JOURNAL OF MANAGERIAL ISSUES
Vol. XX Number 4 Winter 2008: 485-506

The Complex Contribution of Information Technology Capability to Business Performance*

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Annual spending on information technology capability—specifically on computer hardware, software, and related devices—will increase to $1.2 trillion by 2008, representing the single largest capital investment by businesses (International Data Corporation, 2005). Information technology (IT) capability is the ability of a computer system to store, process, and communicate information (Bakos and Treacy, 1986). The sizable and growing spending on IT capability has managers asking what contribution information systems make to business performance. One answer is not much. In an attention-grabbing *Harvard Business Review* article, Carr (2003) argues that computers confer no meaningful gains due to their ubiquity and commodity nature. Other experts disagree. Broadbent and her colleagues (2003) point out that IT systems enable firms to increase work efficiencies, exploit market opportunities, and strengthen the financial bottom-line. The debate reminds us that, despite the wide acceptance of computers, the contribution of IT capability to business performance—known as the IT business value issue—is not entirely settled. There are two emerging insights to help resolve this important managerial concern, insights that suggest a complex relationship.

* The Center for Research on Information Management at the University of Illinois-Chicago is gratefully acknowledged for a research grant and other forms of support to conduct this study.

The first insight is that IT capability contributes to business performance, but the path may be indirect rather than direct. Studies examining the direct path have yielded mixed results: some studies have found IT to have positive effects on performance, some have found negative effects, and others have found no effects (Brynjolfsson and Hitt, 2000; Dedrick *et al.*, 2003). Consequently, the path has been proposed as indirect—IT capability perhaps facilitates critical organizational activities, which in turn augments business performance (Chan, 2000; Melville *et al.*, 2004). A few empirical studies have been conducted on this alternate route, with promising findings. The positive influences of IT capability on business performance have been demonstrated as mediated by resource utilization and inventory turnover (Barua *et al.*, 1995), loan origination and mortgage handling (Lee, 2001), supplier and customer side digitization (Barua *et al.*, 2004), and cross-unit knowledge management (Tanriverdi, 2005).

The second insight is that the impact of IT capability may be socially contingent. Studies suggest that a strong IT capability is a necessary but insufficient condition for organizational effectiveness (Davenport, 1994; Orlikowski, 1992). A particular IT capability cannot on its own produce work efficiencies, cost savings, and sales growth because people in the organization ultimately determine the design and use of that system to achieve collective ends. When social factors such as human resources and organizational climate are favorable, the benefits of IT capability are recognized, supported, and sought in the organization; when unfavorable, the capability is apt to be ignored, underused, and even misused (Brown and Starkey, 1994). Following on these insights, we conduct a study aimed at examining a more complex set of relationships between IT capability and business performance.

Specifically, we propose studying one mediator and two moderators in the IT capability-business performance relationship. The mediator we consider is customer orientation, which is the firm-level ability to identify, analyze, understand, and meet customer needs (Deshpande *et al.*, 1993; Gatignon and Xuereb, 1997). We focus on customer orientation because it has long been held to be a primary determinant of business performance (Day, 2003; Narver and Slater, 1990). Drucker (1954) espoused the view that knowing and satisfying customers is the surest route to market and financial success. Researchers in marketing have speculated that customer orientation is strengthened by IT capability. Computer technologies such as datamining software seem to assist in rapid, comprehensive, and accurate understanding of and reactions to changing buyer needs (Day, 1994; Shugan, 2004; Varadarajan and Yadav, 2002). As buyer needs are met, sales and other performance dimensions improve. Similarly, researchers in information systems have theorized that IT expedites critical processes such as customer servicing, which in turn elevates revenues and profits (Bharadwaj, 2000; Melville *et al.*, 2004). Thus, we posit customer orientation as a mediator between IT capability and business performance.

The moderators we consider are information systems (IS) service quality and intra-organizational trust. The IS group is the human resources most closely associated with IT capability.

Businesses today rely on computer programmers, engineers, and managers—referred to as IS specialists—to support IT infrastructures. Particularly important is the quality of services delivered by specialists. Information systems service quality is the degree to which these services exhibit desired properties, such as reliability and timeliness (Pitt *et al.*, 1995). Studies indicate that high IS service quality is crucial for computer systems to fulfill intended applications (e.g., Broadbent and Weill, 1997). Intra-organizational trust is an organizational climate variable, and refers to positive expectations that workers across the organization have about one another's abilities, actions, and motives (Huff and Kelley, 2003). Trust has long been deemed essential for superior firm performance, since employees who trust one another experience significant work efficiencies (Kramer and Tyler, 1996). In relation to IT, researchers have proposed that a climate of trust fosters worker receptivity to and use of computer technologies, increasing the impact of these systems (Brynjolfsson and Hitt, 2000; Dedrick *et al.*, 2003). We therefore posit that IS service quality and intra-organizational trust moderate the influence of IT capability on business performance.

In sum, our study examines the question of IT capability's contribution to business performance by determining: (1) if there is an indirect relationship through customer orientation, and (2) if IT capability has interactive relationships with IS service quality and intra-organizational trust. As best we know, none of these effects has been empirically investigated, although they have often been conjectured. We proceed by developing a model of these relationships and testing it through a survey of senior executives in a wide range of firms and industries. Our intended contribution is twofold. First, we advance knowledge on the IT business value issue by explaining how computer technologies affect business performance. We investigate a more complex relationship than previously studied, looking at both mediated and moderated influences. Second, as explained in the next section, we ground the model in the Socio-Technical View (Trist, 1990). Past IT business value research has been based largely on the Resource-Based View, with useful insights (Barney, 1991; Zhang, 2006). Ours may be one of the first to apply the Socio-Technical View, a relevant theory that considers the confluence and consequences of social and technological elements in organizations. We note that while the Socio-Technical View offers a different emphasis regarding how IT business value is generated, the theory is complementary to and extends the Resource-Based View.

CONCEPTUAL FRAMEWORK

Socio-Technical View

The Socio-Technical View (STV) is a theory that resulted from research conducted on the British coal mining industry at the end of World War II. The research intended to describe the potential and limits of technologies to achieve organizational objectives (Trist, 1990). In brief the theory posits that technologies rarely directly or on their own advance the overall performance of an organization; rather, any gains come from technologies improving processes, and—very importantly—improvements depend on internal social con-

ditions. The theory's significance lies in its recognition of the interdependencies between technological and social factors as well as the sequential impacts of technologies. The STV is the basis for our conceptual framework because it speaks to our interest in computer technologies in tandem with social characteristics and their joint influences on organizational behaviors and outcomes.

The theory's core premise is that organizations are socio-technical systems rather than exclusively or predominantly social or technical. Another premise of the STV is that the two dimensions are independent yet correlative—independent in that they are discrete and distinct from one another, but correlative in that their combination enables inputs to be transformed into valued outputs. In more concrete terms, workers (a social input) use tools (a technological input) to make products (a task) that are profitably sold to buyers (valued outputs). This leads to the third premise of the theory: organizational activities and outcomes are optimal when both social and technical elements are strong (Trist, 1990).

Extending these three premises to the IT business value issue, we develop a conceptual framework in which IT capability is the technological input that interacts with the social inputs of IS service quality and intra-organizational trust, affecting customer orientation as a throughput and business performance as the final output. Note that our model is not intended to be a direct translation or test of the STV, but rather a reflection of its perspective. The model is also consistent with the social rule systems literature, which posits that IT capability is a key enabler of processes such as customer orientation, but does so when accompanied by trust or other positive social elements (Lee and Choi, 2003; Tillquist, 2000). Furthermore, the model, while rooted principally in the STV, complements and builds on the Resource-Based View. The latter argues that a firm's combination of technological and human inputs is socially complex; therefore, organizational routines can be difficult to imitate, forming the basis of competitive advantage and superior performance (Barney, 1991; Barney and Ketchen, 2001). For sake of clarity, we briefly discuss each construct in our conceptual framework.

Key Constructs

IT Capability. According to Orlikowski and Iacono (2001), IT can be conceptualized as a tool to orchestrate and amplify human efforts, especially in information tasks. The tool view and the notion of IT as an information aid or enabler are pervasive in the literature (e.g., Brynjolfsson and Hitt, 2000; Kohli and Devaraj, 2003). Consistent with this interpretation, we adopt Bakos and Treacy's (1985) definition of IT capability as the ability of a computer system—the collection of computers and related technologies in an organization—to store, process, and communicate information. Due to differences in components and configuration, an IT capability can be described in terms of the capacity, quality, and speed of its storage, processing, and communications functions. This definition avoids *de facto* equating IT capability with IT investment. Firms can spend the same amounts of money on computer technologies but end up with very different capabilities due to rapid price drops, introduction of new features,

and multiple approaches to systems design and use (Kohli and Devaraj, 2003).

Customer Orientation. Customer orientation is the firm-level ability to identify, analyze, understand, and meet customer needs. It has long been considered a key requisite for business success (Drucker, 1954), and thus plays a prominent role in our model. More tangibly, customer orientation is a set of information activities that make a firm proactively attentive to customers—the organization-wide gathering, sharing, and responding to customer information (Deshpande *et al.*, 1993; Gatignon and Xuereb, 1997). Importantly, customer orientation is distinct from market orientation. Customer orientation is about determining and addressing the preferences of buyers, generally to the exclusion of other concerns, whereas market orientation is more encompassing, including competitor orientation and interfunctional coordination (Narver and Slater, 1990; Slater and Narver, 1998). Researchers have recommended customer orientation be studied separately from market orientation because of growing evidence of unique psychometric properties as well as distinct antecedents and consequences (Slater and Narver, 1998; Rindfleisch and Moorman, 2005).

IS Service Quality. Once primarily the developers and operators of IT systems, IS specialists are now expanding their services to include not only simple and mundane tasks such as manning technical help desks but also more involved tasks such as integrating legacy systems. The rise of micro-computing, advent of the Internet, and an explosion of IT products have only increased the demand for and diversity of IS services. Because many of these services are tied to customer orientation, such as assisting managers to operate customer relationship management platforms, and the literature emphasizes the quality of IS services as a major influence on IT outcomes (Aladwani, 2002; Broadbent and Weill, 1997), we include it in our study. We define IS service quality as the degree to which services provided by IS specialists to systems users exhibit desired properties, including reliability, timeliness, and appropriateness (Pitt *et al.*, 1995). This conceptualization is based on the seminal service quality framework proposed by Parasuraman, Zeithaml, and Berry (1988).

Intra-organizational Trust. Because organizations cannot constantly police the actions of workers, trust is a less intrusive means of ensuring workers achieve organizational goals. Intra-organizational trust, or the trust workers in an organization have in one another, spurs social bonds and collaboration in endeavors such as finding new ways to satisfy customers. We include it in our framework because researchers conclude it is crucial for organizational effectiveness, and plays an important role in collective receptivity to and exploitation of computer technologies (Barney, 1991; Dedrick *et al.*, 2003; Kramer and Tyler, 1996). Intra-organizational trust is defined as the positive expectations that workers across the organization have about one another's abilities, actions, and motives (Huff and Kelley, 2003). It consists of cognitive, affective, and moral dimensions, and describes the perceived intent and behaviors of organizational members (Chowdhury, 2005; Hosmer, 1995; McAllister, 1995).

Business Performance. In IT business value studies, business performance is

often examined exclusively in financial terms such as cost ratios. However, it has been argued that business performance should be framed as multi-dimensional (Chan, 2000; Eskildsen, 2003). Therefore, we specify business performance as comprised of two dimensions—market performance and financial performance (Brady and Cronin, 2001; Morgan and Piercy, 1996). Market performance refers to the relative effectiveness of an organization in market domains (as indicated by customer retention, market share, product quality, and other measures of customer value generation), whereas financial performance is the relative effectiveness of an organization in financial domains (as reflected in gross profits and returns on equity and investment).

RESEARCH HYPOTHESES

IT Capability and Customer Orientation

IT capability may have an indirect tie to business performance through customer orientation. We believe IT capability is positively related to customer orientation for reasons centered on customer information.

First, IT capability can facilitate collecting large amounts of customer information. The most salient example is the Internet, which through electronic surveys and websites can obtain specific data on buyers' demographics, purchase habits, and product and service satisfaction levels (Varadarajan and Yadav, 2002). Second, IT capability can assist in sharing customer data. An example is electronic data interchange (EDI), an open system of continuously updated databases accessible by separate units within or across firms. Firms such as Procter and Gamble have developed EDI systems in order to disseminate customer data and purchase data throughout the firm and to outside suppliers and retailers on a real-time basis. Third, IT capability can aid decision-making, problem-solving, and planning based on customer information. Insurance firms, for example, are using these programs to automate decision criteria about current and prospective customers, speeding the selection of customers for sales pitches and cross-selling efforts (Levin, 2000). Finally, IT capability can increase coordination and speed of responses across the organization to evolving buyer needs. It has been demonstrated that adoption of more accessible computer systems reduces order cycle time, increases order accuracy, and eliminates interfunctional conflicts (Bondra and Davis, 1996).

Hypothesis 1: IT capability is positively related to customer orientation.

IT Capability and IS Service Quality

Barney and Ketchen (2001) observed that a computer system does not typically lead to competitive advantage unless directed by knowledgeable persons who understand and leverage its benefits. These persons are housed in the IS group. Working on various IT projects over time, the group cultivates tacit abilities, distinctive styles, and coordinating mechanisms unique to their organization. The result can be a highly competent IS team, which builds and assists users to apply a firm's IT capability toward better gauging and fulfilling customer requirements.

Several studies suggest that quality IS services are needed to convert and

integrate commodity-like servers, computers, software, and network applications into a superior IT architecture for customer monitoring and value delivery. Broadbent and Weill (1997) found that the higher the abilities of IS personnel, the more computer systems are designed with advanced features, such as automated customer tracking tools. Chung and colleagues (2005) noted that skilled IS personnel in close communications with other employees assemble and support flexible IT applications for mass customization of goods and services.

In addition to designing, constructing, and maintaining computer systems, the IS group may also assess the needs of systems users such as marketing managers, train and support users in technology applications, and share knowledge with users about how technologies improve analysis and decision-making. Several studies are suggestive that the quality of such services affects users, and thereby the organization's ability to deliver customer value. Shaw, DeLone, and Niederman (2002) learned that computer technicians help line managers, such as in marketing, better know and apply IT tools. Ray, Muhanna, and Barney (2005) identified shared knowledge between IS and customer service units, along with good technical skills within the first group, as pivotal to customer service.

Hypothesis 2: IS service quality strengthens the positive relationship between IT capability and customer orientation.

IT Capability and Intra-organizational Trust

Firms differ in their conversion effectiveness or ability to transform IT investments into productive strategic capabilities. There is increasing evidence that this ability hinges on the firm's organizational climate (Hauschild *et al.*, 2001). Orlikowski described this dynamic:

> . . . as many case studies reveal, how a technology is deployed and appropriated depends on social . . . forces. . . . Some of these forces include institutional properties of the organization, micropolitics of the workplace, features of the environment, and unintended consequences of organizational change. Such forces may account for the mixed success that socio-technical interventions have had in a range of organizations (1992: 401).

An organization's climate can be welcoming, indifferent, or hostile to new information technologies. Case studies reveal that new information systems can be ignored by workers if they perceive managers are implementing the technology to subvert interpersonal communications and ties (Brown and Starkey, 1994). In more extreme cases, unreceptive workers sabotage systems, even inputting incorrect information (Davenport, 1994). Thus, installing advanced applications doesn't necessarily lead to usage or usage as intended.

An aspect of organizational climate that is pertinent to worker receptivity toward IT is intra-organizational trust. Trust can act as a powerful force welding employees together to carry out complex, socially embedded routines. Customer orientation is one such set of routines. It requires members of often distant units such as R&D and marketing to engage in acts of high interdependence, such as developing new products, in order to better serve customers.

If intra-organizational trust is a permeating influence on relationships throughout the firm, it may also be important in shaping attitudes and behaviors toward an IT capability.

Under high trust conditions, workers are more willing to use IT tools, such as an intranet platform to partner with others, to carry out relationally intricate, customer-focused tasks. This is because when they share strong personal bonds, workers want to interact more with one another. Thus, they gravitate toward computer technologies that intensify information exchange, deepen joint problem solving, and enable cooperative efforts aimed at customer fulfillment. In contrast, under a climate of low trust, workers avoid the IT capability, allowing it to lie dormant because of pre-occupation with self-preservation and resource stockpiling (Kramer and Tyler, 1996).

Hypothesis 3: Intra-organizational trust strengthens the positive relationship between IT capability and customer orientation.

Customer Orientation and Business Performance

Drucker (1954) asserted that satisfying customers is the true mission of a business, and success in this endeavor yields profits and other rewards. Others have likewise espoused the virtues of staying close to the customer (e.g., Day, 1994; Deshpande *et al.*, 1993). Despite intuitive appeal, customer orientation has not been unequivocally demonstrated as a driver of business performance. In some studies customer orientation has been positively associated with sales growth, return on investment, new product success, services quality, and employee performance (Brady and Cronin, 2001), whereas other research has not linked customer orientation to profitability, customer retention, and repeat business (Balakrishnan, 1996).

Given the importance of this relationship to management practice and theory, we study it anew. However, we do so by accounting for two critical limitations of past studies. The first limitation is the use of disparate and highly specific performance outcomes (e.g., ticket subscriptions and new-to-the-world product introductions), which may obscure the influence of customer orientation. Hence, we conceptualize business performance in a broad but multi-dimensional way to reflect the varied output of firms and to enable comparisons. The other limitation is that past studies have generally looked at a single industry or subset of firms (e.g., Appiah-Ahu and Singh, 1998; Balakrishnan, 1996). We address this limitation by surveying strategic business units (SBUs) in a wide range of industries, including industrial as well as consumer businesses, and smaller to larger firms. If the customer orientation-business performance relationship is as robust as claimed, it should be found in a heterogeneous sample of firms. Based on the theoretical notion of positional advantage, which says that catering to customers generates market loyalties that translate into financial gains (Day, 1994), we posit *a priori* no differential effects of customer orientation on the two performance dimensions.

Hypothesis 4: Customer orientation is positively related to business: a) market performance and b) financial performance.

IT Capability and Business Performance

The literature on IT business value has mainly addressed the prospect of a direct effect from IT capability to business performance; however, evidence of such a relationship is con-

flicting. For example, Santhanam and Hartono (2003) found that IT capability, as indicated by IT leadership rank, increases profit and cost ratios. In contrast, Shin (2001) observed that returns on investment and equity do not improve with higher IT capability. While conceptual arguments favor the idea that IT capability strengthens business performance, the inconsistency of a direct association has led to speculation of mediating variables between the two constructs (Chan, 2000; Hu and Quan, 2005). Mediating variables are likely core organizational activities, since IT offers the potential to expedite work tasks and improve firm performance.

Accordingly, we theorize that IT capability positively relates to business performance but is mediated by customer orientation. The mediating effect of customer orientation occurs for two reasons. First, computer systems automate and lend precision to what would otherwise be laborious and mistake-laden exercises utilizing customer data. That is, computer systems allow the firm to be more cost and time efficient in analyzing customer data. An example is Northern Group Retail's data-mining program that sifts through voluminous customer purchase and sales records to calculate and post optimal prices on a continuous basis for all store items (Haisley, 2004). Second, IT capability may enhance the firm's collective customer sense-making and responsiveness capabilities in order to improve business performance (Day, 1994). Information technologies connect the firm with its environment by identifying external demands and helping to translate those demands into competitive offerings. At First USA Bank, for example, segmentation software has been used to target small but profitable clusters of individuals who may patronize the bank if offered specific credit card packages. The method has elevated the firm's sales rate well above the industry average (Day, 2003).

Hypothesis 5: IT capability is positively related to a) market performance and b) financial performance, but indirectly through customer orientation.

METHODOLOGY

Sample Selection and Data Collection

We obtained a Dun and Bradstreet database of SBUs located in all regions of the U.S. The database, which was derived from Dun and Bradstreet's *Million Dollar Directory*, contained 1,471 SBUs in a range of sizes (from 100 to 20,000 employees), customer types (industrial and consumer), and industries (510 SIC codes). Dun and Bradstreet provided the database by extracting all SBUs from the directory for which detailed information was available. The breadth of firms was intentional, allowing us to improve generalizability of the conceptual model. The firm characteristics would later serve as control variables.

We then identified the senior-most marketing executive in each SBU as the key informant. Because the senior executive in charge of marketing is knowledgeable about customers, directs his/her staff to use and he/she uses the IT capability for this purpose, interfaces with all if not most functions in the organization, including IS specialists, we believed s/he would be the most appropriate individual in the organization to serve as the key informant. The senior marketing executive also has profit and loss responsibilities, possessing the needed expertise and knowledge to

render judgments about market and financial performance. Furthermore, s/he represents a major user group for IT and IS services. Surveying users (rather than IS specialists and managers) is a well-accepted means of objectively assessing computer infrastructures, IS support personnel, and outcomes (Pitt *et al.*, 1995; Shaw *et al.*, 2002).

Finally, the questionnaires, along with a letter explaining the study and a postage-paid return envelope, were mailed to the senior marketing executive in each SBU in three waves. Study results were promised as an incentive for participation. After the third mailing, a total of 206 questionnaires were returned for a response rate of 14%. Of the 206 returns, 189 were usable. The return rate was similar to those reported in other surveys of senior marketing executives (e.g., Narver and Slater, 1990). To assess non-response bias, chi-square tests of differences were performed on sample characteristics. There were no differences between early and late respondents or between respondents and non-respondents.

Measures

All measures were adopted or adapted from prior studies. Each measure was assessed on a seven-point disagree/agree Likert scale (1 = strongly disagree, 7 = strongly agree).

IT Capability (ITC). The ITC measurement, based on Bakos and Treacy (1986), consisted of nine items to evaluate the storage, processing, and communicating functions of an IT capability in terms of speed, capacity, and quality. We replaced unit cost with speed as an item from Bakos and Treacy's conceptualization due to the rapid decline of unit cost and the rising importance of speed as a critical feature of computing capabilities.

IS Service Quality (ISSQ). SERVQUAL, the best-known measure of services quality (Parasuraman *et al.*, 1988), was adapted by Pitt, Kavan, and Watson (1995) to evaluate IS service quality. Due to stronger predictive validity, we used the shortened form of this scale developed by Kettinger and Choong (1997). The form consisted of 13 items describing IS service quality attributes including reliability, timeliness, and customization.

Intra-organizational Trust (Trust). We expanded the trust measure developed by Huff and Kelly (2003), adding items for cognitive, affective, and moral aspects of intra-organizational trust (Hosmer, 1995; McAllister, 1995). The resulting measure consisted of 15 items.

Customer Orientation (CO). We adopted CO scale items from Narver and Slater (1990) and Deshpande, Farley, and Webster (1993), which in whole or part are the most prominent assessments of customer orientation. We selected items specific to customer orientation to form a ten-item measure. The items were adapted for the SBU context.

Business Performance (BP). Based on Brady and Cronin (2001) and Morgan and Piercy (1996), we identified nine items to describe marketing and financial performance. The six items for market performance (MP) centered on market assessments, including market share, customer retention, and product quality. The three items for financial performance (FP) reflected commonly used financial metrics, such as gross profit and returns on equity and investment.

Control Variables

We included three control variables in the analysis: firm size, customer type (industrial versus consumer) and industry category (manufacturing versus services), which were reported by the survey respondents. These control variables were chosen to represent organizational characteristics deemed influential on business performance (e.g., Brady and Cronin, 2001).

ANALYSES AND RESULTS

We followed Anderson and Gerbing's (1988) two-step approach for structural equation modeling, in which the estimation of a measurement model using confirmatory factor analyses (CFA) preceded estimation of the structural model. We used LISREL 8 to conduct the tests.

Psychometric Properties of Measures

First, a six-factor CFA was performed on the entire set of measurement items simultaneously. Per Anderson and Gerbing (1988), we removed items with low or cross loadings to reduce misspecifications in the measurement model. This step resulted in elimination of 16 items. The final scale items and statistics for assessing internal consistency are in Table 1.

The six-factor CFA model converged in 45 iterations and showed good absolute, comparative, and parsimonious fit (Kelloway, 1998): $\chi^2_{(708)} = 1019.69$, $p < .01$; CFI = .98; NFI = .94; RMSEA = .04. Each of the observed indicators loaded significantly on its intended factor. All scales achieved reliability estimates exceeding Nunnally's cut-off of .70. To verify the stability of the measurement structure, we grouped the constructs into three subset CFAs (Jöreskog and Sörbom, 1990). Fit indices for the full measurement model and three subset models suggested the six-factor solution was superior to alternative solutions. Given high reliability of the constructs' scales, as well as the strong factor loading magnitudes, the sample size of 189 was adequate to produce stable parameter estimates (Gagne and Hancock, 2006).

Discriminant validity was determined by using the procedure outlined by Bagozzi and Phillips (1982). All two-factor pairs were assessed by comparing: (1) the chi-square in a model constraining the correlation parameter between two latent variables to unity with (2) the chi-square in a model freeing this parameter. For all possible pair-wise cases, the chi-square values were significantly lower for the unconstrained models, and the change in chi-square between the two models exceeded the critical value for statistical significance. These results suggested that the variables exhibited discriminant validity.

Due to the self-reported nature of the data, there was potential for common method variance. Two tests were conducted to determine the extent of variance. The first was the Harman one-factor test (Podsakoff and Organ, 1986). Test results indicated the presence of six discrete factors in the data set, which was consistent with the hypothesized model, suggesting that common method variance was not a likely contaminant. As a confirmation, a second test was performed on the full measurement model in which we incorporated a common latent factor following the procedures outlined by Podsakoff and colleagues (2003). The results showed that while

Table 1
Measurement Scales and Psychometric Properties

Construct	Items	IC	α	λ
IT Capability (ITC)	*Consider all forms of IT (computer hardware, software, and related devices) available, including any for customer information tasks.*	.85	.87	
	Speed of IT in communicating information.			.50
	Capacity of IT in communicating information.			.43
	Quality of IT in communicating information.			.73
	Speed of IT in storing information.			.67
	Capacity of IT in storing information.			.84
	Quality of IT in storing information.			.59
	Capacity of IT in processing (accessing, retrieving, analyzing).			.60
	Quality of IT in processing information.			.71
IS Service Quality (ISSQ)	*IS refers to the group of people responsible for servicing users of IT in your SBU.*	.93	.94	
	When IS promises to do something by a certain time, they do so.			.75
	People in IS are rarely willing to help users. (R)			.77
	People in IS are consistently courteous to users.			.78
	IS has people who give personal attention to users.			.73
	IS provides services at the time they promise to do so.			.72
	People in IS give users prompt service.			.79
	People in IS are too busy to respond to user's requests. (R)			.54
	People in IS are always willing to help users.			.94
	IS gives individual attention to users.			.90
Intra-organizational Trust (Trust)		.92	.93	
	Employees throughout this SBU...			
	Are competent at their jobs.			.74
	Uphold professional work values.			.73
	Are skilled and knowledgeable to do their work.			.76
	Really care and are concerned for each other.			.62
	Are close enough to freely share ideas, thoughts and feelings.			.80
	Invest emotionally in their work relationships.			.74
	Enjoy and like one another.			.70
	Do what is right rather than expedient.			.64
	Deal with each other fairly and justly.			.75
	Treat one another with dignity and respect.			.82
Customer Orientation (CO)		.71	.78	
	My SBU's business objectives are driven primarily by customer satisfaction.			.52
	In my SBU, we rarely monitor our level of commitment and orientation to serving customer needs. (R)			.51
	Strategy for competitive advantage is based on customer needs.			.61
	We measure customer satisfaction unsystematically, infrequently. (R)			.48
	We have routine or regular measures of customer satisfaction.			.43
	We are more customer focused than our competitors.			.69
Market Performance (MP)		.73	.79	
	Product or service quality.			.65
	New product or service success.			.50
	Customer retention rate.			.78
	Sales level.			.60
Financial Performance (FP)		.96	.96	
	Return on equity.			.92
	Gross profit margin.			.90
	Return on investment.			1.00

IC = internal consistency; α = Cronbach's alpha; λ = completely standardized item loading from the full measurement model; (R) = reverse-coded.

inclusion of the common method factor improved model fit, the factor accounted for only a small portion of total variance (15%), which was on the lower end of the range considered acceptable. The model structures also remained the same after controlling for method variance. Together, these findings suggested common method bias did not distort the data.

The means, standard deviations, and Pearson correlation matrix for all variables are shown in Table 2. Overall, our results indicated that the measures had reasonable psychometric properties and were suitable for the structural model analysis in the next step.

Hypothesis Testing

We tested the hypotheses simultaneously using LISREL 8.3. The measurement path estimates were set equal to 1 in order to scale the latent variables. Residuals, or error terms (δs and εs), for IT capability, IS service quality, intra-organizational trust, customer orientation, market performance, and financial performance were estimated to be equal to $(1-\alpha)$ × variance, per recommended practice (Jöreskog and Sörbom, 1996). Prior to creating the interaction terms, the variables were mean-centered to reduce multi-collinearity. The product of two mean-centered variable scores was used as the score of each interaction (Jaccard and Wan, 1996). Because no conventional estimate of error was available for the single-item measures for the three control variables and the two interaction terms, we assumed no error (or fixed to zero value) for these variables in the measurement model. The assumption of no error for these variables provided a conservative test of the model.

The hypothesized model, which controlled for the direct effects of IS service quality and intra-organizational trust on customer orientation, yielded the following fit statistics: $\chi^2_{(31)} = 62.68$, $p < .01$; CFI = .95; NFI = .89; RMSEA = .07. The squared multiple correlations for structural equations (R^2) were .51, .50, and .14 for customer orientation, market performance, and financial performance, respectively. The fit statistics met or exceeded the criteria established by Bagozzi and Yi (1988), leading us to conclude the goodness-of-fit statistics were satisfactory, and the model provided an acceptable representation of the data.

Hypothesis 1 stated that IT capability is positively associated with customer orientation. The standardized path coefficient γ_{11} was .25, and was statistically significant ($p < .01$), in support of Hypothesis 1. In Hypothesis 2 we posited that IS service quality has an interactive effect, increasing the positive relationship between IT capability and customer orientation. The coefficient $\gamma_{14} = .00$ was not significant ($p > .05$), failing to support Hypothesis 2. The third hypothesis predicted that intra-organizational trust interacts with IT capability, strengthening the association between IT capability and customer orientation. The path coefficient for this interaction, γ_{15}, was statistically significant at .35 ($p < .01$), supporting Hypothesis 3. According to Hypothesis 4, customer orientation has a positive relationship to the two dimensions of business performance. The path to market performance, β_{21}, was statistically significant at .70 ($p < .01$), as was the path to financial performance, β_{31}, at .38 ($p < .01$). Hence, Hypoth-

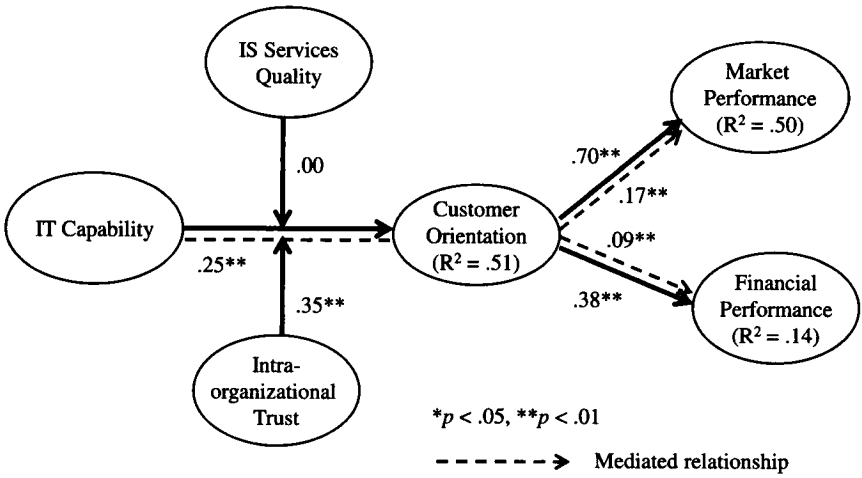
Table 2
Means, Standard Deviations, and Pearson Correlation Matrix

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9
1. IT Capability (ITC)	5.00	1.12	1.00								
2. IS Service Quality (ISSQ)	4.74	1.24	0.36**	1.00							
3. Intra-organizational Trust (Trust)	5.16	0.96	0.33**	0.62**	1.00						
4. Customer Orientation (CO)	4.74	1.17	0.23**	0.20**	0.39**	1.00					
5. Market Performance (MP)	5.19	1.01	0.22**	0.32**	0.49**	0.42**	1.00				
6. Financial Performance (FP)	4.75	1.53	0.00	0.18*	0.31**	0.23**	0.52**	1.00			
7. Firm Size (Natural Log Number)	5.16	1.50	-0.17*	-0.23**	-0.12	0.03	-0.02	0.00	1.00		
8. Industry (Goods v. Services)	0.37	0.46	0.16*	0.07	0.09	0.14	-0.01	0.00	-0.06	1.00	
9. Customer Type (Cons. v. Indus.)	0.35	0.45	0.01	-0.13	-0.03	0.03	0.04	-0.01	-0.12	0.00	1.00

$*p < .05$, $**p < .01$.

Figure I

Estimation of Standardized Path Coefficients and R-square Values (N = 189)



Fit Statistics

$\chi^2(31.) = 62.68$, $p < .01$, CFI = .95, NFI = .89, RMSEA = .07

Control Variables

Firm Size → Customer Orientation: $\gamma = .12$, $p > .05$, Firm Size → Market Performance: $\gamma = -.06$, $p > .05$, Firm Size → Financial Performance: $\gamma = -.02$, $p > .05$, Customer Type→ Customer Orientation: $\gamma = .05$, $p > .05$, Customer Type →Market Performance: $\gamma = .02$, $p > .05$, Customer Type → Financial Performance: $\gamma = -.02$, $p > .05$; Industrial Type→ Customer Orientation: $\gamma = .01$, $p > .05$, Industrial Type→ Market Performance: $\gamma = -.09$, $p > .05$, Industrial Type → Financial Performance: $\gamma = -.05$, $p > .05$.

esis 4 was supported. Finally, we proposed in Hypothesis 5 that customer orientation mediates the relationships between IT capability and (a) market performance and (b) financial performance. The respective coefficients for the indirect effects of IT capability through customer orientation were .17 ($p < .01$) on market performance and .09 ($p < .01$) on financial performance. As both paths were statistically significant, Hypothesis 5 was supported.

None of the control variables had significant direct effects on customer orientation, market performance, or financial performance ($p > .05$). For firm size, the standardized coefficients were .12 for customer orientation, -.06 for market performance, and -.02 for financial performance; for customer type (industrial versus consumer), the coefficients were .05, .02 and -.02; and for industrial type (manufacturing versus services) they were .01, -.09 and -.05. The model test results are summarized in Figure I.

DISCUSSION

This study was motivated by the continuing controversy surrounding the IT business value issue. Business managers are making sizable investments in IT, but are unsure of what benefits their firms are deriving. An

intended contribution of this study was to explain how computer technologies affect business performance, examining a more complex contribution than a simple direct relationship. Overall, the results largely supported our hypothesized model by finding that IT capability: (1) has an indirect tie to business performance through customer orientation and (2) interacts with intra-organizational trust in predicting customer orientation.

That there is an indirect path from IT capability to business performance provides evidence that IT impacts key performance metrics such as net profits, customer retention, and product quality, but this effect is mediated by customer-focused activities (Melville *et al.*, 2004). That intra-organizational trust positively moderates the relation of IT capability to customer orientation suggests, consistent with the Socio-Technical View, that IT capability is a technological input that combines with a non-technological one (trust) to facilitate organizational routines (customer orientation behaviors), and subsequently strengthen business performance (market and financial results).

Contrary to our model, we did not find an interaction between IT capability and IS service quality. It may be that IS service quality and intra-organizational trust, because they are both social factors, are somewhat redundant within the same model. In separate slope analyses, we found that each interaction on its own is statistically and positively related to customer orientation. Because trust is a more global perception of the social environment in organizations than IS service quality, it may overshadow IS service quality when simultaneously considered.

Managerial Implications

Investing heavily in information technologies, managers are asking what their companies are getting in return. The question has triggered a flurry of research, some of which says that there is bang for the buck and others that the hoped-for gains are elusive. Our study results align more with the former than latter view, though with critical qualifications. Those qualifications are: first, that it is IT capability—what the computer infrastructure does and not necessarily how much it costs—that is tied to performance, and second, that the correspondence of IT capability to performance is not straightforward. Consequently, we advance several managerial implications.

Most obvious is that managers should consider strengthening their organizations' IT capability. This study found that higher IT capability corresponds significantly with greater market and financial performance. Therefore, managers who decide their organizations should make due with a weak or low IT capability, perhaps out of a mistaken belief that IT doesn't matter, may find their businesses' competitiveness eroding. In contrast, rivals who strengthen their IT capability may win new customers and elevate profits at the expense of technology laggards. This is not to suggest that the most advanced technologies are always preferable. For some companies, this may be the appropriate decision, involving creation of proprietary systems, whereas for others, off-the-shelf components and software may be suitable. The point we wish to make is that in light of evidence for the IT capability-business performance link, managers who avoid regularly assessing and consid-

ering computer system upgrades do so at the peril of their organizations' market and financial well-being.

Another implication is that managers should emphasize computer technologies that support customer information handling and related work flows. Our study demonstrated that IT capability contributes to business performance indirectly via customer orientation. This is a significant result because it implies that an unfocused expansion of a computer infrastructure is unlikely to reap rewards; rather, the expansion should be centered around technologies that help improve customer information routines. Websites to automate the collection of detailed customer data, intranet platforms to share best customer practices in real time across global subsidiaries, and artificial intelligence software to sift out purchase patterns are only a few of the many IT applications available to support customer information handling.

Given that our study found that a trusting climate magnifies the positive impact of IT capability, a third implication is for managers to build more trust across their organizations in order to increase receptivity and willingness to use the capability for customer-oriented ends. Trust is generated when workers, especially leaders, engage in trusting behaviors toward others. After seeing a consistent pattern of trusting actions, peers and subordinates will reciprocate, engendering trust throughout the organization. A possible starting point is for managers to discuss with employees their customer information requirements. From there managers could implement feasible IT solutions, providing training to workers on usage. By presenting an open posture of search and consideration, then installing computer systems that make work more efficient and less frustrating, and by addressing employees' needs for assistance in adopting new technologies, managers can produce a more trusting climate for embracing the IT capability.

Research Implications

Along with providing the above implications to managers, a research contribution is applying the STV to the IT business value issue. Although the STV is a foundational theory in the organizational sciences, and speaks especially to the interdependencies between technological and social systems, as best we know it has not been previously used to explore the IT business value concern. The Resource-Based View has been frequently applied instead, with clearly demonstrated utility (e.g., Melville *et al.*, 2004; Zhang, 2006). We proposed and found evidence that the STV can likewise be used to illuminate the IT business value issue. The theory helped us to identify relevant variables as well as predict and explain relationships among them. The STV is complementary to the Resource-Based View, and thus our findings build upon understanding of IT impacts provided by the latter theory.

Our study makes a second research contribution by developing an alternative IT capability measurement. It has been noted that knowledge on the IT business value would be better advanced by measures of IT that are theoretically grounded and multi-dimensional, rather than narrowly financial or cost-based as in early studies (Santhanam and Hartono, 2003). Such a scale would not only interest scholars but also managers, who need instruments to identify strengths and

weaknesses of their current computer systems. We offer such a scale by operationalizing Bakos and Treacy's (1986) IT capability concept. By measuring a system's key information functions on critical performance dimensions, our scale provides a composite as well as feature-wise assessment of that technology.

Future research can be conducted along several lines. One suggestion is to investigate sets of organizational activities besides customer orientation that may have a direct bearing on business performance and for which IT capability is expected to be a potent enabler. For example, research might investigate whether knowledge-sharing mediates between IT capability and business performance. Our results indicated that a positive social environment in which employees trust one another support the intricate, interdependent routines comprising customer orientation. Therefore, a second line of inquiry is to explore other social contingencies of IT capability. One such variable might be organizational identification (Ashforth and Mael, 1989).

LIMITATIONS AND CONCLUSIONS

We determined that IT capability contributes to market and financial performance via customer orientation and depends on intra-organizational trust. Nevertheless, our findings must be interpreted in light of potential limitations. A key limit is the cross-sectional data, making it difficult to confirm causal ordering of variables. A longitudinal study is necessary for such determinations. Additionally, qualitative, in-depth methods may offer insights on the dynamics of IT impacts, including worker receptivity to and actual application of computer systems. Nevertheless, we hope this study expands the horizon of understanding on the IT business value question, and that others will join us in further research on factors and conditions that enhance or diminish the potency of computer systems. Also, as managers learn to harness IT capability for performance gains, they can bear in mind the complexity of relationships shown in this study.

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