable bias due to exclusion of higher-order terms of independent variables. Because we obtained broadly similar results, albeit with higher standard errors due to the presence of a quadratic term, we report our main results without higher-order terms for easier interpretation of results.

Fourth, we also assessed the stability of our results by estimating the models after log-transforming the dependent variables. Because these estimates yielded essentially similar results, we continue with interpreting the results from original nontransformed dependent variables for a simpler and more managerially relevant interpretation. Finally, because the error terms of the profitability and Tobin's Q equations may be correlated for the same firm, we allowed for these potentially correlated errors to obtain consistent and efficient estimates of parameters by using the seemingly unrelated regression (SUR) estimation technique (Zellner 1962). Note that gains in efficiency do not accrue if equations in the SUR model use same regressors, as is the case here (as the estimated coefficients are identical to OLS); thus, the SUR estimation technique is used only as a robustness check here. These SUR models use only those observations for which both profitability and Tobin's Q measures are available. Although this caused the loss of observations for which we had only the profitability measure but not the Tobin's Q measure, we obtained broadly similar results as reported previously. In summary, we used several tests to assess the stability of our results, and broadly similar results across our tests provide confidence in the robustness of our results.

Table 5. How a Dual Versus Single Strategic Emphasis Influences Profits and Tobin's Q

	(1) Profit		(2) Tobin's Q	
Dual Emphasis	β_{11}	0.762	β_{21}	0.308***
		(0.263)		(0.001)
Dual Emphasis \times Mean-Centered IT Investments _{t-1}	β_{12}	1.115***	β_{22}	0.0432**
		(0.006)		(0.047)
IT Investments _{t-1}	β_{13}	0.295*	β_{23}	0.0139**
		(0.083)		(0.014)
Service	β_{14}	4.284***	β_{24}	-0.214*
		(0.003)		(0.074)
Year Dummy for 2004	β_{15}	0.660	β_{25}	-0.0270
		(0.315)		(0.642)
Constant	β_{10}	12.84***	β_{20}	1.329***
		(0.000)		(0.000)
Observations		511		416
R-squared		0.126		0.056

Robust p -values are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (one tailed tests for IT investments and IT strategy, and two-tailed tests for other variables).

Table 6. How Dual, Revenue, and Cost Strategic Emphasis Influence Profits and Tobin's Q

	(1) Profit		(2) Tobin's Q	
Dual Emphasis	β_{31}	15.13***	β_{41}	1.738***
		(0.000)		(0.000)
Revenue Emphasis	β_{32}	16.49***	β_{42}	1.857***
		(0.000)		(0.000)
Cost Emphasis	β_{33}	13.85***	β_{43}	1.369***
		(0.000)		(0.000)
Dual Emphasis \times Mean-Centered IT Investments _{t-1}	β_{34}	1.417***	β_{44}	0.0580**
		(0.000)		(0.011)
Revenue Emphasis \times Mean-Centered IT Investments _{t-1}	β_{35}	0.211	β_{45}	0.0010
		(0.188)		(0.363)
Cost Emphasis \times Mean-Centered IT Investments _{t-1}	β_{36}	0.426**	β_{46}	0.0474***
		(0.029)		(0.003)
Service	β_{37}	3.938***	β_{47}	-0.260**
		(0.006)		(0.028)
Year Dummy for 2004	β_{38}	0.470	β_{48}	-0.0597
		(0.501)		(0.316)
Observations		511		416
R-squared		0.652		0.716

Robust p -values are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (one tailed tests for IT investments and IT strategy, and two-tailed tests for other variables).

Results

Before presenting the results of the tests of our conjectures, we first discuss how IT strategic emphasis affects firm performance at the mean levels of IT investments. We find that at the mean value of IT investments, firms with a dual emphasis do not have higher profitability than firms with a revenue or cost emphasis (see Table 5; $\beta_{11} = 0.762$, n.s.). However, we find that firms with a primary emphasis on revenue or cost with respect to their IT investments will have lower market value than firms with a dual emphasis, at the mean value of IT investments (Table 5; $\beta_{21} = 0.308$, $p < 0.01$). The effects are not only statistically significant but also appear to be economically significant because dual emphasis firms have Tobin's Q that is 0.31 higher than single-emphasis firms (see Table 5), which is a very large value considering that it implies about one-third increase in market value over the replacement cost of assets of firms in our sample (this magnitude is about one-third of the standard deviation of Tobin's Q in our sample). Taken together, the market appears to value dual-emphasis firms higher than revenue- or cost-emphasis firms, even though these firms have similar profitability at the mean levels of IT investments.

We now describe the results of the tests of our conjectures. We find support for the first conjecture, which predicted that dual-emphasis firms will have a stronger positive association between IT investments and profitability than firms with either a revenue emphasis or a cost emphasis alone. Indeed, we find that IT investments have a positive and statistically significant association with profitability for dual-emphasis firms (refer to column 1 of Table 5; $\beta_{12} = 1.115$, $p < 0.01$); this result is higher than that for revenue- or cost-emphasis firms.

We also find support for the second conjecture, which predicted that dual-emphasis firms will have a stronger positive association between IT investments and Tobin's Q than firms with either a revenue emphasis or a cost emphasis alone. Indeed, we find that IT investments have a positive and statistically significant association with Tobin's Q for dual-emphasis firms (Table 5; $\beta_{22} = 0.043$, $p < 0.05$).

We find support for the corollaries based on the results of our Wald tests (refer to Table 7). IT investments have a positive and statistically significant association with profitability for dual-emphasis firms (refer to column 1 of Table 6; $\beta_{34} = 1.417$, $p < 0.01$), which is higher than that for revenue-emphasis firms ($\beta_{35} = .211$, n.s.) or cost-emphasis firms ($\beta_{36} = .426$, $p < 0.05$). Likewise, Table 7 shows support for our prediction that IT investments have a greater impact on market value (as measured by Tobin's Q) for dual-emphasis firms than for cost-emphasis firms. IT investments have a

positive and statistically significant association with Tobin's Q for dual-emphasis firms (refer to column 2 of Table 6; $\beta_{44} = 0.058$, $p < 0.05$), a nonsignificant association with Tobin's Q for revenue-emphasis firms ($\beta_{45} = 0.001$, n.s.), and a positive and statistically significant association with Tobin's Q for cost-emphasis firms ($\beta_{46} = 0.047$, $p < 0.01$). Dual-emphasis firms have a steeper and more statistically significant IT–Tobin's Q relationship than revenue-emphasis firms (see Table 6). However, we did not find support for the prediction that IT investments have a greater impact on market value (as measured by Tobin's Q) for dual-emphasis firms than for cost-emphasis firms (see Table 7).

We plotted the results in Tables 5 and 6 to show how the effect of IT investments on firm performance varies by IT strategic emphasis. Figure 1 shows that at the mean value of IT investments (shown by a vertical line), dual-emphasis firms do not have higher profitability than single-emphasis firms (i.e., revenue or cost). This figure suggests that although profitability is approximately the same at the mean value of IT investments, the differences can be much larger at higher levels of IT investment. In particular, at higher levels of IT investment, dual-emphasis firms can significantly outperform single-emphasis firms (i.e., revenue or cost). Conversely, at low levels of IT investments, single-emphasis firms (i.e., revenue or cost) may have higher profitability than dual-emphasis firms.

Figure 2 shows that at the mean value of IT investments (shown by a vertical line), dual-emphasis firms have a significantly higher market value than single-emphasis firms (i.e., revenue or cost). As with profitability, the market values dual-emphasis firms even higher than single-emphasis firms (i.e., revenue or cost) when firms spend significantly more than the mean levels of IT investments. Notably, the market values dual-emphasis firms more than single-emphasis firms even at lower levels of IT investments, despite the lower profitability of dual-emphasis firms.

While Figures 1 and 2 show how profitability and market value vary for dual- or single-emphasis firms, Figures 3 and 4 disaggregate the single strategic emphasis into its constituent elements (i.e., revenue and cost) to glean deeper insights. Specifically, Figure 3 shows that at the mean value of IT investments (shown by a vertical line), revenue-emphasis firms and dual-emphasis firms have approximately the same profitability as cost-emphasis firms. Again, although profitability may be approximately the same at the mean value of IT investments, the differences can be much larger at higher levels of IT investment. In particular, at higher levels of IT investments, dual-emphasis firms can significantly outperform revenue- and cost-emphasis firms. Figure 4 shows that at the mean value of IT investments (shown by a vertical line),

Table 7. Summary of Results

Conjectures and Corollaries	Test	Supported
Conjectures: Single Versus Dual Emphasis		
Conjecture 1: IT investments have a stronger positive association with profitability for dual-emphasis firms than for single-emphasis firms (revenue growth or cost reduction).	$\beta_{12} = 0$	Yes**
Conjecture 2: IT investments have a stronger positive association with Tobin's Q for dual-emphasis firms than for single-emphasis firms (revenue growth or cost reduction).	$\beta_{22} = 0$	Yes**
Corollaries: Disaggregating Single Strategic Emphasis into Revenue or Cost Emphasis		
Corollary 1a: IT investments have a greater impact on profitability for dual-emphasis firms than for cost-emphasis firms.	$\beta_{34} - \beta_{36} = 0$	Yes**
Corollary 1b: IT investments have a greater impact on profitability for dual-emphasis firms than for revenue-emphasis firms.	$\beta_{34} - \beta_{35} = 0$	Yes***
Corollary 2a: IT investments have a greater impact on market value (as measured by Tobin's Q) for dual-emphasis firms than for cost-emphasis firms.	$\beta_{44} - \beta_{46} = 0$	n.s.
Corollary 2b: IT investments have a greater impact on market value (as measured by Tobin's Q) for dual-emphasis firms than for revenue-emphasis firms.	$\beta_{44} - \beta_{45} = 0$	Yes**

n.s. = not statistically significant, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (all one-tailed tests).

revenue-emphasis firms and dual-emphasis firms have a higher market value than cost-emphasis firms. From this figure, it appears that the market has a generally favorable assessment of dual- and revenue-emphasis firms over a significantly large range of IT investments.

Among other results for which we did not pose specific conjectures, firms in the service sector appear to have higher profitability but a lower Tobin's Q compared with firms in the manufacturing sector (see Tables 5 and 6). As the coefficient of the year dummy indicates, we fail to observe any statistically significant differences in firm performance in 2004 compared with 2003.

We conducted additional analyses for robustness. First, we included R&D and advertising investments (as percentage of sales) as additional control variables in the models. However, because many firms do not report R&D and advertising investments, to avoid data loss, we used the mean value of R&D and advertising intensity for missing data. These models provide broadly similar results. Second, because SG&A expenditures may be correlated with IT investments and because they may also affect outcome variables, we included a variable we refer to as non-IT SG&A (= SG&A – IT) in our models. Because of missing data for the SG&A variable in Compustat, the sample size in these models is less than the sample size in the models without this control variable, thus affecting the statistical significance of the variables. Nonetheless, on the whole, the results are broadly similar to those we report in Table 6, with some minor differences. In

these models, the stock market values dual- and revenue-emphasis firms more than cost-emphasis firms at the mean value of IT investments, even though the differences in profitability are not significant at the mean value of IT investments. Again, dual-emphasis firms have a steeper IT–profitability relationship than cost-emphasis firms.

Third, we conducted our analyses using raw (i.e., untransformed) and standardized values of IT investments and obtained qualitatively similar results. Fourth, we controlled for industry concentration (using the Herfindahl Index) in our models and obtained broadly similar results. Finally, instead of using a service-sector dummy variable, we also used one-digit NAICS industry dummies in the models. Use of these industry dummies accounts for many variables that are calculated at the industry level, such as industry capital intensity, industry concentration, average Tobin's Q, and industry regulation, and these models also yielded broadly similar results, thus providing confidence in the robustness of results.

Discussion

Main Findings

Our goal in this study was to conceptualize why a revenue, cost, or dual strategic emphasis in IT strategy will affect firm performance and moderate the returns to IT investments. We test the resulting conjectures using archival data from more than 300 large U.S. firms. We found that firms with a dual

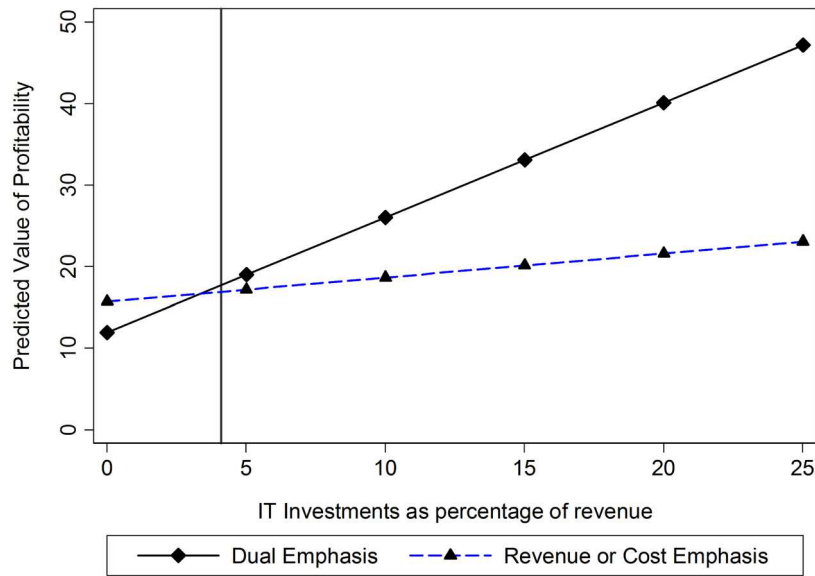


Figure 1. IT–Profitability Relationship for Dual- Versus Single-Emphasis Firms (Revenue or Cost) (other variables are at their mean value)

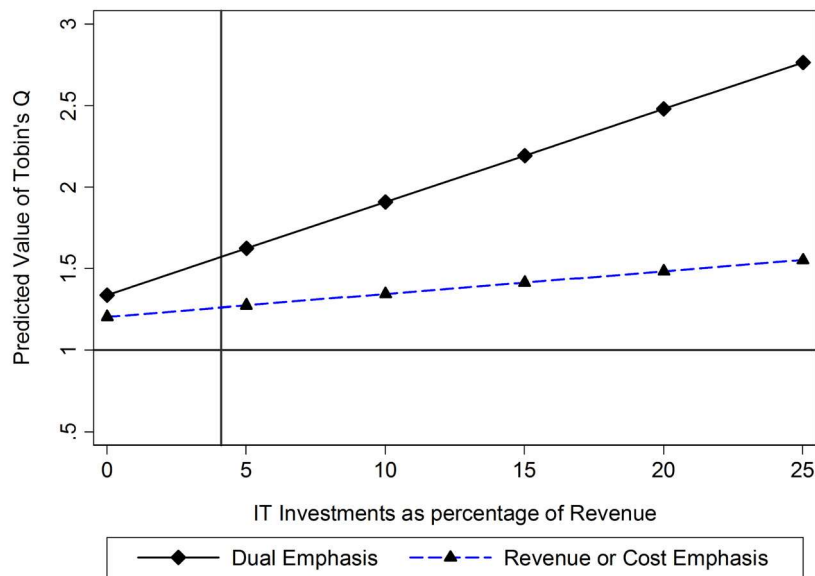


Figure 2. IT–Tobin's Q Relationship for Dual- Versus Single-Emphasis Firms (Revenue or Cost) (other variables are at their mean value)

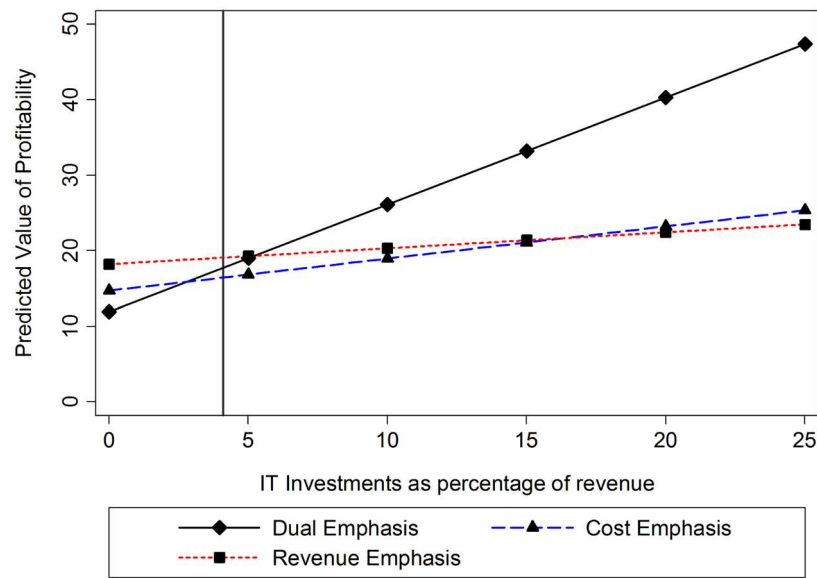


Figure 3. IT–Profitability Relationship by Dual, Revenue, and Cost IT Strategic Emphasis (other variables are at their mean value)

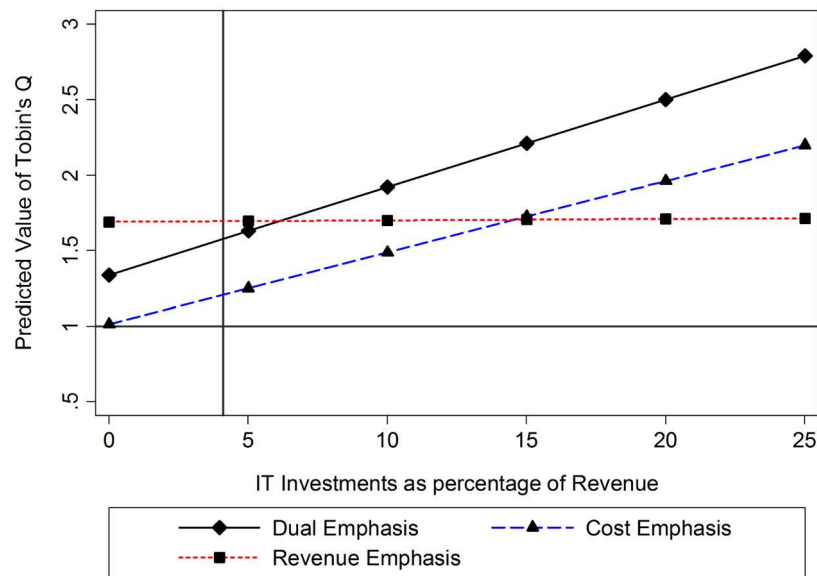


Figure 4. IT–Tobin's Q Relationship by Dual, Revenue, and Cost IT Strategic Emphasis (other variables are at their mean value)

emphasis in their IT strategy have a higher Tobin's Q than firms with a revenue or a cost emphasis at the mean value of IT investments; these differences in market value arise despite no statistically significant differences in profitability.

Why does the market reward dual strategies over single focus strategies? We believe that the possible reasons may be because markets may perceive dual strategies to be less replicable because of (1) RBV mechanisms such as greater social complexity, causal ambiguity, path dependence, and organizational learning, (2) reduced diminishing returns and plentiful low-hanging fruits in opportunity space, and (3) stretch targets in two key areas related to revenues and costs, as we argued in the "Background and Theory" section. Together these mechanisms may allow dual emphasis firms to have more sustainable, higher, and accelerated cash flows because of simultaneous targets for higher revenues and lower costs, with less variability in cash flows because cash flows have two sources (both revenue growth and cost reduction), while firms with a primary emphasis on either revenue growth or cost reduction have only one source of IT-enabled cash flow.

Taken together, these findings foreground the importance of IT strategic emphasis because such strategies influence market valuations even if they do not yield measurable profitability differences at the mean value of IT investments. Of greater importance, IT strategic emphasis plays a significant role in moderating the relationship between IT investments and firm performance. We find that dual-emphasis firms have a stronger IT–profitability relationship than single-emphasis (revenue or cost emphasis) firms. Dual-emphasis firms also have a stronger IT–Tobin's Q relationship than revenue-emphasis firms. In general, our findings and plots show that a dual IT strategic emphasis yields better profitability and market value outcomes when such a strategic emphasis is combined with high levels of IT investments. At the same time, a dual emphasis can backfire if not supported by adequate levels of IT investments because at lower levels of IT investments, it is outperformed by other strategic emphases. Our results are consistent with the view that firms can realize significant performance benefits when they combine higher levels of IT investments with the more sophisticated management and governance capabilities that firms may need to realize the dual strategic emphasis of both cost reduction and revenue enhancement (Aral and Weill 2007; Weill and Ross 2009). These findings extend prior literature by showing, for the first time, how IT investments and IT strategic emphasis jointly influence firm performance. They also provide important implications for practice, while suggesting the need for developing stronger theory (e.g., in the area of IT strategic ambidexterity) and more precise empirical tests in further work.

Before considering implications, however, we discuss some limitations. First, our study uses a cross-sectional analysis and, although we performed an extensive set of analyses, we do not claim causality and treat our results as associational; longitudinal studies with several years of panel data would help validate our findings to increase their generalizability and to enable stronger claims related to causality. Longitudinal studies could also help sort out the extent to which the stock market is efficient in recognizing the improvements in fundamentals due to managerial interventions and strategic choices. Second, although we used a perceptual single-item measure for primary emphasis in IT strategy—which is not a major limitation per se, as other studies have also used similar measures (Rust et al. 2002; Tallon 2007, 2008) and such measures can be preferred in certain contexts to elicit appropriate response behavior and clearer interpretation of findings (Drolet and Morrison 2001; Rossiter 2002; Wanous et al. 1997)—further studies with alternative operationalizations using multi-item scales might be helpful.

Third, we used two of many possible measures of organizational performance, future research should use a more comprehensive approach for assessing the effect of IT strategies and IT investments on performance (see Richard et al. 2009). In particular, although some may question whether Tobin's Q, developed in 1969, is a relevant metric in today's dynamic business environment, to the extent that a large share of top managers' compensation is tied to stock performance, focusing on Tobin's Q is still informative and is in line with recent research linking IT with firm performance (e.g., Tafti et al. 2013). Fourth, although this study provides useful insights by leveraging data on both IT investments and IT strategic emphasis, richer conceptualizations and theorizing along the lines in other studies (e.g., Oh and Pinnsoneault 2007; Tallon 2007) can be illuminating. Fifth, our findings are more likely to apply to single-business firms or strategic business units where a dominant IT strategic emphasis can be clearly identified because it may be harder to identify a dominant IT strategic emphasis in conglomerates or multi-business firms that are much more dominant in emerging economies but are sometimes considered relevant even in the West as reflected in Google's reorganization in 2015 (*The Economist* 2014, 2015; Mithas 2015). Nevertheless, the findings are still useful for the strategic business units within such conglomerates. Finally, and perhaps most importantly, although we provide plausible arguments for the likely mechanisms that drive our results, we did not directly test those mechanisms; we discuss this issue in the research implications section to motivate a program of research.

Implications for Research

Several important conclusions result from the conjectures motivated by Table 1 and tested in our empirical analyses. These conclusions generate implications for developing a program of research that explains, extends, or clarifies our findings. First, our findings suggest that the overall effect of IT strategic emphasis on firm performance depends on the type of strategic emphasis, levels of IT investments, and specific measures of firm performance. Unlike Rust et al. (2002), who report the effect of strategic quality emphasis on profitability, our findings show that IT strategic emphasis does not influence profitability at the mean level of IT investments, and no one strategic emphasis is unconditionally superior in terms of profitability at all levels of IT investments. While Rust et al. do not investigate the effect of quality-based strategic emphasis on Tobin's Q, we find that firms with a revenue or dual IT strategic emphasis have a higher Tobin's Q than firms with a cost emphasis, at the mean value of IT investments. These differences in findings across studies investigating an emphasis on quality and IT strategy highlight the need for similar investigations of emphases in other functional strategies or governance processes such as exploitation versus exploration (O'Reilly and Tushman 2004), prospector versus defender (Miles et al. 1978), autonomy versus control (Tafti et al. 2007), centralization versus decentralization (Xue et al. 2014), regulation- versus consensus-based governance (Lazic et al. 2014), standardization versus integration (Weill and Ross 2009), focused versus broad search (Leiponen and Helfat 2010), flexibility versus efficiency (Adler et al. 1999) and their implications for firm performance. We recognize that some functional strategies may not have a dual focus in the sense of the revenue and cost emphases used in this paper.

Second, although our focus in this study was on IT strategic emphasis, IT strategic emphasis is not completely independent of the overall strategy of a firm and strategic emphases in other areas (e.g., marketing, operations, capital projects). There is a need for further research to better understand the linkages and interactions between strategic emphases across functional areas, how they relate to IT strategy and the overall strategy of firm, and the implications for firm performance.

Third, although we find that the dual strategic emphasis alone is associated with a higher Tobin's Q, and stronger IT–Tobin's Q and IT–profitability relationships, there remains the need to quantify the risks associated with adopting dual strategies and higher IT investments. The complexities and path dependence of a dual-emphasis strategy can also make firms more rigid and reduce their flexibility to compete successfully if the environment changes suddenly.

Fourth, in terms of implications for future theoretical work, our study suggests a need for analytical work on the one hand and a deeper unpacking of the notion of IT ambidexterity and its implications on the other hand, beyond some nascent work in the IS literature that has begun to examine various notions of ambidexterity at multiple levels (Cao et al. 2013-14; Gregory et al. 2015; Im and Rai 2008; Khuntia et al. 2014; Kude et al. 2015; Lee et al. 2015; Schmidt et al. 2014; Tiwana 2010). In particular, theorizing and testing how diversity of IT systems, stretch targets, and specific combinations or configurations of specific IT systems allow firms to develop IT ambidexterity is an attractive area of inquiry. There are also opportunities to study IT ambidexterity at the project or application level, perhaps using a case study approach (Cederlund et al. 2007; Kohli and Hoadley 2006; Ramasubbu et al. 2014). Such case studies might facilitate better opportunities for theory-building and for understanding the performance implications of fit between strategic objectives of that project and the application capabilities. It is also likely that some projects that initially offer cost reduction opportunities might subsequently provide revenue growth opportunities. For example, UPS introduced its Delivery Intercept Service because its existing IT infrastructure enabled them to do so. While the original system facilitated cost reduction, the same technology enabled UPS to increase revenue subsequently. Such options (previously unknown) provide opportunities from existing infrastructures that cannot be easily classified into a narrow bucket. Although we recognize that theory-building is an important undertaking in and of itself, we call for an equally important consideration of operational issues, such as how theoretical constructs will be measured in a practical and unobtrusive manner to test theories and to generate insights for practitioners.

Finally, we call for further research to articulate the boundary conditions of when dual-emphasis is likely to be rewarding and when it may be deleterious, in the spirit of “pursuing failure” to prune theories (Gray and Cooper 2010). Although the jury is still out on some of the arguments that Gray and Cooper make as they themselves acknowledge, we can add that scientific enterprise is just as well served by curiosity- and problem-driven research (Lawrence 1992) in a context where organizations are best viewed as tools instead of natural objects that are susceptible to laws, experimental controls are lacking, and regularities are often context and time-dependent (Davis 2010). How might one go about testing as to which theory or mechanism (or a combination of mechanisms) among those listed in Table 1 provides the best explanation for why dual-emphasis in IT strategy and its interaction with IT investments is associated with superior performance? We can envision a research program for operationalizing the mechanisms, collecting data on them from secondary or primary sources and then testing their relative

explanatory power. While prior literature on RBV may provide guidance for operationalizing some of these mechanisms, some new measures may have to be developed for operationalizing reduced diminishing returns (for example, by counting total number and types of revenue expansion and cost reduction IT projects that are part of an organization's consideration set in a year) and stretch targets across revenue and cost domains (for example, number of revenue and cost metrics used by the IT department of an organization). Although creating new scales will be useful, in some cases, researchers may come across archival but unobtrusive data that may proxy for some of the underlying ideas in Table 1 for initial tests of competing mechanisms. Like other tests of organizational theories (for a discussion, see Davis 2010), it is unlikely that any one study or method of enquiry can provide a definitive test of the conjectures or implications arising from our research or the ideas listed in Table 1. However, we hope that multiple studies across varying contexts with differing approaches will give us a vantage point to make sense of the contours of the richness and complexity of organizational strategies, resources, and associated performance outcomes to develop useful insights and generalizations.

Implications for Practice

Our most important managerial implication is that a dual or revenue emphasis in IT strategy pays off in terms of firm valuation, as measured by Tobin's Q, even though profitability is not improved at the mean level of IT investments. We also find that firms with a dual emphasis in IT strategy are more profitable and have a higher Tobin's Q when they invest more in IT. At lower IT budget levels, it is best for the firm to choose one strategy or the other—either revenue expansion or cost cutting—as its primary IT emphasis. How would Tobin's Q vary if a dual-emphasis firm did not spend higher amounts on IT? The answer to this counterfactual question would require a randomized field trial involving the assignment of low and high IT investments to dual-emphasis firms. However, in the absence of such a field trial, our observational study leverages variation in IT investments across dual-emphasis firms in our sample to provide a preliminary answer. Figures 1–4 show that at lower levels of IT investments, dual-emphasis firms do about as well as single-emphasis firms in terms of profitability, although they do slightly better than single-emphasis and particularly cost-emphasis firms in terms of Tobin's Q (see Figure 4).

In a broader sense, our study provides an assessment of the implications of IT strategic emphasis for multiple measures of firm performance. Our results suggest that IT strategic emphases have a significant impact on market value at the mean value of IT investments, despite no differences in

profitability at those levels of IT investments. Our results are not only statistically but also economically or practically significant because Tobin's Q for dual-emphasis firms is 0.31 higher (because these are large firms, a Tobin's Q of 0.31 means 31 percent of replacement cost of assets of the large firms in our sample which is an economically large quantity) at the mean level of IT investments (see Aguinis et al. [2010] for further discussion of statistical versus practical significance; see also Fornell et al. [2009]). Managers need to understand the trade-offs involved in pursuing a particular strategic emphasis in a functional area, and depending on the strategic goals, they can choose a particular IT strategic emphasis that meets their needs. In particular, because adoption of a particular strategic emphasis affects market value without affecting profitability, managers need to consider the market value implications of their actions and strategic choices carefully even if they do not appear to affect profitability (Kohli et al. [2012] make similar observations). It is also possible that strategic emphases in different functional areas have different implications for managing profitability and Tobin's Q, and by combining the strategic choices across various functional areas, managers may be able to select a portfolio of strategic options to meet their desired performance objectives.

Another managerial implication of our findings pertains to tactical actions and investments in discretionary expenditures such as advertising, R&D, and IT investments to operationalize the strategic emphasis in a functional area. Although managers can view IT investments as providing the firm with the capabilities to become ambidextrous and agile for improved firm performance, this does not mean that all IT systems and applications can help with revenue growth or cost reduction. As we argue in the "Background" section, it is not so much which applications firms use but rather what their overall strategic objectives are for deploying the applications that is more critical, because we argue that managerial beliefs, mental models, and strategic posture shape an organization's IT governance and management of IT projects to create business value (Mithas et al. 2013). This means that managers can choose a suitable portfolio or combinations of appropriate IT applications (each of which may only provide either revenue growth or cost benefits to a greater degree, with some exceptions such as business analytics systems that may provide dual capabilities) that are consistent with their strategic objective. For example, while CRM systems may help firms improve customer satisfaction (Mithas et al. 2005, 2016) and, in turn, repurchase intentions and sales (Lariviere et al. 2016); eProcurement and RFID (radio-frequency identification) systems may help firms reduce costs (Mithas and Jones 2007; Whitaker et al. 2007). Thus, managers need to synchronize their IT strategic emphasis with related IT applications to achieve their strategic objectives.

Conclusion

To conclude, this research empirically tested the effect of IT strategic emphases and IT investments on firm profitability and market value. Using archival data from a broad cross-section of more than 300 U.S. firms, we find that at the mean value of IT investments, dual-emphasis firms have a higher Tobin's Q than firms with a revenue or a cost emphasis, without any statistically significant differences in profitability due to strategic emphases. Of greater importance, IT strategic emphasis plays a significant role in moderating the relationship between IT investments and firm performance. Dual-emphasis firms have a stronger IT–profitability relationship than single-emphasis firms, and dual-emphasis firms have a stronger IT–Tobin's Q relationship than revenue-emphasis firms. Overall, while this research provides useful insights into the effects of IT-related strategic emphasis on firm performance, the findings imply that the effects of strategic emphasis (revenue growth, cost reduction, or a dual emphasis) on firm performance can vary significantly and are conditional on levels of IT investments. For typical levels of IT expenditure, a dual emphasis in IT strategy pays off in terms of a higher firm valuation, and a higher level of IT investments makes a dual emphasis increasingly attractive, with respect to both profitability and Tobin's Q. These findings should help managers craft their IT strategies and better allocate resources for IT systems to achieve or sustain competitive advantage.

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Appendix

This appendix provides further discussion on why endogeneity is not a significant concern in our analyses. We begin by noting that endogeneity typically arises when (1) both dependent and independent variables are simultaneously determined, or (2) when reverse causality is suspected (i.e., when the dependent variable causes independent variables). First, regarding the situation in which endogeneity arises from the simultaneity of IT investments and firm performance, one way to rule this out is by conducting a formal test for endogeneity following a procedure suggested by Wooldridge (2003b, p. 506) and used in prior IS research (see Mithas et al. 2012). The intuition for this procedure is that instrumental variable approaches to deal with endogeneity are less efficient than OLS when the explanatory variables are exogenous. Therefore, Wooldridge (2003b, p. 506) suggests a test to assess whether an explanatory variable is endogenous before making indiscriminate use of 2SLS. The test is based on the idea that both OLS and 2SLS are consistent if all variables are exogenous, but if 2SLS and OLS estimates differ significantly then we may conclude that the explanatory variable may be endogenous. In accordance with this procedure, we regressed the value of IT investments on lagged values of IT investment.² We used the predicted value of IT investments from this model to compute predicted residuals for IT investments. We then included this predicted residual in the firm performance models in equations along with other variables specified in firm performance models as noted above. Because this predicted residual was not statistically significant in the firm performance models, the result of this test reduces concerns about the endogeneity of the IT investments variable.

Second, regarding the situation in which endogeneity arises from reverse causality, because independent variables precede our dependent variables by at least one year, this reduces (at least to some degree) concerns about reverse causality as a reason for endogeneity.

From an econometric and theoretical perspective, the use of ordinary least squares (OLS) to estimate the following equations is appropriate for testing our main conjectures for a dual versus single strategic emphasis:

$$\text{Profitability}_i = \beta_{10} + \beta_{11}\text{Dual Emphasis}_i + \beta_{12}\text{IT Investments}_{i-1} \times \text{Dual Emphasis}_i + \beta_{13}\text{IT Investments}_{i-1} + \beta_{14}\text{Service} + \beta_{15}\text{Year Dummy} + \varepsilon_i \quad (\text{A1})$$

$$\text{Tobin's } Q_i = \beta_{20} + \beta_{21}\text{Dual Emphasis}_i + \beta_{22}\text{IT Investments}_{i-1} \times \text{Dual Emphasis}_i + \beta_{23}\text{IT Investments}_{i-1} + \beta_{24}\text{Service} + \beta_{25}\text{Year Dummy} + \varepsilon_i \quad (\text{A2})$$

This is because the focal explanatory variables (i.e., IT strategic emphasis and IT investments) are exogenous in an econometric sense; the term *exogenous* here is used in a technical sense as predetermined or occurring before firm performance (see Kennedy 1998; Wooldridge 2003b), and we acknowledge that IT investments can be determined by a firm's overall strategy. From a theoretical perspective, one can justify IT strategic emphasis as exogenous to firm performance but determined by a firm's overall strategy, which is usually assumed to endure over many time periods, thus avoiding any simultaneity between firm performance and choice of IT strategic emphasis.³ Likewise, theoretically, one way to conceptualize exogeneity of IT investments is that significant uncertainties in value realization from IT investments make it difficult for managers to know whether IT investments will yield the desired outcomes in the context of their firm and what level of IT investment is consistent with their IT strategies. These factors can create exogenous variation in IT investments across firms that is unrelated to subsequent profitability (particularly because IT investment decisions are likely to precede the realization of profits in a given year). Our models already allow firms' IT investments to be driven by their business strategies.

Note also that prior research suggests that the mere presence of endogeneity does not always bias the coefficients of interest. For example, Tambe and Hitt (2012) used IT employment data and concluded that "effects of endogeneity on IT productivity estimates may be relatively small" (p. 599) and the bias may even be negligible for studies that use IT spending data which includes IT hardware, software, and systems spending as is the case in our setting. Tambe and Hitt used IT capital stock data from Computer Intelligence as an instrument for IT employment to generate some of their findings. Their results are a reminder that presence of endogeneity does not automatically mean bad parameter estimates.

²Although the lagged value of an endogenous independent variable is not a perfect instrument, it is often used in the absence of better instruments (Kennedy 1994). Prior studies in the business value of IT literature have justified or used similar instruments (Han and Mithas 2013; Hitt and Brynjolfsson 1996; Kohli, Devaraj and Ow 2012; Mithas et al. 2012).

³Overall strategy of a firm may be determined by its industry, and we account for that correlation to some extent but we acknowledge that future research should explore controls for a firm's overall strategy.

Although Tambe and Hitt's findings provide some confidence that endogeneity issues may not always be severe, researchers often agree that the instrumental variable approach can be a potential remedy to address or mitigate concerns related to endogeneity.⁴ For example, Kohli et al. (2012) report that their exploratory robustness checks with 2SLS using lagged value of average prior period IT investments as instrumental variable provided results similar to their main estimates. Although our tests for endogeneity do not suggest that the use of the instrumental variables approach is warranted, we nonetheless estimated our models using two-stage least squares (2SLS) as an exploratory robustness check similar to Kohli et al. (2012). We obtained broadly similar results as those reported in Table 5, with positive and statistically significant coefficients for the interaction term involving IT investments and a dual emphasis by using another lag of IT investments as instrument. This analysis, once again, suggests that endogeneity concerns are not serious in our study and do not affect our main findings. For our IV analysis, we used the lagged values of IT investment as the instrumental variable drawing guidance from prior work on business value of IT.⁵ This IV also meets the relevance condition (IV should be strongly correlated with the focal explanatory variable that is suspected to be endogenous; in our case, it is the IT investments variable). Our instrumental variable also appears to be uncorrelated with the error term in the profit and Tobin's Q equation on conceptual grounds because, essentially, the argument would be that the IT investments in period t-2 are more likely to affect IT investments in period t-1, and once we account for this effect, then we would expect to recover a consistent estimate of the effect of IT investments at t-1 on firm performance (profits and Tobin's q). This assumption is made by almost all other studies that use such a lagged instrumental variable (Han and Mithas 2013; Hitt and Brynjolfsson 1996; Kohli et al. 2012; Mithas et al. 2012), even if it is not explicitly stated. Note that there are no empirical tests for verifying how good such an assumption is in a just-identified case when one uses only one instrumental variable.⁶

In summary, given the various sensitivity analyses that we have performed and reported in the paper and the additional discussion here, we feel that our empirical choices are reasonable, consistent with prior work in this area, and that our chosen instrument satisfies relevance (as we could empirically test) and exclusion restriction (as can be plausibly argued based on guidance from prior literature). Earlier in the note, we discussed and explicitly ruled out two alternative explanations of our findings (which may suggest that either IT strategic emphasis influences IT investments, or IT investments determine dual emphasis; our data do not support either). Then, even though we show that the IT investments variable is not endogenous, our IV results as a further robustness check, following the approach used by Kohli et al. (2012), to reduce concerns about endogeneity because they provided broadly similar results for our main findings. Finally, we recognize as many others do that one can never prove causality in an observational study, and therefore we include an explicit limitation that our study is associational and we do not claim causality.

⁴In addition to the instrumental variable approach, there are other methods that can be used to assess the causal nature of treatment effects and sensitivity of parameter estimates. These include propensity score matching, impact threshold for a confounding variable, and regression discontinuity approaches (Kim et al. 2014; Kohli et al. 2012; Mithas and Krishnan 2009), among others. However, the use of such methods is context dependent on the type of research questions and data to which researchers have access.

⁵Prior studies in the business value of IT literature have also used similar lagged values as the instrumental variable, although the exact operationalization is always subject to data limitations and somewhat context-specific. Therefore, conceptually and empirically our choice of instrument is consistent with prior literature (Han and Mithas 2013; Hitt and Brynjolfsson 1996; Kohli et al. 2012; Mithas et al. 2012).

⁶Sometimes researchers use multiple instruments and report some statistical tests to provide confidence in usage of such multiple instruments. Such instruments have often been criticized because they also come with unexplained or non-verifiable assumptions.

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