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Why Do Customer Relationship Management Applications Affect Customer Satisfaction?

This research evaluates the effect of customer relationship management (CRM) on customer knowledge and customer satisfaction. An analysis of archival data for a cross-section of U.S. firms shows that the use of CRM applications is positively associated with improved customer knowledge and improved customer satisfaction. This article also shows that gains in customer knowledge are enhanced when firms share their customer-related information with their supply chain partners.

Despite substantial investments in customer relationship management (CRM) applications, there is a lack of research demonstrating the benefits of such investments. In particular, there has been limited research on the role and contribution of CRM applications in managing customer encounters (Bitner, Brown, and Meuter 2000; Meuter et al. 2000). Although marketing and information systems researchers have developed theories about the effect of CRM applications, with some progress toward empirical validation (Jayachandran et al. 2005; Reinartz, Krafft, and Hoyer 2004; Romano and Fjermestad 2003; Srinivasan and Moorman 2005), there is limited knowledge about the effect of CRM applications on a firm's customer knowledge and customer satisfaction. Furthermore, prior research does not shed light on why CRM applications affect customer satisfaction or the role of complementary investments in supply chain management systems.

Against the backdrop of significant investment in CRM applications and limited empirical work on the effect of CRM applications on customer relationships, this article poses the research question, What is the effect of CRM applications on customer knowledge and customer satisfaction? We performed an empirical study using a cross-section of large U.S. firms. This study includes the development of a theoretical model and the collection of archival data from the National Quality Research Center at the University of Michigan and an *InformationWeek* survey of senior information technology (IT) managers. We examine the role of customer knowledge as a mediating mechanism to explain the effect of CRM applications on customer satisfaction. We also study the moderating effect of supply chain integration in leveraging CRM applications.

We structure the rest of the article as follows: In the next section, we review the literature and develop the hypotheses. Then, we discuss the methodology and present the results. We conclude with a discussion of the implications of the study.

Research Model and Theory

The customer equity literature provides the basic rationale for investing in customer relationships. There is increasing recognition of the importance of managing customer relationships and customer assets. Marketing has moved from a brand-centered focus to a customer-centered approach. Hogan, Lemon, and Rust (2002) argue that the ability to acquire, manage, and model customer information is key to sustaining a competitive advantage. Berger and colleagues (2002) develop a framework to assess how customer database creation, market segmentation, customer purchase forecasting, and marketing resource allocations affect customers' lifetime value to the firm. Hogan and colleagues (2002) extend this work and provide conceptual support for linking customer assets (in terms of customer lifetime value) and financial performance.

Next, we develop the hypotheses for the effect of CRM applications on customer knowledge and customer satisfaction. We also discuss the moderating role of supply chain integration to understand the effect of CRM applications on customer knowledge.

The Effect of CRM Applications on Customer Knowledge

A primary motivation for a firm to implement CRM applications is to track customer behavior to gain insight into customer tastes and evolving needs. By organizing and using this information, firms can design and develop better products and services (Davenport, Harris, and Kohli 2001; Nambisan 2002). Davenport and Klahr (1998) argue that customer knowledge has certain attributes that make it one of the most complex types of knowledge. For example, customer knowledge may be derived from multiple sources and media and may have many contextual meanings. Customer knowledge is also dynamic, and it changes rapidly.

Customer relationship management applications facilitate organizational learning about customers by enabling firms to analyze purchase behavior across transactions through different channels and customer touchpoints. Glazer (1991) provides examples of how FedEx and American Airlines used their investments in IT systems at the customer interface to gain valuable customer knowledge. More recently, firms have invested in an integrated set of tools and functionalities offered by leading software vendors to gather and store customer knowledge. Firms with greater deployment of CRM applications are in a better position to leverage their stock of accumulated knowledge and experience into customer support processes. In addition, firms with a greater deployment of CRM applications are likely to be more familiar with the data management issues involved in initiating, maintaining, and terminating a customer relationship. This familiarity gives firms a competitive advantage in leveraging their collection of customer data to customize offerings and respond to customer needs.

Customer relationship management applications help firms gather and use customer knowledge through two mechanisms. First, CRM applications enable customer contact employees to record relevant information about each customer transaction. After this information is captured, it can be processed and converted into customer knowledge on the basis of information-processing rules and organizational policies. Customer knowledge captured across service encounters can then be made available for all future transactions, enabling employees to respond to any customer need in a contextual manner. Firms can also use customer knowledge to profile customers and identify their latent needs on the basis of similarities between their purchase behaviors and those of other customers. Second, firms can share their accumulated customer knowledge with customers to enable those customers to serve themselves by defining the service and its delivery to suit their needs (Prahalad, Ramaswamy, and Krishnan 2000). The process of customer self-selection of service features provides additional opportunities for firms to learn about their customers' evolving needs and to deepen their customer knowledge.

> H$_1$: The use of CRM applications is associated with an improvement in the customer knowledge that firms gain.

The Moderating Role of Supply Chain Integration

Supply chain integration refers to the extent to which a firm shares relevant information about its customers with its supply chain partners. Supply chain integration ensures that products and services offered by various organizational units and suppliers are coordinated to provide a better customer experience. Previous research suggests that integration of IT systems in a firm's value chain is essential to the realization of the full benefits of seamless information sharing and data completeness (Brohman et al. 2003; Gosain, Malhotra, and El Sawy 2005; Rai, Patnayakuni, and Patnayakuni 2005). For example, Fisher, Raman, and McClelland (2000) note that IT-enabled data accuracy is critical for efficient forecasting and to design agile supply chain management processes. Anderson, Banker, and Ravindran (2003, p. 94) argue that "interweaving of IT links throughout the supply chain create[s] value by enabling each member of the supply chain to identify and respond to dynamic customer needs." Creating an integrated IT infrastructure enables organizational units to leverage their resources effectively to address customers' evolving needs (Sambamurthy, Bharadwaj, and Grover 2003). For example, superior customer ratings and the success of customer relationship programs at Saturn, Dell, and Southwest have been attributed to their excellent supply chain management integration (*Harvard Business Review* 2003). Conversely, industry observers have noted that the failure of many CRM efforts is due to "the propensity of firms to avoid the important 'data transformation and convergence' processes including all transactions, interactions, and networked touch points" (Swift 2002, p. 95). Thus, we expect that firms with greater supply chain integration benefit more from their CRM applications in terms of improved customer knowledge.

> H$_2$: Firms with greater supply chain integration are more likely to benefit from their CRM applications and achieve improved customer knowledge.

The Effect of CRM Applications on Customer Satisfaction

Customer satisfaction has significant implications for the economic performance of firms (Bolton, Lemon, and Verhoef 2004). For example, customer satisfaction has been found to have a negative impact on customer complaints and a positive impact on customer loyalty and usage behavior (Bolton 1998; Fornell 1992). Increased customer loyalty may increase usage levels (Bolton, Kannan, and Bramlett 2000), secure future revenues (Rust, Moorman, and Dickson 2002), and minimize the likelihood of customer defection (Anderson and Sullivan 1993; Mithas, Jones, and Mitchell 2002). Customer satisfaction may also reduce costs related to warranties, complaints, defective goods, and field service costs (Fornell 1992). Finally, in a recent study, Anderson, Fornell, and Mazvancheryl (2004) find a strong relationship between customer satisfaction and Tobin's q (as a measure of shareholder value) after controlling for fixed, random, and unobservable factors.

Customer relationship management applications are likely to have an effect on customer satisfaction for at least three reasons. First, CRM applications enable firms to customize their offerings for each customer. By accumulating information across customer interactions and processing this information to discover hidden patterns, CRM applica-

tions help firms customize their offerings to suit the individual tastes of their customers. Customized offerings enhance the perceived quality of products and services from a customer's viewpoint. Because perceived quality is a determinant of customer satisfaction, it follows that CRM applications indirectly affect customer satisfaction through their effect on perceived quality. Second, in addition to enhancing the perceived quality of the offering, CRM applications also enable firms to improve the reliability of consumption experiences by facilitating the timely, accurate processing of customer orders and requests and the ongoing management of customer accounts. For example, Piccoli and Applegate (2003) discuss how Wyndham uses IT tools to deliver a consistent service experience across its various properties to a customer. Both an improved ability to customize and a reduced variability of the consumption experience enhance perceived quality, which in turn positively affects customer satisfaction. Third, CRM applications also help firms manage customer relationships more effectively across the stages of relationship initiation, maintenance, and termination (Reinartz, Krafft, and Hoyer 2004). In turn, effective management of the customer relationship is the key to managing customer satisfaction and customer loyalty.

H₃: The use of CRM applications is associated with greater customer satisfaction.

The Mediating Role of Customer Knowledge

Although customer knowledge and customer satisfaction by themselves are important metrics for tracking the success of CRM applications, from a theoretical perspective, it is important to consider whether the association of CRM applications with improvement in customer satisfaction is mediated by an improvement in customer knowledge. From a managerial perspective, an understanding of causal mechanisms will shed light on the conditions that facilitate CRM success in terms of customer satisfaction. We posit that the real value of CRM applications lies in the collection and dissemination of customer knowledge gained through repeated interactions. This customer knowledge subsequently drives customer satisfaction because firms can tailor their offerings to suit their customers' requirements. Previous research provides support for this view. For example, Bharadwaj (2000) notes the advantages of gathering customer knowledge from customer encounters and disseminating this knowledge to employees for cross-selling and forecasting product demand. Bolton, Kannan, and Bramlett (2000) provide empirical evidence that IT-enabled loyalty programs enable firms to gain valuable customer knowledge about customers' purchase behavior. Jayachandran, Hewett, and Kaufman (2004) show that customer knowledge processes enhance the speed and effectiveness of a firm's customer response. Better knowledge of customer behavior enables firms to manage and target customers on the basis of evolving service experiences rather than stable demographic criteria, which increases the perceived value of the firm's offering and decreases the chance of loyal customers defecting to the competition. Firms also derive a competitive advantage by making cumulative customer

knowledge available to their customers to help those customers manage their internal operations using information from the firm (Glazer 1991). As the preceding discussion suggests, better customer knowledge facilitated by CRM should enable a firm to improve its customer satisfaction. Therefore, we posit that the effect of CRM applications on customer satisfaction is mediated through customer knowledge.

H₄: Customer knowledge mediates the effect of CRM applications on customer satisfaction.

Because this research studies the effect of CRM applications on customer satisfaction, we control for other relevant variables to account for alternative and complementary explanations. We control for firms' aggregate IT investments because such investments influence perceived quality, perceived value, and customer satisfaction (Prahalad, Krishnan, and Mithas 2002). We control for firm size, which may influence a firm's ability to benefit from CRM investments as a result of organizational inertia and a greater potential in large organizations for leveraging slack resources. Finally, consistent with previous research, we control for sector differences (manufacturing versus services), which may affect gains in customer knowledge and customer satisfaction.

Research Design and Methodology

A major strength of this study is its use of data on key independent and dependent variables from separate sources to avoid common method bias. We obtained the CRM and IT-related data from *InformationWeek*, a leading, widely circulated IT publication in the United States. *InformationWeek* collected this data by surveying the top IT managers at more than 300 large U.S. firms during the 2001–2002 period. *InformationWeek* is considered a reliable source of information, and previous academic studies have used data from *InformationWeek* surveys (Santhanam and Hartono 2003). We collected customer satisfaction data (American Customer Satisfaction Index [ACSI]) that was tracked by the National Quality Research Center (NQRC) at the University of Michigan to obtain an archival measure of customer satisfaction for the firms common in the *InformationWeek* data and the NQRC database.

Variable Definition

ACSI. The ACSI is considered a reliable indicator of a firm's customer satisfaction, and the data have been used in several academic studies in the accounting and marketing literature (e.g., Anderson, Fornell, and Mazvancheryl 2004; Fornell et al. 1996).

Customer knowledge (CUSTKNOW). Customer knowledge is a binary variable for which 1 indicates that a firm has gained significant knowledge about its customers from its customer-related IT systems, and 0 indicates that a firm does not perceive any gains in customer knowledge from its customer-related systems.

CRM applications (CRMAPLC). This variable encompasses both the legacy IT applications (i.e., the applications that firms developed before modern CRM applications were

introduced) and newer IT applications (i.e., the integrated suite of marketing and sales applications developed by CRM and enterprise resource-planning vendors). We measured the first component of CRM applications (legacy customer-related IT applications) using a 12-item summative index that indicates the deployment of IT systems to support business processes associated with customer acquisition and disposal of a firm's products and services. The specific IT systems covered by this scale are related to product marketing information, multilingual communication, personalized marketing offerings, dealer locator, product configuration, price negotiation, personalization, transaction system, online distribution and fulfillment system, customer service, and customer satisfaction tracking. We measured the second component of CRM applications (modern CRM systems) using a binary variable (1 = the firm has deployed modern CRM systems, 0 = the firm has not deployed modern CRM systems). We added these two components of CRM systems after standardizing the legacy CRM component (mean = 0, standard deviation = 1). Thus, the variable (i.e., CRM applications) provides greater weight to modern CRM systems but also captures the deployment of legacy customer-related IT applications. Overall, this variable measures a firm's sophistication in managing customer-related information.

Supply chain integration (SCMINTGR). This variable refers to the extent to which a firm's suppliers and partners are included in its electronic supply chain and how much access they have to the firm's customer-related data or applications. It consists of a five-item summative index that describes whether a firm provides its suppliers with electronic access to the following types of application or data: sales forecasts, marketing plans, sales or campaign results, customer demographics, customer loyalty, and satisfaction metrics. We used the standardized (after standardization, mean = 0, standard deviation = 1) value of this variable in our estimation for easier interpretation of the results, particularly because we also investigate the interaction of this variable with CRM applications.

IT intensity (ITINVPC). This variable refers to the level of IT investment as a percentage of the firm's sales revenue.

Industry sector (MFG). This indicator variable represents whether the firm's offering is primarily a good or a service (1 = good, 0 = service).

Firm size (SIZE). This variable is the natural log of the firm's sales revenue.

Empirical Models

Because the dependent variable (i.e., customer knowledge) appears as a binary choice, the ordinary least squares (OLS) approach for modeling the binary dependent variable is not appropriate because of heteroskedastic error distribution. A linear model may result in predicted probabilities less zero or greater than one. In addition, a linear model does not allow us to consider the nonlinear nature of the effect of independent variables on the binary dependent variable. To overcome these estimation problems inherent in the OLS approach, we conducted our analysis for this model using the probit approach with the following specification:

$$(1) \quad \text{Probability(CUSTKNOW = 1)} = \Phi(\beta_{10} + \beta_{11}\text{CRMAPLC}$$
$$+ \beta_{12}\text{ITINVPC} + \beta_{13}\text{MFG}$$
$$+ \beta_{14}\text{SIZE} + \beta_{15}\text{SCMINTGR}$$
$$+ \beta_{16}\text{CRMAPLC}$$
$$\times \text{SCMINTGR} + \varepsilon),$$

where βs are the parameters for the respective variables, and Φ denotes the normal cumulative distribution function (the area under the normal curve).

We used the OLS approach to estimate the customer satisfaction model because the ACSI is a continuous measure of customer satisfaction.

$$(2) \quad \text{ACSI} = (\beta_{20} + \beta_{21}\text{CRMAPLC} + \beta_{22}\text{ITINVPC} + \beta_{23}\text{MFG}$$
$$+ \beta_{24}\text{SIZE} + \beta_{25}\text{SCMINTGR} + \beta_{26}\text{CUSTKNOW} + \varepsilon).$$

The sample size for Equation 1 is 360, and the sample size for Equation 2 is 40. Table 1 shows the results of empirical estimation of the models in Equations 1 and 2.

Results

Consistent with H_1, we find that CRM applications are positively associated with an improvement in customer knowledge (Column 1 of Table 1; $\beta_{11} = .280$, $p < .001$). Because the probit model is inherently nonlinear, we interpret the effect of each individual variable, holding all other variables at their mean values.

In H_2, we posit a moderating effect of supply chain integration on the relationship between CRM applications and customer knowledge. We find support for this hypothesis because the joint hypothesis test for the terms involving CRM applications and the interaction of CRM applications with supply chain integration is statistically significant. This result suggests that CRM applications are likely to have a greater association with customer knowledge when firms are electronically integrated in their supply chain and share customer-related data with their supply chain partners.

We also find support for H_3, which posits a positive association between CRM applications and customer satisfaction (Column 2 of Table 1; $\beta_{21} = 1.266$, $p < .069$). In H_4, we suggest that the association between CRM applications and customer satisfaction is mediated by the effect of CRM applications on customer knowledge. We used the Sobel test to assess this mediation effect (Baron and Kenny 1986). We find evidence for the indirect effect of CRM applications on customer satisfaction mediated through customer knowledge ($\beta_{26} = 4.307$, $p < .028$). This result implies that, holding other factors constant, firms that report an improvement in customer knowledge due to their customer-related IT systems have ACSI scores 4.307 points greater than firms that report no gains in customer knowledge following investments in CRM applications. Because the coefficient of the CRM applications variable is statistically significant in Column 2 of Table 1, our results suggest partial mediation and imply that CRM applications may also have a direct effect on customer satisfaction.

The results showing the effect of control variables on customer satisfaction also provide useful insights. Note that

TABLE 1
Customer Knowledge and Customer Satisfaction Models

Dependent Variable	Model 1: Improvement in Customer Knowledge (Probit)		Model 2: ACSI (OLS)[a]	
CRM applications	β_{11}	.280*** (.001)	β_{21}	1.266* (.069)
IT investments as percentage of revenue	β_{12}	.042* (.056)	β_{22}	−.437** (.011)
Manufacturing[b]	β_{13}	.011 (.474)	β_{23}	7.420*** (.000)
Firm size	β_{14}	.254*** (.009)	β_{24}	−.987** (.046)
Supply chain integration	β_{15}	.011 (.453)	β_{25}	−.555 (.166)
Interaction term (CRM × supply chain integration)	β_{16}	.120* (.084)		
Improvement in customer knowledge			β_{26}	4.307** (.028)
Constant	β_{10}	.488** (.018)	β_{20}	73.333*** (.000)
Observations		360		40
Overall fit	χ^2	28.06	R^2	.661

*$p < .10$ (one-tailed test).
**$p < .05$ (one-tailed test).
***$p < .01$ (one-tailed test).
[a]We also conducted an additional analysis that controlled for the ACSI score before CRM implementation, and we obtained broadly similar results.
[b]We also estimated models with more detailed industry classification, and our primary results remain unchanged.
Notes: p values are shown in parentheses.

when we control for the presence of CRM applications, the effect of IT investments on customer satisfaction is negative and statistically significant (Column 2 of Table 1; $\beta_{22} = -.437$, $p < .011$). This result is consistent with the observation that specific IT applications, such as CRM, that are directly involved in business processes affecting the customer experience may be much more effective in improving customer satisfaction than are aggregate IT investments (Mithas, Krishnan, and Fornell 2002). Focusing on CRM applications also avoids aggregation across several IT applications, in which applications may be relevant for customer satisfaction and others may have a negative or zero impact (Banker et al. 2005; Kauffman and Weill 1989; Mukhopadhyay, Kekre, and Kalathur 1995). Column 2 of Table 1 also shows that, on average, manufacturing firms have greater customer satisfaction than services firms, a finding that is consistent with previous research (Fornell et al. 1996).

Additional Analyses

We conducted additional sensitivity analyses to check the robustness of our results. Because Equation 1 uses data from *InformationWeek* sources on dependent and independent variables, we tested for common method bias using Harman's one-factor test. Because no single factor emerged as a dominant factor accounting for most of the variance, common method bias is unlikely to be a serious problem in the data.

As we previously noted, the variable (i.e., CRM applications) represents a combination of legacy CRM systems and modern CRM applications. We considered whether the use of modern CRM applications (captured by a binary variable in our data set) "causes" customer knowledge. Because a treatment such as CRM is not exogenously assigned to firms, we investigated the sensitivity of our results due to the potential correlation of CRM with unobservable variables that may have affected our findings (Boulding and Staelin 1995; Wierenga, Van Bruggen, and Staelin 1999). We used a matching estimator based on propensity scores to calculate the treatment effect of CRM implementation on improvement in customer knowledge (Heckman, Ichimura, and Todd 1997; Rubin 2003). Using a procedure that Rosenbaum (2002) suggests, we bound the matching estimator to evaluate the uncertainty of the estimated treatment effect due to selection on unobservables.

After matching the propensity scores and thus adjusting for the observed characteristics, we find that the average CRM effect for improvement in customer knowledge is positive and statistically significant. This calculation is based on the assumption that treatment and control groups are different because they differ on the observed variables in the data set. However, if treatment and control groups differ on unobserved measures, a positive association between treatment status and performance outcome would not necessarily represent a causal effect (Boulding and Staelin 1995). Given that we already accounted for selection bias due to

observed characteristics, sensitivity analysis provides an assessment of the robustness of treatment effects due to factors not observed in the data. Because it is not possible to estimate the magnitude of selection bias due to unobservables with nonexperimental (i.e., observational) data, we calculated the upper and lower bounds on the test statistics used to test the null hypothesis of the no-treatment effect for different values of unobserved selection bias.

For firm i, assume that u_i is an unobserved variable and that γ is the effect of u_i on the probability of participating in a treatment. Under the assumption that the unobserved variable u is a binary variable, the following expression can be derived (Rosenbaum 2002):

$$1/\Gamma \leq [\pi_i/(1 - \pi_i)]/[\pi_j/(1 - \pi_j)] \leq \Gamma,$$

where $\Gamma = \exp(\gamma)$, i and j are two different firms within a stratum, and π is the conditional probability (propensity score) that a firm with given observed characteristics will be in the treatment group. If unobserved variables have no effect on the probability of getting into the treatment group (i.e., $\gamma = 0$), or if there are no differences in unobserved variables (i.e., $[u_i - u_j] = 0$), there is no unobserved selection bias, and the odds ratio will be $\exp(0) = 1$. In the sensitivity analysis, we evaluate how inferences about the treatment effect will be altered by changing the values of γ and $(u_i - u_j)$. If changes in the neighborhood of $\exp(\gamma) = 1$ change the inference about the treatment effect, the estimated treatment effects are posited to be sensitive to unobserved selection bias.

We find that improvement in customer knowledge is not sensitive to unobserved selection bias even if the binary unobserved variable makes it twice as likely for a firm to be in the treatment group than in the control group (after we control for several observed characteristics). Overall, these results provide evidence for the robustness of our findings, showing the positive effect of CRM applications on customer knowledge and, in turn, on customer satisfaction.

Discussion and Conclusion

Our goal in this research was to study the effect of CRM applications on customer knowledge and customer satisfaction. We developed a theoretical model that posits a mediating role of customer knowledge and a moderating role of supply chain integration in explaining the effect of CRM applications on customer satisfaction. We used archival data on CRM applications and a perceptual measure of customer knowledge on a cross-section of large U.S. firms during the 2001–2002 period. The study's time frame encompasses a period when firms made significant investments in IT, particularly Internet-based and integrated suites of CRM systems. We matched part of this data set with the sample of firms common to the ACSI to study the effect of CRM applications on customer satisfaction.

Consistent with our expectations, we find that CRM applications are associated with a greater improvement in customer knowledge when firms are willing to share more information with their supply chain partners. Our results suggest that the effect of CRM applications on customer satisfaction is mediated by an improvement in firms' cus-

tomer knowledge. These results lend support to our previously developed theory and conceptual framework.

Contributions and Research Implications

This study makes three contributions: First, it builds on previous research that links IT systems and customer satisfaction to contribute to the cumulative knowledge in this stream of literature (Balasubramaniam, Konana, and Menon 2003; Brynjolfsson and Hitt 1998; Chabrow 2002; Devaraj and Kohli 2000; Susarala, Barua, and Whinston 2003). More specifically, given the paucity of research on the benefits gained from CRM technology investments, this study augments the understanding of the beneficial effects of CRM applications by relating them to customer knowledge and customer satisfaction at the firm level. We extend previous research on the effect of CRM processes at the customer-facing level in European countries (Reinartz, Krafft, and Hoyer 2004) and at the strategic business unit level in the United States (Jayachandran et al. 2005) by providing answers to strategic questions about the effect of CRM technology investments on customer knowledge and customer satisfaction. By emphasizing the strategic benefits of CRM applications in terms of customer knowledge and customer satisfaction, we provide a complementary view of judging returns from CRM applications by considering nontangible aspects that are critical for the creation of shareholder wealth (Anderson, Fornell, and Mazvancheryl 2004).

Second, our study points to the importance of customer knowledge as one of the mediating mechanisms that explains the association between CRM applications and customer satisfaction. Although several studies provide conceptual support for the effect of CRM applications on customer knowledge, our study empirically establishes this association. More broadly, our study provides support for the emerging view that IT applications affect firm performance by enabling other business processes and capabilities, which in turn may affect firm performance (Mithas et al. 2005; Pavlou et al. 2004).

Third, the results of this study suggest that it is important to account for the effect of factors such as supply chain integration in the evaluation of returns from CRM applications. We find that though CRM applications are associated with customer knowledge and customer satisfaction, they are even more beneficial if firms share their customer-related information with supply chain partners. This result provides empirical support for the importance of supply chain integration for firm performance (Chopra and Meindl 2003; Fisher, Raman, and McClelland 2000; Gosain, Malhotra, and El Sawy 2005; Narasimhan and Jayaram 1998). This finding is also consistent with studies by Barua and colleagues (2001) and Rai, Patnayakuni, and Patnayakuni (2005), emphasizing the importance of flexibility in the supply chain and sharing information with supply chain partners.

Directions for Further Research

We identify several promising areas for further research in this stream of literature. First, firm strategies for treating customers may differ depending on a business-to-consumer

(B2C) or business-to-business (B2B) context. These differences arise because of the differential ability of firms to negotiate Pareto-optimal contracts across these contexts, the large but infrequent purchases in the B2B context (compared with small but frequent purchases in the B2C context), and the presence of multiple stakeholders in the buying center in the B2B context (compared with individual decision making in the B2C context). Future studies could explore whether CRM initiatives in the B2B context have an effect on customer satisfaction and other customer-based metrics.

Second, although our study suggests that the association between CRM applications and customer satisfaction is mediated by customer knowledge, note that CRM applications merely enable firms to collect customer knowledge. Only when firms act on this knowledge by modifying service delivery or by introducing new services will they truly benefit from their CRM applications.[1] Furthermore, firms may need to make changes in their incentive systems and institute complementary business processes to leverage CRM investments. There is a need for further research to trace the causal chain linking CRM applications and customer satisfaction at a finer level of granularity by specifically accounting for such complementary actions. The studies by Barua and colleagues (2004), Barua and colleagues (2001), and Wu, Mahajan, and Balasubramaniam (2003) provide good instrumentation and research design for undertaking such research.

Finally, although many firms justify the implementation of CRM applications based on expected gains in customer satisfaction, there is a need for further research to examine the benefits in terms of increased revenue, profitability, and market value compared with the costs of implementing CRM applications. Equally, there is a need to consider and quantify the potential risks of not implementing CRM applications in a competitive environment. An attractive area for further research may be to evaluate the extent to which the implementation of CRM applications helps firms enhance the net present value of their customer base and improve the effectiveness of cross-selling and one-to-one marketing programs (Peppers and Rogers 2004).

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[1]We thank an anonymous reviewer for this insightful observation.

Managerial Implications

This study also has several managerial implications. First, for firms evaluating CRM applications, it is important to understand the conditions under which deployment of those applications contribute to improved customer knowledge and customer satisfaction. Our results showing the importance of supply chain integration in realizing the benefits from CRM applications could be useful to managers who are currently evaluating or implementing CRM applications. Our analysis shows that firms with greater supply chain integration are more likely to benefit from CRM applications in terms of customer knowledge and customer satisfaction. The results imply that firms need to be willing to share their customer-related information with supply chain partners to benefit from the implementation of CRM applications.

Second, the importance of customer knowledge as a mediator for customer satisfaction suggests that in addition to implementing CRM, managers should also ensure that customer knowledge is disseminated across customer touchpoints in order to benefit in terms of customer satisfaction. An implication of this finding is that managers need to institute measurement systems to capture the gains in customer knowledge following the implementation of CRM applications because gains in customer knowledge are a precursor to gains in customer satisfaction.

Conclusion

This research empirically tested the effect of CRM applications on customer knowledge and customer satisfaction. Using archival data on a broad cross-section of U.S. firms, we found that CRM applications are likely to affect customer knowledge when they are well integrated into the supply chain. Our findings provide empirical support for the conjectures that CRM applications help firms gain customer knowledge and that this knowledge helps firms improve their customer satisfaction. Our research contributes to empirically valid theory by synthesizing insights from the marketing and information systems literature and by investigating the effect of organizational variables that leverage CRM investments. Overall, our results suggest that firms that make investments in CRM applications reap significant intangible benefits, such as improved customer knowledge and customer satisfaction. Achieving such customer-focused business objectives is a critical ingredient for success in increasingly competitive markets.

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