

INFORMATION TECHNOLOGY AND THE PERFORMANCE OF THE CUSTOMER SERVICE PROCESS: A RESOURCE- BASED ANALYSIS¹

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Abstract

Delivering quality customer service has emerged as a strategic imperative, one that is increasingly tied to a firm's information technology resources and capabilities. This paper presents an empirical study that examines the extent to which IT impacts customer service. More specifically, this study investigates the differential effects of various IT resources and capabilities on the performance of the customer service process across firms that compete in the North American life and health insurance industry. The paper builds on (1) information systems work that suggests that the effects of IT are best documented at the level of processes within a firm, (2) information systems work that suggests that the performance effects of IT are likely to be contingent in nature, and (3) developments in the resource-based view, which describes the kinds of IT resources and capabilities that are likely to enable a process in one firm to outperform the same process in competing firms. The findings suggest that tacit, socially complex, firm-specific resources explain variation in process performance across firms and that IT resources and capabilities without these attributes do not. Of particular interest to IS scholars, it is found that shared knowledge between IT and customer service units—an important driver of how IT is implemented and used in the customer service process—is a key IT capability that affects

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customer service process performance and moderates the impacts of explicit IT resources such as the generic information technologies used in the process and IT spending, which—consistent with resource-based predictions—were not found to be directly and positively associated with relative process performance. The implications of the findings for research and practice are discussed.

Keywords: IT resources and capabilities, shared knowledge, resource-based theory, business processes, process performance, business value of IT

Introduction

During the past two decades, customer service has emerged as a strategic imperative for most firms (Reichheld and Sasser 1990; Rust et al. 2000; Treacy and Wierseman 1995), and service quality has been the subject of considerable interest among marketing academics and practitioners, spurred by the original work of Parasuraman et al. (1985). Today, there is general agreement among marketing scholars that quality customer service is not only the most important factor for achieving the paramount marketing outcome, namely customer satisfaction, but it is the principal criterion for measuring the competitiveness of the customer service process (Szymanski and Henard 2001; Zeithaml 2000). At the same time, the increased emphasis on customer service has emerged as a key driver for IS priorities, reflecting the general recognition of the essential role IT plays in support of this process (El Sawy and Bowles 1997). However, while a number of case studies do highlight the critical role of IT in customer service (Elam and Morrison 1993; El Sawy and Bowles 1997), empirical research examining the link between IT and customer service performance has been lacking. This article fills this void by drawing on resource-based theory (Barney 1986, 1991; Rumelt 1984; Wernerfelt 1984) to investigate the differential effects of five different IT resources and capabilities on the performance of the customer service process across firms that compete in the North American life and health insurance industry.

In examining how IT impacts customer service, our approach is consistent with the process perspective to the question of IT business value, suggesting that enterprise level impact of IT can be measured only through their intermediate (i.e., process) level contributions (Barua et al. 1995; Mooney et al. 1995; Mukhopadhyay et al. 1997; Sambamurthy 2001; Tallon et al. 2000). The argument here is that IT is deployed in support of specific activities and processes, and, therefore, the impact of IT should be assessed where the first-order effects are expected to be realized. Our approach is also consistent with a second stream of research that takes a contingency approach, suggesting the need to take into consideration other variables that may mediate or moderate the payoff from IT investments (Markus and Soh 1993; Weill 1992), as well as organizational investments complementary to IT (Barua et al. 1996; Brynjolfsson et al. 1998).

Consistent with resource-based theory, the findings suggest that valuable, rare, and costly to imitate IT capabilities such as shared knowledge—the level of shared knowledge and common understanding between IT and the customer service manager regarding how IT can be used to improve the performance of the customer service process—is a key IT capability that affects relative customer service process performance. This result extends earlier empirical findings that link shared knowledge (at the firm level) with increased levels of IT use (Boynton et al. 1994), with increased operational and service performance of the IS group (Nelson and Coopridge 1996), and increased IT assimilation in value-chain activities and business strategies (Armstrong and Sambamurthy 1999). We also find that the effects of explicit IT resources such as technical skills of IT labor, generic information technologies, and IT spending are contingent on the level of the shared knowledge. In other words, shared knowledge has both direct and moderating effects on customer service process performance.

The rest of the paper is organized as follows. In the next section, the theoretical framework and hypotheses are developed. The method used to test the hypotheses is then presented. The data

and data collection are described and the results of the data analysis presented. The paper concludes with a discussion of the findings as well as directions for future research.

Theory and Hypotheses

Resource-Based Explanations of Performance Differentials

Historically, resource-based theory was developed to understand the conditions under which firms are able to gain and sustain a competitive advantage (Amit and Schoemaker 1993; Barney 1986, 1991; Rumelt 1984; Wernerfelt 1984). However, more recently it has begun to be applied to understand why the performance of processes within a firm may vary across a set of competitors (Henderson and Cockburn 1994; Miller and Shamsie 1996; Schroeder et al. 2002). Ray et al. (2004) summarize the arguments that, in some cases, using resource-based theory to examine the economic implications of resources and capabilities at the firm level can lead to misleading conclusions, and that process-level analysis may be more appropriate.²

Differences in performance—whether they are at the firm or process level—are explained in resource-based logic in terms of the types of resources and capabilities that different firms control.³ The value, rarity, and imitability of these

²The arguments are about the attribution and appropriation of economic impacts of resources, and the growing consensus in the strategy literature that business processes are the basic unit of competitive advantage.

³A variety of labels (inputs, assets, capabilities, competencies) have been used to describe a firm's resource endowments. The label is not critical in this context; what is important is identifying resources that are likely to be sources of competitive advantage. Following Grant (1991), Amit and Schoemaker (1993), and Makadok (2001), in this paper the label *resource* is used in the general sense to refer indistinctly to all of these concepts. The term *capability* is defined as a special type of resource, encompassing a firm's capacity to coordinate and deploy other resources to effect a desired end (Amit and Schoemaker 1993).

resources have been shown to be important (Barney 1991). Resources are valuable when they enable firms to increase the efficiency or effectiveness of processes compared to what would be the case if these resources were not exploited in these processes. That is, valuable resources increase the *absolute* level of performance of a process. However, just because exploiting resources can improve the absolute performance of a particular process in a firm does not mean that investing in these resources will improve the *relative* performance of this process across competing firms. Whether valuable resources explain variance in the performance of a process across competing firms depends on how rare and costly to imitate these resources are.

Resource-based theory suggests that resources that are held by large numbers of competing firms—that is, resources that are not rare—cannot explain variance in the performance of a process across competing firms. It also suggests that even when these resources are held by just a few competing firms, if they are also not costly to imitate, they will rapidly diffuse among competitors. In a competitively mature industry, such resources will also not explain variance in the performance of processes across competing firms. Only when valuable resources are rare and costly to imitate can they explain variance in performance of processes across competing firms (Barney 1991). A resource is likely to be costly to imitate in the presence of isolating mechanisms such as path dependence, causal ambiguity, social complexity, and team-embodied skills (Barney 1986; 1991; Dierickx and Cool 1989; Rumelt, 1984).

IT Resources and Capabilities and Process Performance

As suggested earlier, the purpose of this paper is to apply this general theoretical framework to examine the relationship between IT resources and capabilities and the relative performance of the customer service process across a group of competing firms. To accomplish this objective, it was first necessary to choose an industry within which to study it.

The insurance industry was chosen for three reasons.⁴ First, the financial services industry, because of the digital nature of its products and services, has historically been among the largest investors in IT. One recent survey suggests that insurance companies on average, spend about 3.5 percent of their gross premium on IT. This puts the insurance industry in the top tier of industries in terms of IT investment. Moreover, IT is a critical tool for providing customer service personnel with the information they need to deliver quality service (Elam and Morrison 1993). Second, in the highly competitive insurance industry, customer service is widely seen as being strategically important (Berry 1995; Griffith 1993). For example, the ability of USAA (one of the largest insurance carriers in the United States) to consistently provide superior customer service is often credited for the company's stellar reputation and overall performance (Garvin 1995; Teal 1991). Finally, there is a high level of variance in the reported ability of firms in this industry to satisfy their customers (LOMA 1993), suggesting that firms differ in their ability to execute this process.⁵

IT Resources and Capabilities and Their Direct Impact on the Customer Service Process

A wide variety of IT resources and capabilities are relevant to the execution of the customer service process. An examination of the IS literature and interviews with customer service and IT managers in insurance companies led to the identification of two general categories of resources that are associated with the planning, conception, implementation, and use of IT applications. The first class of

these IT-related resources encompasses raw IT spending and two pure technology resources, namely, technical IT skills and generic information technologies used in the customer service process. The second class of these resources includes two capabilities that influence how the first class of resources is used: shared knowledge (knowledge IT managers have about the customer service process linked with the knowledge that customer service managers have about IT) and IT infrastructure flexibility.⁶ Based on the review of the literature and the interviews, it was initially assumed that all of these five IT resources and capabilities are valuable in the sense that they have the potential to improve the absolute performance of a customer service process. The focus of this research was to explore whether these resources and capabilities could explain variance in performance of the customer service process across competing firms. We will examine each next, drawing on resource-based logic.

Technical IT Skills. Technical IT skills refer to general, explicit skills (e.g., programming), possessed by the firm's IT staff that are needed to develop IT applications. While these skills can be very valuable, since they are widely available to firms (either through hiring employees or consultants with these skills) they are usually not rare or costly to imitate, and thus such skills, by themselves, are not likely to explain variance in the performance of the customer service process across competing firms. Moreover, as Mata et al. (1995) note, even when such skills are heterogeneously distributed across firms, they are typically mobile as it is not difficult for competitors to hire away this value-creating resource from their competitors at their market price.

⁴In this industry, customer service is defined as activities that involve episodes of interaction between customers (and agents acting on the behalf of customers) and company employees when customers make inquiries, request changes to a policy, or conduct financial transactions (LOMA 1993). Virtually all of the firms in this sample had a separate customer service process at the time of the study.

⁵The competitive maturity of the North American life and health insurance industry also plays a role in the empirical analysis reported below.

⁶Of course, other IT resources besides these, such as top-management support or end-user environment, could also be relevant for customer service processes within firms. However, interviews and our analysis suggested that most of these other IT resources were either special cases of, or closely related to, these resources. Moreover, in order to bound the study and make data collection feasible, it was decided to limit the analysis to these five resources.

Generic Information Technologies. Generic information technologies refer to the set of well-known hardware and software technologies that can be purchased from outside suppliers. In the context of the customer service process, generic technologies include scanning and imaging technology, computer networks with agents and brokers, Web-enabled customer interfaces, call-tracking and customer relationship management software, computer and telephony integration, and customer service expert systems. These technologies are generic in the sense that they are available from multiple suppliers for those who wish to source them and are lacking in asset specificity in the sense that, although aimed at the customer service process, they are not specific for any particular firm. While much of this technology must ultimately be integrated into a firm's customer service process, these applications and technologies, per se, are available to all of the firms in the insurance industry. Such technologies may be valuable in an absolute sense: investing in these technologies can enhance the performance of the customer service process compared to that process without these technologies. However, since most firms have access to the same technology, such generic technologies are, per se, unlikely to explain variance in customer service performance across competing firms. Research on the diffusion of generic information technologies in different industries is consistent with these expectations. For example, Powell and Dent-Micallef (1997) in their study of the retail industry found that generic information technologies like point-of-sale terminals and electronic data interchange with suppliers did not explain variance in firm performance.

IT Spending. The level of raw dollar spending on IT is an important resource for the customer service process. For example, it has already been suggested that generic information technologies can be valuable for the customer service process. Failure to invest in IT resources and capabilities, by sourcing them internally or externally, can put a firm at a competitive disadvantage in terms of the performance of its customer service process. For this reason, firms in this industry have a strong incentive to invest in the IT assets necessary to maintain a competitive level of service. While in a given year a particular firm may face budget

constraints, over time, investing in IT has almost become a competitive necessity in this industry.⁷ As such, IT spending, per se, is not likely to explain variance in customer service process performance across firms in this industry.

Hitt and Brynjolfsson (1996) argue that to the extent that IT assets are equally available to all of the participants, in a competitive market all of the firms will make optimal IT investments in equilibrium, and no firm will gain an advantage from their spending per se. Of course, some firms may have access to capital at lower cost relative to others. However, as Mata et al. (1995) note, it is the special resources and capabilities of these firms that enable them to manage the technical and market risks associated with IT investments more efficiently, and not access to capital per se that is the source of distinctive advantage. In short, there is no reason to expect that IT spending per se, will explain variation in customer service process performance across competing firms. The above observations lead to the following hypotheses:

Hypothesis 1a: *Technical IT skills, per se, will not explain variance in the performance of the customer service process across firms in the North American insurance industry.*

Hypothesis 1b: *Generic information technologies used to support the customer service process, per se, will not explain variance in the performance of the customer service process across firms in the North American insurance industry.*

Hypothesis 1c: *The level of IT spending, per se, will not explain variance in the performance of the customer service process across firms in the North American insurance industry.*

⁷Indeed, commitments to IT spending in this industry tend to vary with the financial conditions of the industry: When profits are on the rise, IT spending across firms in the industry tends to rise, and vice versa (LOMA 1993).

While it is hypothesized that the first three IT resources, per se, may not explain variance in the performance of the customer service process, the remaining two IT capabilities may.

Shared Knowledge. Rockart (1988) and Henderson (1990) argued that it is the shared knowledge between line and IT managers that determines the strategic use of IT. Similarly, Boynton et al. (1994) use absorptive capacity theory (Cohen and Levinthal 1990) to show that an organization's IT use is influenced by the presence of a mosaic of IT-related knowledge that binds the firm's IT and line managers. A major component of a firm's absorptive capacity regarding IT is represented by the conjunction of IT and business-related knowledge possessed by and exchanged among the IT and line managers. In the context of the customer service process, it is the knowledge that the IT manager possesses about the customer service process, the knowledge that the customer service manager possesses about the potential opportunities to apply IT to improve customer service, and the common *understanding* between the IT and the line manager regarding how IT can be used to improve customer service process performance that constitute the construct we refer to as shared knowledge. Shared knowledge is, therefore, an important capability that enables the organization to conceive, effectively implement, and use IT applications to improve customer service process performance. In this regard, Nelson and Coopridge (1996) found that increasing levels of shared knowledge between IS and line groups are linked with increased operational and service performance of the IS group.⁸ Similarly, Armstrong and Sambamurthy (1999) found that shared knowledge influences IT assimilation. Additionally, recent research (Reich and Benbasat 2000) suggests that shared domain knowledge between IT and business executives influences the level of IT-business alignment, a key success factor long emphasized in the IS literature.

⁸Their shared knowledge construct shares similarities with our conceptualization, although their operationalization, level of analysis, and dependent measure differ.

Drawing on resource-based logic, Mata et al. (1995) argue that, among the commonly discussed IT resources, only *managerial IT skills* (a construct similar to shared knowledge, although these authors place more emphasis on the IT manager's side of the dyad) can be a source of sustainable competitive advantage. Shared knowledge is developed over long periods of time. The trust, interpersonal relationship, and a shared body of firm-specific knowledge between the IT and the customer service managers at a level where they are able to effectively work together to conceive novel IT applications can take years and numerous joint development projects to evolve. Thus the development of shared knowledge is often a path-dependent and socially complex process. To the extent that this knowledge is valuable and heterogeneously distributed across firms, it can be a key IT-related differentiator as it is not subject to low cost imitation. Thus, variance in the extent to which there is shared knowledge between IT and customer service managers about how IT can be used to improve the customer service process can explain differences in the performance of this process across competing firms.

Flexible IT Infrastructure. In recent years, IT infrastructure has been identified as another capability that can influence a firm's ability to use IT strategically (Allen and Boynton 1991; Armstrong and Sambamurthy 1999; Broadbent et al. 1999; Davenport and Linder 1994; Duncan 1995; Ross et al. 1996; Sambamurthy et al. 2003; Weill 1993). IT infrastructure is defined as a shared set of capital resources that provide the foundation on which specific IT applications are built (Broadbent and Weill 1997; Duncan 1995). The primary constituents of IT infrastructure are (1) computing platform (hardware and operating systems), (2) communications network, (3) critical shared data, and (4) core data processing applications (Byrd and Turner 2000).

The differential flexibility of firms' IT infrastructure makes the cost, pace, and value of IT-enabled innovation different for different firms (Broadbent and Weill 1997; Duncan 1995). A flexible IT infrastructure facilitates rapid development and implementation of IT applications that enhance

customer service process performance by enabling the organization to respond swiftly to take advantage of emerging opportunities or to neutralize competitive threats. On the other hand, an inflexible IT infrastructure may get in the way of some important initiatives, limiting the freedom of the company to respond to market forces and innovate (Davenport and Linder 1994). In this sense, flexible IT infrastructure is seen as likely to be a valuable capability for the customer service process. The flexibility and enabling nature of an IT infrastructure is manifested in the extent to which a firm adopts standards for the components of its IT infrastructure. Standards for hardware, operating systems, communications network, data, and applications imply that data and applications can be shared and accessed throughout the organization (Broadbent and Weill 1997).

A flexible IT infrastructure is a complex set of technological resources carefully planned for and developed over time. Because of its path dependent nature, there can be significant differences across firms in how their infrastructure is constituted. Moreover, these differences can be long lasting, since disassembling one infrastructure and erecting a new one can be both costly and time consuming. To the extent that the flexibility of IT infrastructure varies across firms in the insurance industry, and to the extent that a flexible infrastructure enables firms to implement IT applications to support customer service more efficiently and effectively, the variance in infrastructure flexibility could explain differences in the performance of the customer service process across these firms. These observations lead to the following hypotheses:

Hypothesis 2a: *The level of shared knowledge will explain variance in the performance of the customer service process across firms in the North American insurance industry.*

Hypothesis 2b: *The flexibility of IT infrastructure will explain variance in the performance of the customer service process across firms in the North American insurance industry.*

IT Complementarities

IT can affect customer service process performance differences across firms in at least two different ways. First, if a firm possesses valuable, rare, and costly to imitate IT capabilities like shared knowledge or a flexible IT infrastructure, then, as suggested by hypotheses 2, the application of such capabilities to the customer service process can lead to relative gains in process performance. In this sense, the valuable, rare, and costly to imitate IT capability, per se, can explain variance in customer service process performance.

Alternatively, a firm with valuable, rare, and costly to imitate IT capability may be able to leverage this capability to realize the full competitive potential of IT resources like technical IT skills, generic information technologies, and IT spending, that are, as suggested by hypotheses 1, by themselves, unlikely to explain variance in customer service process performance across firms. This is especially the case with respect to process-specific IT capabilities, such as shared knowledge, as opposed to an organizational-level capability such as a flexible IT infrastructure. The ability to generate superior customer service process performance compared to competitors, from explicit IT resources, is contingent upon the level of shared knowledge. After all, it is the shared knowledge that drives *how* IT resources like generic technologies, technical skills, and IT spending are deployed and used to improve customer service process performance. Therefore, it is hypothesized that shared knowledge has a *direct* and a *moderating* effect on the ability of a firm to achieve relative gains in customer service process performance through IT. If these moderating effects are not taken into account, the impact of explicit resources (technical IT skills, generic information technologies, and IT spending) on customer service process performance may be obscured. While these explicit IT resources, by themselves, may not explain variance in the performance of the customer service process across firms, they may help explain this variance in settings in which firms have high levels of shared knowledge. In this sense, the shared knowledge may also be an ex-

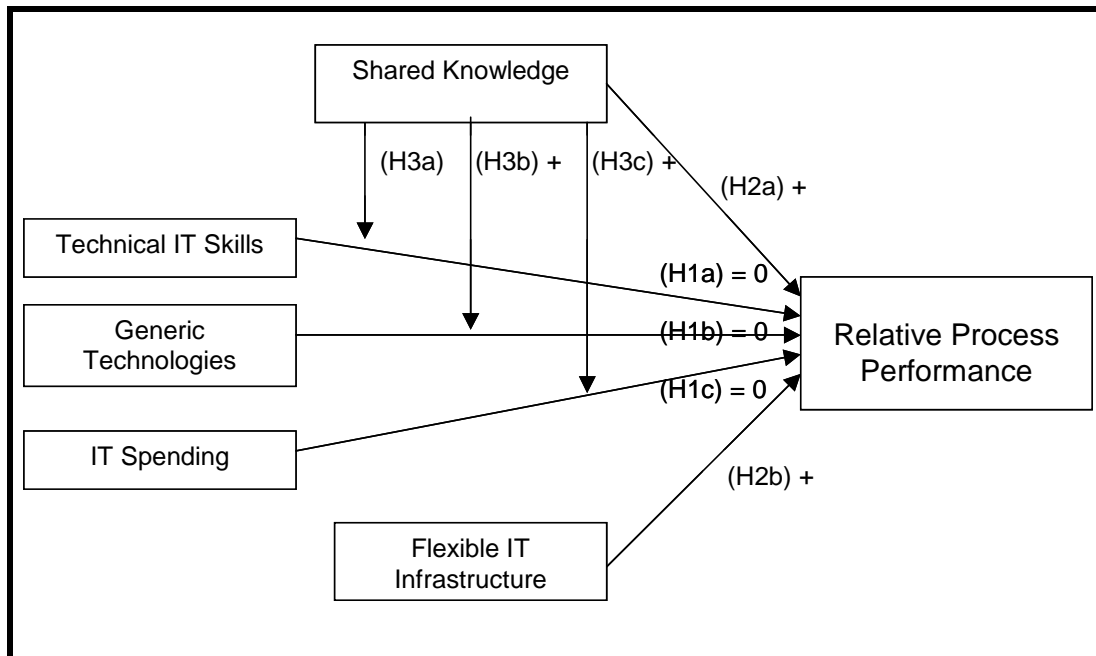


Figure 1. The Research Model

ample of a complementary organizational IT asset as discussed by Barua et al. (1996) and by Brynjolfsson et al. (1998). Thus, it is hypothesized that the interaction of the explicit resources with shared knowledge will explain variance in customer service process performance. These observations lead to the following hypotheses:

Hypothesis 3a: *Technical IT skills, in the presence of a high level of shared knowledge, will explain variance in the performance of the customer service process across firms in the North American insurance industry.*

Hypothesis 3b: *Generic information technologies used to support the customer service process, in the presence of a high level of shared knowledge, will explain variance in the performance of the customer service process across firms in the North American insurance industry.*

Hypothesis 3c: *The level of IT spending, in the presence of a high level of shared knowledge, will explain variance in the performance of the customer service process across firms in the North American insurance industry.*

The research model developed in the previous discussion is presented in Figure 1.

Research Methodology

Measures

A two-part survey instrument was designed to elicit information about all of the variables. Wherever possible, existing scales were used. However, some new scales were also developed. A copy of the surveys used to measure these variables is included in Appendix A.

Independent Variables

The scale developed by Leitheiser (1992) and by Lee et al. (1995), focusing on programming skills, was used to assess the technical skills of the IS unit.⁹ A new scale, similar to the scale developed by Powell and Dent-Micallef (1997), was developed to measure the generic information technologies variable. Interviews with IT and customer service managers were used to identify the range of well-known information technologies that are used to support the customer service process in the insurance industry. The scale identifies which of these technologies a particular firm has and the extent to which these technologies have been implemented. The primary measure for IT spending is the standard benchmark metric for enterprise IT spending, namely, IT budget¹⁰ per employee.¹¹

Shared knowledge was measured using an instrument adapted from Boynton et al. (1994). The instrument consists of two 3-item scales for two informants in each firm: the manager of the customer service unit and the senior IT executive. Obtaining perceptions about shared knowledge from both sides of the customer service and IT relationship provides a more accurate measure of this capability than relying on firm-level perceptual measures or from a single informant. Answers to

⁹The results did not change when, instead of focusing on programming skills, we used a four-item scale with emphasis on other technical skills (systems analysis, database design, operating systems, systems integration).

¹⁰The IT budget is inclusive of outsourcing costs.

¹¹Additional measures of IT spending were also explored, including the firm's total IT budget and the proportion of that budget used for customer service (customer service IT budget). The results were not substantially different. However, because these measures of spending turned out to be almost perfectly correlated with firm size and highly correlated with generic information technologies, we only present the regression results using IT spending per employee as a measure of IT spending, since this allows us to better partial out the possible effects of firm size on process performance.

these questions were averaged.¹² The variable "flexible IT infrastructure" was measured using a set of questions adapted from Duncan (1995). This scale assessed the degree to which the firm had standardized on the platform and data such that information could be easily shared across systems and business units.

Dependent Variable

The dependent variable in this study is the relative performance of the customer service process. Two approaches could have been taken in measuring the level of customer service performance across firms. First, productivity measures such as the level of throughput and process cycle time could be used. Second, the quality of the output of this process could be assessed. In this study, the latter approach was adopted.

This choice of measure for the dependent variable reflects both the specific process and the industry studied here and the theoretical interest of this study: understanding the impact of IT on the relative performance of this process across competing firms. Several authors have argued that while productivity measures may be appropriate in the manufacturing context where the output (product) can be defined and measured easily and unambiguously, they are less appropriate for service processes (Brynjolfsson 1993; Parasuraman 2002). In contexts like customer service in insurance companies, the experience of the customer is the critical competitive performance criteria, not the productivity of the process, per se. Indeed, some very inefficient customer service processes—defined in productivity terms—are routinely cited as sources of superior customer service in the marketing and strategy literatures (e.g., Collins and Porras 1994). Moreover, it is understanding variance in this customer experience that is most consistent with the notion of

¹²A measure of shared knowledge calculated by multiplying the two sides of the dyad was also explored. However, it generated the same results as the simpler additive approach, and thus this additive approach was adopted.

relative process performance that is central to this study. As Parasuraman (2002) notes, productivity measures fail

to take into consideration customers' input into the process (e.g., waiting time and emotional energy due to frustration), as well as the output experience by the customers (service performance, satisfaction).

Service quality takes the customer view into account and is, therefore, believed to be a more appropriate indicator of process performance in the context of this study.

The specific measure of customer service performance used in this study is a widely used scale adapted from Parasuraman et al. (1988). This instrument is normally administered to a firm's customers to assess its customer service quality. In order to calculate the variance in the performance of the customer service process across firms in this industry, it was necessary to measure the quality of customer service for a large number of companies. Thus, it was not feasible to administer this instrument directly to the customers of these companies. Therefore, a modified version of this instrument was administered to the customer service managers to assess the customer service performance of their units. This measure of customer service performance is called PZB in the rest of the paper.

To check for possible common method variance problems, this subjective measure of process performance was *triangulated* with three objective measures. These measures were (1) customer retention rate, (2) self-assessment from surveys distributed by a firm to its customers to assess the quality of its customer service, and (3) the complaints ratio—defined as the ratio of the number of complaints to regulators relating to an insurer, to the premiums written by that insurer—collected by the National Association of Insurance Commissioners. In general, it is assumed that firms with high quality customer service (PZB) will have high retention rates, high evaluations from customer surveys, and low complaints ratios. In fact,

the correlation between PZB and these three objective measures is consistent with these expectations. The positive and significant correlations between PZB and retention ($r = 0.355$, $p = 0.005$), self-assessment ($r = 0.489$, $p = 0.000$), and complaints ratio (reverse coded) ($r = 0.292$, $p = 0.042$) provide confidence in PZB as a reliable measure of customer service performance. Moreover, examining the hypotheses with these alternative dependent variables led to results similar to those presented here.¹³

Control Variables

The literature in Strategy and Human Resource Management identifies *service climate* as a critical non-IT resource that determines customer service performance (Hansen and Wernerfelt 1989; Schneider et al. 1992; Schneider et al. 1998). Service climate refers to the employee's perceptions of the practices, procedures, and behaviors that are expected, supported, and rewarded, with regard to customer service (Schneider et al. 1992; Schneider et al. 1998). Service climate was included as a control variable and assessed using a scale developed and validated by Schneider and his colleagues (1992, 1998). To the extent that firm size might influence customer service process performance and to the extent that firm size tends to be associated with IT resources, firm size as measured using the number of employees in the firm was also included as a control variable.

Data Collection and Analysis ■

Sample

The questionnaire was administered to managers in the life and health insurance industry during the first quarter of the year 2000. Data was collected for the year 1999. The target respondent list,

¹³The only substantive difference was that infrastructure flexibility had a significant and positive impact on customer retention.

which was compiled from two different sources, namely, the membership list of Life Office Management Association (LOMA), an industry organization, and the Dun & Bradstreet database, consisted of 800 companies comprising the life and health insurance companies operating in North America with over 100 employees. The questionnaire was divided into two parts: (1) customer service and (2) information systems. Components were to be completed and returned independently by the customer service and the IT manager respectively.¹⁴ Responses from 104 distinct firms were obtained. Responses from both the customer service and IT manager were obtained from 72 firms. This generated a matched sample response rate of 9 percent. This response rate is comparable to other studies with matched surveys from senior executives (Sabherwal and Chan 2001). A variety of analyses indicated that respondents were representative of the target population, and thus nonresponse bias does not appear to be a problem in the data.¹⁵ Descriptive statistics for the firms in the sample are shown in Table 1.¹⁶

Data Analysis

The research model and the hypotheses presented earlier were examined using a manifest variable method. All of the multivariate variables were estimated by averaging the item scores for the variable. Table 2 summarizes for each variable the number of items in the scale, the mean of items in the scale, the standard deviation of the mean, and the reliability of the scale. All the

¹⁴For the LOMA sample, surveys were sent directly to IS managers (typically, the CIO) with instructions to complete and return the information systems component and to forward the customer service component to the customer service manager in their company. For the Dun & Bradstreet sample, surveys were sent to the chief executive, with instructions to pass the surveys to the IS and customer service managers in their organization.

¹⁵Details of these analyses, omitted to conserve space, are available from the authors.

¹⁶Surveys from both the CIO and customer service managers were received from 72 different firms. However, missing data on some of these surveys reduced the sample to 62.

Cronbach's alpha values were found to be greater than 0.70, the threshold recommended by the literature, except for the scale for generic information technologies in customer service. This scale, in the spirit of a scale developed by Powell and Dent-Micallef (1997), is intended to assess the types and scope of the generic technologies implemented to support customer service. As such, variances among the items in this scale may not be as homogeneous as would be expected in the other scales, leading to a marginally lower alpha. Nevertheless, the alpha coefficient for this scale (0.65) is close to the widely accepted cutoff value of 0.70 and greater than the minimum recommended (0.60) for newly developed scales (Nunnally 1988).

In order to assess the convergent and divergent validity of the scales, a factor analysis was conducted on all of the items used in the study. The items loaded highly on the right constructs and had low loadings on the other constructs indicating high convergent and divergent validity (see Appendix B). Table 3 shows the bivariate correlations between the dependent variable customer service (PZB), the independent variables, and the control variables. The correlation matrix shows that larger firms make higher IT investments in customer service. They also implement a larger number of generic information technologies.

Ordinary least squares (OLS) regression analysis was used to test the hypotheses. The residuals for all of the models satisfied distributional assumptions. The normal probability plot of the standardized residuals suggested that the residuals are normally distributed. The plot of standardized residuals against the standardized predicted values indicated linearity and equality of variance. Multicollinearity, as indicated by variance inflation factors, was also consistently low. Table 4 shows the results of the regression analyses.¹⁷

¹⁷As noted earlier, rerunning the same set of models using customer service IT budget as a measure of IT spending produced similar results. No control for firm size was included in these models because customer service IT budget is almost perfectly correlated with firm size. However, Chow tests suggest that regression coefficients do not vary when the sample is split based on firm size.

Table 1. Descriptive Statistics of Firms Included in the Sample (N = 62)

Variable	Sample Minimum	Sample Maximum	Sample Mean	Sample Standard Deviation
Total Assets (million \$)	17.3	191,536.5	11,931.9	33,541.8
Total Premiums (million \$)	8.7	9,896.5	1,129.9	2,282.2
Annual CS Budget (million \$)	0.2	180.0	13.9	34.7
Annual IT Budget (million \$)	0.3	1000.0	48.3	147.8
Annual CS IT Budget (million \$)	0.03	300.0	17.8	46.7
Company Age (years)	3	175	58.9	40.8
Number of Customer Service Employees	3	3,600	210	574
Number of IS Employees	3	5,194	234	711
Total Employees	38	60,000	3,124	8,629
Number of Products Sold	1	13	3.9	2.5

Table 2. Independent and Dependent Variables' Mean, Standard Deviation, and Reliability

Variable Type	Variable Name	Number of Items	Mean	Standard Deviation	Reliability (Cronbach's Alpha)
Dependent Variable	Customer Service Performance (PZB)	7	3.95	0.50	0.84
Independent Variables	Technical Skills of IT Labor	3	2.84	0.77	0.79
	Generic Information Technologies	6	2.09	0.81	0.65
	Shared Knowledge	6	3.77	0.59	0.83
	Flexibility of IT Infrastructure	5	3.36	0.83	0.80
Control Variable	Service Climate	6	3.79	0.61	0.84

Table 3. Correlation Coefficients

Variables	1	2	3	4	5	6	7	8	9
1. Customer Service (PZB)	1.00								
2. Technical IT Skills	0.048	1.00							
3. Generic Technologies	0.018	0.253**	1.00						
4. IT Budget Per Employee	-0.032	-0.026	0.166	1.00					
5. Customer Service IT Budget	0.199	0.168	0.430***	0.158	1.00				
6. Shared Knowledge	0.359***	0.211*	0.303**	-0.023	0.213*	1.00			
7. Flexibility of IT Infrastructure	-0.054	0.256**	0.243*	-0.252**	0.076	0.170	1.00		
8. Service Climate	0.395***	0.224*	0.357***	0.016	0.327***	0.133	0.138	1.00	
9. Number of Employees	0.214*	0.201	0.441***	0.064	0.957***	0.254*	0.130	0.293**	1.00

*p < .10, **p < .05, ***p < .01 (All tests are two-tailed)

Table 4. Results of Regression Analysis

Hypothesis/Variable	Customer Service (Model 1)	Customer Service (Model 2)	Customer Service (Model 3)	Customer Service (Model 4)	Customer Service (Model 5)
	Std. Estimate p – value	Std. Estimate p – value	Std. Estimate p– value	Std. Estimate p– value	Std. Estimate p– value
Intercept	4.125***	4.094***	4.089***	4.129***	4.078***
Technical Skills (H1a)	-0.058 0.634	-0.045 0.714	-0.068 0.569	-0.057 0.640	-0.056 0.643
Generic CS Technologies (H1b)	-0.172 0.253	-0.200 0.185	-0.230 0.125	-0.174 0.251	-0.239 0.117
Annual IT Budget per Employee (H1c)	-0.042 0.732	-0.038 0.757	-0.054 0.653	-0.048 0.698	-0.052 0.667
Shared Knowledge (H2a)	0.395*** 0.002	0.388*** 0.002	0.403*** 0.001	0.419*** 0.001	0.411*** 0.001
Flexibility of IT Infrastructure (H2b)	-0.145 0.265	-0.154 0.234	-0.208 0.114	-0.148 0.257	-0.203 0.126
Service Climate	0.468*** 0.000	0.475*** 0.000	0.488*** 0.000	0.452*** 0.001	0.479*** 0.000
Log of Number of Employees	-0.079 0.570	-0.072 0.599	-0.079 0.559	-0.081 0.564	-0.076 0.580
Shared Knowledge × Technical IT Skills (H3a)		0.157 0.175			0.107 0.377
Shared Knowledge × Generic Technologies (H3b)			0.241** 0.047		0.193 0.145
Shared Knowledge × IT Budget / Employee (H3c)				0.094 0.431	0.058 0.630
R ²	0.326	0.350	0.376	0.334	0.387
Adjusted R ²	0.237	0.250	0.280	0.232	0.264
F – Model p – value	3.663 0.003	3.496 0.003	3.910 0.001	3.262 0.004	3.155 0.003
Power at $\alpha = 0.05$	87.65	87.31	92.59	83.26	85.05
Max VIF	1.745	1.779	1.812	1.745	1.826

*p < .10, **p < .05, ***p < .01 (All tests are two-tailed)

Model 1 tests the direct effects of IT resources and capabilities on process performance (hypotheses 1 and 2). Consistent with hypotheses 1a, 1b, and 1c, technical IT skills, generic information technologies, and IT spending did not explain significant variance in customer service performance. The direct effect of shared knowledge is positive and significant at the .01 level. Hypothesis 2(a) is, therefore, supported by the data. The effect of the flexibility of the IT infrastructure is not significant. Thus, there is no support for hypothesis 2(b). Overall, the analysis suggests that shared knowledge is a critical IT capability that explains variance in customer service process performance across firms.

The contingency relationships suggested in hypotheses 3 were tested with moderated regression analysis (Aiken and West 1991). Interaction terms were formed by first centering the main variables (subtracting the sample mean value from each observation) and then multiplying the (centered) shared knowledge variable with the (centered) measures for the three explicit IT resources (technical IT skills, generic information technologies, and IT spending). Centering eases the interpretation of the non-product terms and reduces multicollinearity between each interaction term and its component multipliers without affecting the coefficient of the interaction term itself (Aiken and West 1991, Chapter 3). However, since each interaction term shares the same multiplier, including all of the interaction terms in a single model would likely produce biased regression coefficients due to multicollinearity between the interaction terms. Therefore, Table 4 also presents models where each interaction term was included in a separate regression to minimize multicollinearity among the independent variables. Significant regression coefficients for the interaction terms support the hypotheses about the moderating role of shared knowledge.

Models 2 through 5 show the results of the moderated regressions. When all three multiplicative terms are included in the same model (model 5), their coefficients, although not significant, are in the hypothesized direction (positive). Examining the correlation between the interaction

terms suggests that the lack of significance might be due to multicollinearity between the interaction terms.¹⁸ It would, therefore, be premature to conclude that shared knowledge has no moderating role before examining the three contingency relationships independently.

Hypothesis 3a suggested that shared knowledge would interact with technical IT skills to explain variance in customer service process performance. This is tested in model 2 by adding the interaction term involving technical IT skills to the main effects model (model 1). The interaction term is not significant, although it is in the hypothesized direction. Hypothesis 3a is, therefore, not supported in the regression analyses. Hypothesis 3b, which suggested a positive interaction effect between generic information technologies in customer service and shared knowledge, is tested in model 3. The coefficient for the interaction term ($\beta = 0.241$, $p = 0.047$) is significant. Thus, there is some support for hypothesis 3b. Hypothesis 3c, suggesting a positive interaction effect between shared knowledge and IT spending, is tested in model 4. The coefficient for this interaction term is not significant. Thus, we find no support for hypothesis 3c in the regression analyses. With regard to the control variables, as expected, service climate had a significant impact on customer service. Also, firm size had no impact on customer service.

To further test for the moderating role of shared knowledge, a subgroup analysis was also conducted. The median score of shared knowledge was used to split the sample into two subsamples, labeled "high shared knowledge" and "low shared knowledge." ANOVA and Fisher's Z tests were then used to evaluate whether the two subsamples can be considered random samples from a com-

¹⁸In Model 5, the correlation between the generic technologies and IT skills interaction terms is significant ($r = 0.325$, $p = .005$). The interaction term involving generic technologies is also correlated with the interaction term involving IT budget ($r = 0.207$, $p = .054$). The estimated standard errors for the regression coefficients of the interaction terms are, therefore, likely to be large, and with large standard errors, it is unlikely that any of those coefficients would be statistically significant.

Table 5. Descriptive Statistics of the Subsamples and ANOVA Tests

Variable	Firms with <i>High Shared Knowledge</i> (n = 31)		Firms with <i>Low Shared Knowledge</i> (n = 31)		Δ
	Mean	S.D.	Mean	S.D.	
Shared Knowledge	4.25	0.32	3.29	0.36	***
Infrastructure Flexibility	3.50	0.77	3.22	0.87	ns
IT Technical Skills	2.98	0.76	2.71	0.77	ns
Generic Technologies in Customer Service	2.25	0.81	1.93	0.79	ns
Customer Service Performance (PZB)	4.16	0.46	3.75	0.46	***
Service Climate	3.89	0.53	3.68	0.67	ns
Annual IT Budget for Customer Service (million \$)	25.39	60.92	10.13	23.21	ns
Annual IT Budget Per Employee (\$)	14423.82	8435.21	13844.96	6969.07	ns
Total Assets (million \$)	20578.80	44624.47	4009.35	15187.93	ns
Total Premiums (million \$)	1529.01	2648.71	742.54	1805.80	ns
Annual Customer Service Budget (million \$)	18.93	4.77	8.99	12.97	ns
Annual IT Budget (million \$)	76.9	202.51	19.2	31.54	ns
Company Age (years)	60.84	42.23	56.87	39.84	ns
Number of Customer Service Employees	272.25	780.40	148.45	228.29	ns
Number of IS Employees	354.79	995.88	120.65	152.29	ns
Total Employees	4817.26	11805.19	1373.97	1908.23	ns
Number of Products Sold	4.07	2.32	3.79	2.72	ns

*p < .10, **p < .05, ***p < .01 (All tests are two-tailed)

mon population. Table 5 shows the descriptive statistics for the two subsamples and the results of the ANOVA tests. The analysis shows that firms with high shared knowledge had significantly better customer service performance, consistent with hypothesis 2a and our findings regarding shared knowledge discussed earlier. The sample means for all of the other independent and control variables were not statistically different across the two subsamples.

According to Baron and Kenny (1986, p. 1174),

a moderator is a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Specifically within a correlational analysis framework, a moderator is a third variable

Table 6. Correlation between IT Resources and Customer Service Performance (PZB) in the Two Subsamples

	Firms with <i>High Shared</i> Knowledge	Firms with <i>Low Shared</i> Knowledge	
Variable	<i>r</i>	<i>r</i>	Fisher Z
IT Technical Skills	0.186	-0.240*	1.62*
Generic Technologies in CS	0.132	-0.278*	1.57*
CS IT Budget	0.268*	-0.127	1.51*
IT Budget per Employee	-0.039	-0.069	0.11

* $p < .10$, ** $p < .05$, *** $p < .01$

that affects the zero-order correlation between two other variables.

Thus, the significance of the difference between two correlations of the same variables, assessed using the Fisher's Z test, is a direct test of moderation between two independent samples. Table 6 shows the result of this analysis. The small and insignificant correlation between customer service performance (PZB) and each of the three IT resources, technical IT skills, generic information technologies, and CS IT budget, disguises offsetting effects of consistently negative (and for two variables, significant) correlations with PZB for firms with low shared knowledge, and consistently positive (and significant, for one variable) correlations with PZB for firms with high shared knowledge. Comparing these correlation coefficients across the two groups (using appropriate directional one-tailed tests), the differences in the correlations across the two subsamples were all significant at the 0.10 level. No significant differences were found across the two groups when using IT Budget per employee as a measure of IT spending. The subsample analysis, therefore, provided some support for all the three hypotheses regarding the moderating role of shared knowledge.

In summary, the hypotheses regarding technical IT skills (H1a), generic information technologies used in customer service (H1b), and IT investment (H1c), were supported by the data. The analysis

also strongly supported the hypothesis regarding the role of shared knowledge (H2a). The data, however, did not provide support for the hypothesis regarding the flexibility of the IT infrastructure (H2b). The hypothesis regarding shared knowledge moderating the impact of generic technologies (H3b) was supported in both the regression and the subsample analyses. The hypotheses regarding shared knowledge moderating the impact of technical IT skills (H3a) and IT spending (H3c) received some support in the subsample analysis, but not in the regression analyses. Therefore, overall there is weak support for hypothesis 3a and 3c.

Limitations

The present study has both strengths and limitations. Prior to discussing the results, it is necessary to acknowledge the limitations so that appropriate implications of the findings can be drawn. First, the seemingly modest sample size might be a concern. However, it may be noted that all the firms in the sample are from the same industry, as is required for a process level analysis. Further, it is felt that certain loss of sample size is inevitable when collecting data from multiple sources in a single firm. It is believed that one of the distinguishing features of this study is that it combines data from two different respondents from

each organization. Collecting data from both sides of the dyad is essential in the operationalization of the shared knowledge construct. Power analysis also indicated that the statistical power exceeded the recommended 80 percent threshold. Finally, analyses suggested that the respondents are representative of the mailing sample and that a self-selection bias is unlikely to be present in the data.

Second, the possibility of common method variance with respect to the self-reported measure (PZB) of the dependent variable may also be a concern. However, the study involves two key informants in each organization, and factor analysis did not suggest that the variables had a common source. Moreover, the study involves the use of three other measures of customer service performance, namely, retention rate, self-assessment, and complaints ratios, all of which have significant positive correlations with PZB, increasing our confidence in PZB as an unbiased measure of customer service performance.

Third, the empirical analysis was conducted in the context of one specific process in the insurance industry; thus, the generalizability of the results may be limited. Further, because the methodology is cross-sectional, we can only show association, not causality. The data shows that variance in process performance across firms is associated with certain resources (e.g., shared knowledge). This suggests that this resource is valuable and rare. A longitudinal study examining the imitability of shared knowledge would be needed to show causality and directly address the question of sustainability.

Discussion and Conclusion

Organizations spend millions of dollars on IT to improve business performance. However, empirical studies examining the contribution of IT investments to firm performance show mixed results. Therefore, a theory explaining how IT can affect performance is a significant challenge to the Information Systems discipline. Our approach, synthesizing rich traditions from process-orientation and

the resource-based theory, represents one step in that direction. The resulting analysis serves to inform the debate on business value of IT and also helps to explain why some firms are able to leverage IT better than others. The approach presented in this paper suggests that the effects of IT will most clearly appear at the process level, and that resource-based logic can be used to identify the IT resources and capabilities that are most likely to explain variation in performance of these processes across firms.

This study makes several theoretical and empirical contributions. First, it distinguishes between two performance effects of IT: an absolute performance effect and a relative performance effect. IT can improve the efficiency and effectiveness of processes in an absolute sense (i.e., the cost and/or quality of processes can be superior with IT compared to what was the case before IT was used). In this paper, such IT assets and investments are described as economically valuable. However, that IT is economically valuable does not necessarily mean that IT, per se, will improve the performance of a firm's processes relative to competing firms. This depends on how widely diffused (i.e., rare) a valuable technology is, and how fast its diffusion will occur (i.e., how costly to imitate it is). More broadly, applying this distinction shifts attention away from simply describing the conditions under which IT can create value for a firm to describing conditions under which IT can create sustained advantage for firms.

The second contribution of this paper is that it goes beyond the singular focus on IT spending and empirically examines the differential effects of various IT resources and capabilities on relative process performance. Although there is conceptual work in the IS literature on how and which IT resources are most likely to affect performance (Jarvenpaa and Leidner 1998; Mata et al. 1995), and empirical work examining the relationship between broad characterizations of IT capability and firm performance (Barua et al. 2004; Bharadwaj 2000; Bharadwaj et al. 1999), this is the first study to examine the impact of specific IT resources and capabilities on relative process performance. The empirical findings are largely

consistent with resource-based expectations. Tacit, path dependent, and socially complex IT capability (shared knowledge) explains variation in process performance. Explicit IT resources (technical IT skills, generic information technologies, and IT spending) do not.

Of course, these results do not mean that firms should not invest in generic technologies and other tangible aspects of customer service. Clearly, these kinds of explicit resources are required if a firm is to provide a competitive level of service. As suggested earlier, these IT resources may be valuable in an absolute sense: investing in these resources can reduce the cost or increase the quality of customer service compared to the process without these IT resources. However, since these resources are not rare or costly to imitate, most firms in mature industries such as the insurance industry will already have them in place or can acquire them from factor markets, and thus these resources, by themselves, are unlikely to improve the relative performance of this process. Instead, their impact on process performance is conditional on the firm possessing a high degree of shared knowledge so that these technologies can be appropriately deployed and used to generate relative differentials in process performance. The interaction effects studied here demonstrate that in the right setting (namely, high levels of shared knowledge), investment in generic IT does improve relative performance. At low levels of shared knowledge, investing in generic IT may even reduce process performance. Thus, it is not generic information technologies, per se, that impact relative process performance, but this investment in the context of firm-specific ability to properly implement and use generic information technologies that generates process performance differentials across firms.

Based on these results, we conclude that superior relative process performance from IT rests less on the level of IT spending or on the technical skills of the IT staff and more on how these resources are deployed in a firm-specific manner in general, and on creating effective partnerships between IT and business managers in particular. This reaffirms the growing consensus that the context within

which IT is applied is as important as the IT itself. This contingency view of the relationship between IT investments and performance suggests that just throwing technology at a process does not necessarily improve that process. Indeed, such indiscriminant applications of technology may actually reduce process performance—an observation consistent with the results of our subsample analysis and the large negative, although insignificant, coefficient for generic information technologies reported here and with research findings reported elsewhere (Powell and Dent-Micallef 1997; Richardson et al. Zmud 2004; Wade 2002).

We find no support for the hypothesized positive relationship between the flexibility of the IT infrastructure and relative process performance. Two explanations come to mind. First, a flexible IT infrastructure is a firm-wide resource. It is likely that, although a flexible IT infrastructure has no significant positive impact on the relative performance of the customer service process, it may have a positive impact on some other processes within the firm. Second, it may simply be the case that, in an industry as mature as the North American life and health insurance industry, the options available with a flexible infrastructure are just not very valuable. Of course, this possibility can only be examined by studying the impact of infrastructure flexibility in an industry where flexibility is likely to be important (e.g., a rapidly changing industry). Each of these possibilities will need to be examined in future research.

The study raises a number of other important questions as well. First, how is it that some firms are able to develop shared knowledge, while other firms are apparently unable to develop this capability? Additional research is needed to explore the prerequisite skills required to have shared knowledge and how this capability can be developed and nurtured. In this regard, the work of Bassellier et al. (2003) is important in defining the constituents of a line managers' IT knowledge. Similar work is required to define the constituents of IT managers' knowledge of the business. Work is also required to examine the institutional conditions that facilitate or deter the development of such a capability.

Second, this study has examined shared knowledge between IT and the customer service process. Can such shared knowledge exist between IT and other processes within a firm? Do IT units that have high levels of shared knowledge with one process, such as customer service, tend to also have high levels of shared knowledge with other processes (e.g., manufacturing, research and development, and so forth)? That is, are the skills necessary to develop high levels of shared knowledge between IT and a particular process generalizable to other processes within a firm? All of these questions deserve additional attention.

Finally, this research has focused on examining the differential effects of IT resources and capabilities on the relative performance of the customer service process across a set of firms competing in a single industry. Only one non-IT related capability—service climate—was examined here, but only as a control variable. An important unanswered research question implied by this study is: How do non-IT capabilities interact with IT-resources and capabilities to affect the relative performance of processes in these firms? In the end, understanding how these investments affect the relative performance of processes within a firm may require a higher level of integration between IT research and other studies on the non-IT determinants of process performance.

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Appendix A

Survey Measurement Scales

Customer Service Component

A. Service Climate (CLI)

Please indicate, on a scale of 1 to 5, the degree to which you agree or disagree with the following statements.

<i>Strongly</i> <i>Disagree = 1</i>	<i>Disagree = 2</i>	<i>Neither Agree nor</i> <i>Disagree = 3</i>	<i>Agree = 4</i>	<i>Strongly</i> <i>Agree = 5</i>
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- CLI1. Customer service unit has established clear standards for the quality of service to be delivered.
- CLI2. The company measures and tracks the quality of service provided by the customer service unit.
- CLI3. Customer service representatives are informed about external customer evaluations of the quality of service delivered by the customer service unit.
- CLI4. The company offers competitive salaries to customer service representatives.
- CLI5. Customer service representatives are recognized for delivering quality service.
- CLI6. Customer service representatives are rewarded for delivering quality service.

B. IT Manager Knowledge (ITMK)

- ITMK1. Managers in the information systems unit understand the business operations of the customer service unit.
- ITMK2. Managers in the information systems unit understand the business strategies of the customer service unit.
- ITMK3. There is a common understanding between managers in customer service and information systems units regarding how to use information technology to improve customer service.

C. Customer Service Performance (PZB)

- PZB1. The customer service unit gives customers prompt service.
- PZB2. Customer service representatives are never too busy to respond to customers.
- PZB3. Customer service representatives are empowered to solve customers' problems.
- PZB4. When the customer service unit promises to do something for a customer by a certain time, it does so.
- PZB5. When a customer has a problem, the customer service unit shows sincere interest in solving it.
- PZB6. The customer service unit performs the service accurately the first time.
- PZB7. Customer service representatives understand customers' specific needs.

C. Technical Skills (SKL)

How would you rate the information systems units skills in the following areas?

Poor = 1

Fair = 2

Good = 3

Very Good = 4

Excellent = 5

- SKL1. Object-oriented languages and systems
- SKL2. Fourth generation programming languages
- SKL3. Client-Server application development

D. Generic Technologies in Customer Service (TCS)

Please indicate the extent to which you have implemented the following technologies to support customer service.

Don't Intend to Implement = 0

Not Yet Begun = 1

Standard/Common Implementation = 3

Highly Advanced Implementation = 5

- TCS1. Scanning/Imaging Technology
- TCS2. Network with Agents/Brokers
- TCS3. Web-enabled Customer Interaction
- TCS4. Call Tracking/Customer Relationship Management System
- TCS5. Computer Telephony Integration (CTI)
- TCS6. Customer-service Expert / Knowledge-based System

IT Investment

What is your annual IT budget (including outsourcing contracts) for 1999? \$_____

1. What percentage of IT applications directly support the customer service unit? _____
2. What percentage of computer hardware directly supports the customer service unit? _____
3. What percentage of the IS unit support staff is dedicated to supporting the customer service unit?

Appendix B

Results of Factor Analysis

Customer Service Component

	Climate	Customer Service (PZB)	IT Managers Customer Service Knowledge
CLI1	0.764		
CLI2	0.798		
CLI3	0.602		
CLI4	0.635		
CLI5	0.759		
CLI6	0.765		
PZB1		0.565	
PZB2		0.595	
PZB3		0.605	
PZB4		0.604	
PZB5		0.759	
PZB6		0.703	
PZB7		0.799	
ITMK1			0.898
ITMK2			0.899
ITMK3			0.791

Information Systems Component

	Flexible Infrastructure	Customer Service IT Knowledge	Technical Skills	Generic Technologies in Customer Service
INF1	0.410			
INF2	0.800			
INF3	0.683			
INF4	0.846			
INF5	0.826			
CSMK1		0.896		
CSMK2		0.881		
CSMK3		0.668		
SKL1			0.710	
SKL2			0.776	
SKL3			0.569	
TCS1				0.691
TCS2				0.541
TCS3				0.633
TCS4				0.534
TCS5				0.515
TCS6				0.470

The maximum cross loading on INF1 was 0.257 and the maximum cross loading on TCS6 was 0.240.

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