

Expanding Business-to-Business Customer Relationships: Modeling the Customer's Upgrade Decision

This article develops a model of a business customer's decision to upgrade service contracts conditional on the decision to renew the contract. It proposes that the firm's upgrade decision is influenced by (1) decision-maker perceptions of the relationship with the supplier, (2) contract-level experiences, and (3) interactions between firm- and contract-level variables. The authors model the firm's decision as a binary logit model with random parameters for the contract-level variables and fixed parameters for the firm-level variables. They estimate the model with data describing more than 2000 service contracts and find that decision-maker satisfaction, service quality, and price have a significant effect on the decision to upgrade; price and satisfaction also moderate the effect of service quality on the decision. Simulations indicate that modest improvements in service quality for a focal contract can have a relatively large, positive effect on the likelihood that the firm will upgrade. The results suggest that suppliers need to manage their firm relationships at both the individual contract level and the overall firm level. In addition, the results suggest specific windows of opportunity for suppliers when firms may be more likely to upgrade to higher-level service contracts.

Keywords: customer relationships, upgrades, service quality, satisfaction, retention

This article focuses on the customer's decision to upgrade a service contract. A product upgrade is a form of relationship expansion in which the customer purchases an expanded offering—a higher-price, augmented good or service (with higher service levels or additional features)—instead of repurchasing a low-price good or service (with lower service levels or fewer features) from the same supplier. Recently, researchers have developed predictive and normative models that are relevant to consumer service upgrades in industries such as airlines, banks, and theaters (e.g., Ngobo 2005). For example, Li, Sun, and Wilcox (2005) model a consumer's sequential acquisition of banking services on the basis of "maturity" (e.g., demographics, prior purchases). We have not been able to discover any theory-based models of the factors that influence a firm's decision to upgrade a service contract over time. This gap in the literature is rather remarkable because firms frequently buy fixed-price service contracts from suppliers in many industries, including computing, telecommunica-

tions, and information services; repair and maintenance services for engineering, medical, and/or other equipment; and services that support financial, health, or energy management systems. For example, General Electric, Hewlett-Packard, ServiceMaster, and Verizon are major suppliers of service contracts to firms. Service contracts are typically offered at different levels. For example, a "low-level" contract may promise reactive service (e.g., repairs), whereas a "high-level" service contract may promise proactive service (e.g., repairs and preventative maintenance). A large firm may purchase as many as 20–50 service contracts from a service supplier. An upgrade may occur on a given service contract whenever a firm has the opportunity to move (contractually) from a low level of service to a higher level of service.

Marketing academics and practitioners have long been interested in the nature of business-to-business (B2B) relationships (e.g., Dwyer, Schurr, and Oh 1987). An early study of B2B relationships found that the customer's overall assessment of the firm was a key determinant of his or her decision to continue to conduct business with the firm (Jackson 1985). A recent study by Cannon and Perreault (1999) shows how business customers' evaluations of supplier performance vary across different types of relationships. Research in services marketing has focused on cross-sectional studies of consumers' and business customers' switching behavior (e.g., Ganesh, Arnold, and Reynolds 2000; Keaveney 1995). For example, Heide and Weiss (1995) find that an organizational buyer's decision to switch to a new vendor of a high-technology product depends on his or her perception of rapid technological change, his or her prior experiences with vendors, and buying process formalization. However, we could find no studies that examine

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the antecedents of B2B customer upgrade behavior (for an overview of prior research in this area, see Table 1).

We address this gap in the literature by developing a model of how firms make upgrade decisions for fixed-price service contracts. We propose that the firm's decision to upgrade is influenced by the decision maker's perceptions of the supplier (i.e., at the relationship or account level), contract-level service experiences with the supplier, and interactions between supplier- and contract-level variables. Our study context is the repurchase of system support services by large firms. The firm's decision to upgrade a contract is represented by a binary logit model with random parameters for the contract-level variables and fixed parameters for the supplier-level variables. We estimate the model with cross-sectional, longitudinal data from a supplier of system support services with 120 business customers in Germany and the United Kingdom, representing a total of more than 2000 contracts.

Our study contributes to research on business customer-supplier relationships in several ways. First, it highlights the importance of understanding the relationship at both the supplier (i.e., account) level and the individual contract level because it demonstrates that both dimensions influence the firm's upgrade decision. Second, the results suggest a complex role for customer satisfaction, product-customer fit, and service quality, providing novel opportunities for the supplier to use sales and service functions to upgrade customers to higher (more expensive and potentially profitable) levels of services. Third, compared with prior research, the results show significant differences between the factors that influence the firm's decision to upgrade a contract and those that influence the firm's decision to renew a contract. Fourth, from a managerial perspective, the results suggest specific actions firms can take to influence customer upgrades. Finally, the data examined in this study are of the type available to many B2B firms, so it is possible for practitioners to apply our model to their individual business contexts.

Literature Review and Model Development

In this section, we develop a model of the firm's decision to upgrade a service contract conditional on the decision to renew the contract. In other words, the firm has already decided to repurchase a service contract from the same supplier; our model describes the firm's decision about whether to purchase a contract at the same service level or higher.¹ The factors affecting service contract renewal, service usage, and cross-buying (including upgrading and downgrading) are not always the same, and when the factors are the same, the predicted effect (positive, negative, or neutral) is not always the same (Bolton, Lemon, and Verhoef 2004). Thus, by framing the firm's decision problem in this way, our research isolates the factors that uniquely affect the

¹Firms may also decide to "downgrade" or purchase a lower level of service; we find no incidence of downgrading in this context and therefore reserve the issues associated with downgrading for further research.

upgrade decision. From the firm's perspective, the upgrade decision is the process of solving the problem of market matching and congruence (Alderson 1965). In essence, the firm and the supplier are engaging in dynamic adaptation (Dickson 1992); that is, the supplier has distinct levels of market offerings, and firms are heterogeneous with respect to their specific market needs. The firm engages in a problem-solving process to find the level of contract (appropriate level of service from the supplier) that best meets its needs. In this study, we examine specific factors the firm may use to enhance this market matching process.

All our predictions regarding the upgrade decision are made under *ceteris paribus* conditions—that is, after we control for other factors. In our discussion, we distinguish between factors associated with the specific contract and factors associated with the supplier. At the contract level, we propose that firms are influenced by service quality and price. At the supplier level, we propose that firms are influenced by decision-maker perceptions of the buyer-seller relationship—especially assessments of satisfaction and the criticality of the firm's needs—which may be considered account characteristics. We hypothesize interactions between firm- and contract-level variables. The model also includes covariates that control for relationship characteristics (share of customer, relationship duration) and contract type. By incorporating share of customer and price discount, we also account for competitive effects, which tend to be stronger when share is low or price discount is high.

Service Quality

Firms' prior service experiences, especially service quality, at the contract level are likely to influence the decision to upgrade a service contract (Zeithaml 1988). Unlike an initial purchase decision, the firm's upgrade decision is likely to depend on service quality under the current contract (see Kalwani and Narayandas 1995). The firm has many opportunities to assess the service during its experiences with suppliers, thereby learning to make more effective purchase decisions (Dodgson 1993). Organizational norms about the quality of service evolve through ongoing transactions and are based on prior experiences (Coleman 1990). Thus, when a focal contract has poor service quality, the firm is likely to conclude that the service level on the focal contract is inadequate for its needs, so it is less likely to renew the contract (Bolton and Myers 2003). Moreover, when competition exists and switching costs are low, suppliers that deliver consistently bad service are forced to exit the marketplace.

At the same time, unlike many other purchase decisions, the benefits of upgrading a service contract may seem greater when the firm has experienced poor service quality. There are three reasons poor service quality can result in upgrade. First, attribution theory suggests that people are likely to make causal attributions based on their prior service experiences (Folkes 1988). Thus, we believe that if other experiences are satisfactory and the firm intends to renew (i.e., *ceteris paribus*), the decision maker is likely to attribute poor service quality on the focal contract to an inadequate level of service contract. Second, prior research indicates that anticipation of regret may influence repeat purchase decisions such that anticipation of regret associ-

TABLE 1
Studies of Repeat Purchases and Service Quality

	Boulding et al. (1993)	Kalwani and Narayandas (1995)	Rust, Zahorik, and Keiningham (1995)	Rust et al. (1999)	Ganesh, Arnold, and Reynolds (2000)	Bolton and Myers (2003)	Li, Sun, and Wilcox (2005)	Ngobo (2005)	Bolton, Lemon, and Bramlett (2006)	Bolton, Lemon, and Verhoef (2006)
Topic	Model of service quality and repeat purchase intentions as function of "will" and "should" expectations	Investigation of whether relational approach to serving customers "pays off" in sales and profitability	An investigation of return on service quality	Model of customer expectation updating, focusing on distributions of expectations	A comparison of characteristics of consumers who switched banks and consumers who stayed loyal	Global market segmentation for services	Model of how customer demand for multiple products from a single provider evolves over time	An investigation of why some consumers migrate upward ("up-buy") and some migrate downward ("down-buy") in a service relationship over time	Service contract renewal as a function of average service levels, variability in service levels (especially extreme outcomes), and timing of service delivery	Firm's service contract upgrade decision modeled as a function of perceptions of its relationship with a supplier at the enterprise level, contract-level experiences, and interactions between firm-level and contract-level variables
Analysis	Longitudinal experiment and cross-sectional survey	Cross-sectional and longitudinal	Cross-sectional	Cross-sectional experiment	Cross-sectional	Cross-sectional	Longitudinal	Longitudinal and cross-sectional	Longitudinal	Longitudinal
Dependent Variables	Repeat purchase intentions	Changes in net sales, return on investment, and other variables	Market share and net present value derived from consumer repeat purchase intentions	Perceived quality, intentions, word of mouth	No single dependent variable	Sales price elasticity for low-support contracts and sales price elasticity for high-support contracts	Buy/not buy banking products (e.g., loan, debit card, money market account)	Stay/defect, migration intentions (subscribe or not)	Renewal decision for a single contract conditional on renewal	Upgrade decision for a single contract conditional on renewal
Sample	Business-to-consumer (B2C); (1) hotel business trip, (2) educational institution	B2B, COMPUSTAT data for selected Standard Industrial Classification codes (n = 114)	Illustrative B2C example, hotel chain (n = 7882)	B2C, 200 undergraduate students shown describing restaurant service	B2C, banks (n = 200)	B2B: Canada, Germany, Japan, Korea, Singapore, United Kingdom, United States (508 low support, 445 high support)	B2C, banking panel data (n = 1201)	B2C, theatergoers (n = 200)	B2B: Germany and United Kingdom (2442 contracts)	B2B: Germany and United Kingdom (2076 contracts) ^a
Unit of Analysis	Individual consumer level	Comparison of matched samples over time	Individual-level model linked to aggregate model	Individual consumer level	Comparisons of groups	Enterprise level	Individual household level	Individual consumer level	Contract level	Contract level

**TABLE 1
Continued**

	Boulding et al. (1993)	Kalwani and Narayandas (1995)	Rust, Zahorik, and Keiningham (1995)	Rust et al. (1999)	Ganesh, Arnold, and Reynolds (2000)	Bolton and Myers (2003)	Li, Sun, and Wilcox (2005)	Ngobo (2005)	Bolton, Lemon, and Bramlett (2006)	Bolton, Lemon, and Verhoef (2006)
Nature of Predictor Variables	(1) Manipulation or perception of service performance attributes and (2) 36 items from SERVQUAL	Dichotomous categorization: relational versus transactional approach to service	Perceptual ratings of service quality attributes	Service variability (participants were shown graphs of up to 20 past experiences)	Perceptual ratings of service quality attributes	Service operations measures, organizational characteristics, national/cultural variables budget	Accounts with competitors, overall satisfaction, switching costs, demographics	Perceptual ratings of overall satisfaction, service quality and pricing policy, relationship variables, demographics	Service operations measures, price, discount	Decision-maker perceptions (satisfaction, criticality), service operations measures, price, discount, share of customer, relationship duration
Service Quality Constructs	(1) Overall quality of hotel (unfavorable/favorable) and (2) SERVQUAL dimensions of reliability and empathy	Single dimensions: relational or transactional approach to service	Grouped by business processes and their underlying subprocesses	Overall service quality (unfavorable/favorable) following Boulding and colleagues (1993)	Three service factors: people, convenience, ease of transactions (people factor is different across groups)	Responsiveness, reliability, and assurance (each represented by two measures)	None specifically: overall satisfaction the bank	Principal components analysis yielded three factors: quality of acting and decor, quality of performance, quality of subscription system	Design quality (contract type) and experience quality (engineer work minutes)	Overall quality (represented by mean resolution time per contract)

^aThis sample is smaller than the sample Bolton, Lemon, and Bramlett (2006) use because (1) satisfaction measures were not available for some firms and (2) high-level contracts are not eligible for upgrade.

ated with dropping a service can influence a customer to retain the service (Inman and Zeelenberg 2002; Lemon, White, and Winer 2002). Extrapolating to upgrade decisions, we believe that when a decision maker experiences poor service quality, anticipated regret is likely to cause forgone alternatives, such as a higher level of service contract, to become more attractive. Third, Park, Jun, and MacInnis's (2000) experimental research shows that when customers are committed to buying within a category, "subtractive framing" (in which customers are asked to delete options from a fully loaded model) encourages them to choose more options. In our study context, poor service quality on the focal contract may encourage subtractive framing and, thus, upgrading. This is also consistent with the negativity effect, which suggests that a single negative piece of information is often weighed more heavily than a single positive piece of information in consumer evaluations (Price 1996). Finally, this is also consistent with learning theory, which suggests that firms (Dodgson 1993) and consumers (Janiszewski and Van Osselaer 2000) engage in trial-and-error behavior over time that results in learning. This implies that, over time, firms may eventually learn the appropriate contract match for their needs.

In summary, prior research suggests that a firm's service quality has a positive relationship to customer retention; that is, compared with other contracts the firm holds, a firm is less likely to renew a service contract when there is poor service quality on the focal contract. However, the preceding discussion suggests that there are theoretical reasons for this, as follows:

H₁: Conditional on renewal, a firm is more likely to upgrade a service contract when the quality of service on the focal contract is poor.

As we discuss subsequently, we expect that certain factors will moderate the effect of service quality on the firm's upgrade decision.

Degree of Product–Customer Fit: Criticality

Studies of B2B purchasing behavior have long distinguished between products that have a large impact on the firm's financial performance and products that have a small impact on this performance (Kraljic 1983). For example, Cisco Systems does not outsource "mission-critical" activities, defined as "activities that, if performed poorly, would pose an immediate risk to the company" (Bridge 2004). Researchers also recognize that business activities that are "critical" or important to a firm's profit streams are less likely to be outsourced (Stremersch et al. 2003). High-level service contracts are designed for critical service environments, whereas low-level service contracts are designed for less critical service environments. Consequently, we predict that firms with a decision maker who perceives a service as critical will be more likely to upgrade from a low-level service contract. For example, retailers to which copiers may be critical to their service operations (e.g., FedEx Kinko's) are more likely to upgrade their copier maintenance contracts from a low to a higher level of service than other retailers with less critical needs.

The underlying theoretical rationale for our prediction is that a poor fit between the product and the customer should

positively influence the firm's decision to upgrade. This is consistent with the idea of market matching (Alderson 1965; Dickson 1992), suggesting that the firm will adapt and upgrade the contract to create a better fit with its needs. Following Kristof (1996, pp. 4–5), we define product–customer fit as the degree of compatibility between customer and product that occurs when the product provides what the customer needs.² Product–customer fit is poor when a customer perceives service as critical (i.e., a high level of service is required) but purchases a low-level service contract. Mittal and Kamakura (2001) discuss the nature of the relationship (or fit) between the customer and the brand, finding that customers with different characteristics have different satisfaction thresholds and, therefore, different probabilities of repurchase. Poor fit will decrease the likelihood that a contract is renewed because the service does not appear to deliver on its promise, but at the same time, it will increase the likelihood that a contract is upgraded because the firm recognizes the poor fit and adjusts the contract provisions.

H₂: Conditional on renewal, a firm's likelihood of upgrading a service contract is positively related to the decision maker's perception of the criticality of the service to the firm's operations.

Moderating Effect of Criticality

Recent research indicates that when people pay more attention to a product, service quality has a larger effect (more positive) on loyalty (Bloemer and Kasper 1995). This finding suggests that decision makers who perceive critical needs weigh contract-level service experiences more heavily in making their upgrade decision, which results in a "hyperfocus" on these contract decisions. For this reason, when the service is perceived as critical, firms are more likely to upgrade when the focal contract service quality is low. In contrast, if the service is not perceived as critical, firms are less likely to upgrade in response to poor service quality at the contract level (because decision makers are paying less attention to all contracts).

H₃: Conditional on renewal, the strength of the relationship between a firm's likelihood of upgrading a service contract and service quality on the focal contract is greater when the decision maker perceives the service as critical than when he or she perceives it as noncritical.

Satisfaction with Prior Service

Customer satisfaction with prior service experiences has a positive effect on the length, breadth, and depth of the customer–firm relationship (e.g., Oliver 1997). In a field investigation of B2B relationships in mature industrial markets, Narayandas and Rangan (2004) report that a decision maker's favorable evaluations of performance within the contract terms (as well as outside them) lead the firm to increase its commitment to the supplier. Because the upgrade decision is an increase in the firm's commitment to the existing relationship, we predict that a firm with a deci-

²See also Vancouver and Schmitt (1991) regarding person–organization fit, as well as the strategy literature, in which product–market fit is also sometimes called "congruency."

sion maker who is highly satisfied with the supplier (i.e., he or she has high cumulative satisfaction across all aspects of the relationship) will be more likely to upgrade.

H₄: Conditional on renewal, a firm's likelihood of upgrading a service contract is positively related to the decision maker's overall satisfaction with the existing supplier.

Our hypothesis is consistent with the well-established relationship between satisfaction and repeat purchase behavior. However, it is also possible that firms that are satisfied with the supplier are less likely to upgrade because they believe that the current service level is exactly meeting their needs.

Moderating Effect of Satisfaction: The Rose-Tinted-Glasses Effect

Research in psychology and consumer behavior suggests that people exhibit a confirmatory bias (Hoch and Ha 1986), such that their prior opinions or expectations influence not only their overall opinions but also their perceptions of new information (Oliver and Burke 1999). Boulding, Kalra, and Staelin (1999) find that confirmatory bias decreases with higher levels of experience and lower levels of product complexity and ambiguity. Nayakankuppam and Mishra (2005) find that sellers (people who currently own a product) overrepresent the positive features of the product compared with buyers—a “rose-tinted-glasses” effect (Hendrick and Hendrick 1988). Because we are studying complex B2B services, these findings suggest that the firm's assessment of service quality will be positively biased for satisfied decision makers and negatively biased for those who are dissatisfied. Thus, we believe that firms will weigh contract-level service quality less heavily in their upgrade decision when decision makers' satisfaction levels are high.

H₅: Conditional on renewal, the strength of the relationship between a firm's likelihood of upgrading a service contract and service quality on the focal contract is weaker when the decision maker's overall satisfaction with the supplier is high than when it is low.

Price Effects

When customers consider whether to upgrade a service contract, the price of the service may also influence their decision making. Prior research suggests that a customer's reference price will influence his or her decision to purchase a good or service. The reference price is the price against which buyers compare the offered price of a product (Winer 1986). The concept of dual entitlement (Kahneman, Knetsch, and Thaler 1986) suggests that consumers believe that firms are entitled to a reference profit, that customers are entitled to a reference price, and that price increases commensurate with cost increases will be perceived as fair (e.g., Bolton and Alba 2006). Similarly, in this research context, an upgrade represents more benefits to the firm and higher costs to the supplier. Therefore, firms that upgrade to a higher level of contract most likely pay a higher price for that contract than if they had not upgraded. Thus, for completeness, we predict the following:

H₆: Conditional on renewal, a firm's likelihood of upgrading a service contract is positively related to the current price of the service contract.

Bolton and Myers (2003) find that customers who receive less reliable service over time are more price sensitive than customers who receive more reliable service. This suggests that price should moderate the effect of service quality on the firm's upgrade decision.

H₇: Conditional on renewal, the strength of the relationship between a firm's likelihood of upgrading a service contract and service quality on the focal contract is weaker when the price of the contract is high than when it is low.

Summary

We hypothesized that service quality on the focal contract (SQual, H₁), perceived criticality (Criticality, H₂), satisfaction (Satisfaction, H₄), and contract price (LogPrice, H₆) influence the decision to upgrade a service contract. We also hypothesized that perceived criticality, customer satisfaction, and contract price moderate the effect of service quality on the customer's decision to upgrade (H₃, H₅, and H₇). Prior research also suggests that models of ongoing buyer–seller relationships should account for certain covariates. Thus, we include supplier-level variables to capture relationship characteristics, such as commitment (which can be represented by measures of share of customer [Share] and customer relationship duration [Duration]), contract-level variables for price discount (LogDiscount) to account for linear effects that have been previously established (Verhoef, Frances, and Hoekstra 2001), and a dummy variable for contract type (ContractType). Figure 1 depicts the conceptual model of the upgrade decision.

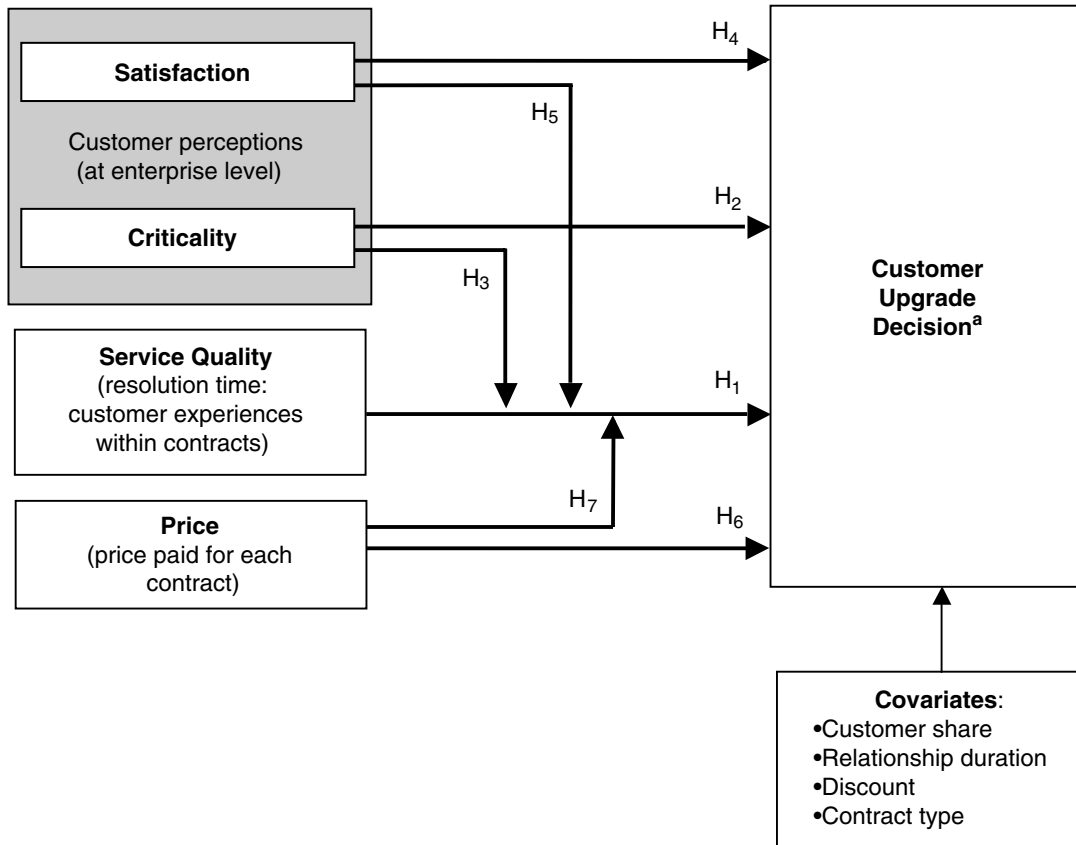
Overall, the firm's decision to upgrade a contract can be considered in terms of the overall assessment of value associated with the contract—that is, how the firm weighs the benefits and costs of the upgraded contract. A customer's assessment of value from a service has been defined as the customer perceived trade-off between costs and benefits (Brady et al. 2005). In a B2B context, Bolton and Drew (1991) suggest a cost–benefit framework in which a customer's assessment of value depends on benefits received and sacrifice (i.e., monetary and nonmonetary costs associated with using the service; e.g., Zeithaml 1988) and the customer's frame of reference or context (Holbrook 1999). At a high level, our model is consistent with the view that firms weigh the benefits (service quality, satisfaction) and costs (price) associated with the contract when determining whether to upgrade and account for their own frame of reference (criticality, share of requirements, relationship duration, and contract type).

Model Specification and Estimation Procedure

Following a long tradition of theoretical and empirical work modeling firm behavior (e.g., Coughlan 1985; Heide and Weiss 1995), we represent the firm's decision to upgrade a service contract by a binary choice (logit) model. The firm (i) renews a service contract (k) by choosing the alternative (upgrade or not) with the highest expected future value (V_{ik}). That is,

$$(1) \quad \text{Prob}(\text{Upgrade}_{ik}) = \text{Prob}(V_{ik^*} > V_{ik}).$$

FIGURE 1
Conceptual Model of Customer Upgrade Decision



^aControlling for the renewal decision.

In this situation, a firm makes repeated decisions (across contracts), creating dependent observations. The number of contracts purchased typically differs between companies, so that we expect the data to be “unbalanced.” To account for the interdependency within each firm and to allow varying coefficients across firms, we estimate a random parameters model (Train 2003). Specifically, we estimate random coefficients for the contract-level variables (Z_{ik}) and fixed coefficients for the supplier-level variables (X_i). This specification is known as a mixed-effects logit model.

If a firm i makes k contract upgrade decisions, we formulate our model as follows:

$$(2) \quad V_{ik} = \alpha'X_i + \mu'_{ik}Z_{ik} + \varepsilon_{ik},$$

where α' represents a vector of fixed parameters for the supplier-level data X_i , μ'_{ik} is a vector of random coefficients for the contract-level data Z_{ik} , and ε_{ik} is i.i.d. extreme value. The terms in Z_{ik} are error components that, along with ε_{ik} , define the stochastic portion of the utility (Train 2003). As such, we define the unobserved random portion of utility (η_{ik}) as

$$(3) \quad \eta_{ik} = \mu'_{ik}Z_{ik} + \varepsilon_{ik}.$$

We assume that the mean and standard deviations of the random parameters are normally distributed.

In summary, we can write our mixed-effects binary logit model as follows:

$$(4) \quad \text{Upgrade}_{ik} = f(\text{Satisfaction}_i, \text{Criticality}_i, \text{SQual}_{ik}, \\ \text{SQual}_{ik} \times \text{Satisfaction}_i, \text{SQual}_{ik} \times \text{Criticality}_i, \\ \text{LogPrice}_{ik}, \text{SQual}_{ik} \times \text{LogPrice}_{ik}, \\ \text{LogDiscount}_{ik}, \text{Share}_i, \\ \text{Duration}_i, \text{ContractType}_{ik}) + \varepsilon_{ik}.$$

Recall that we estimate fixed coefficients for the supplier-level variables (X_i) and random coefficients for the contract-level variables (Z_{ik}). The interactions between perceptions at the supplier level (Satisfaction_i , Criticality_i) and service quality at the contract level (SQual_{ik}) and the interaction between price (LogPrice_{ik}) and service quality create contract-level variables, so we estimate random parameters for these interaction terms.

We specify and estimate our model conditional on contract renewal; that is, we estimate the model only for the 2076 contracts that were renewed. However, the (potential) hierarchical structure of the renewal and upgrade decisions might suggest the specification of a nested logit model that allows for a correlation between the error terms of the unobserved utilities. Because we do not use a nested logit

model, it might be argued that we are biasing the estimates of our logit model parameters (Ben-Akiva and Lerman 1985). However, this argument ignores the issue of random parameters arising from unobserved customer (i.e., firm) heterogeneity. It is cumbersome to account for customer heterogeneity in a nested logit when both upgrade and renewal decisions depend on (mostly) the same explanatory variables. More important, Louviere (2003) argues that if the researcher uses certain mixed-effects logit models (e.g., with a hierarchical structure, random effects), it may not be possible to use statistical tests to identify the “correct” model specification. On the basis of these considerations, we chose a reasonably parsimonious, binary logit model with mixed effects and estimated it with data describing renewed contracts only.

Method

Study Context

The study context is computing system support services purchased by large European firms. Firms spend (approximately) €650,000 per year on computing system support services. The service contracts are fixed-price contracts for one year; customers are not billed on service-usage levels. Firms purchase system support contracts independently for systems that have been purchased previously, and an individual contract is uniquely associated with a particular system. Most firms purchase from multiple suppliers. There are eight suppliers in the European market, and firms may also use internal support services. Large firms usually have many systems, and they buy multiple contracts from multiple suppliers.

Suppliers in many industries give the different levels of their service contracts descriptive names, such as “mission-sensitive support,” “proactive support,” or “managed services,” that are intended to help the buyer achieve a good product–customer fit. System support is provided out of centralized facilities, so that it is standardized across customers and contracts. In our study, the supplier offers contracts that are available at three levels of system support, which we call low, medium, and high support. We do not study high support (which cannot be upgraded); we study upgrades from low to medium levels or from medium to high levels. For each level of support, the supplier has specific, contractually defined service performance levels, such as “24 hours, 7 days a week availability, with a guaranteed response within 2 hours.” Each level of support provides a subset of the services of the next (higher) support level. A higher level of support contract is more expensive than a lower level of support contract, but it provides higher levels of support that can reduce resolution times, thus increasing service quality. Importantly, over time, a customer may decide to upgrade the support level of a contract. No customers downgraded their contracts in our database.

The Database

For our study, a cooperating supplier provided a probability sample of customer records that described purchases of system support service contracts by 120 large firms (i.e., business customers) in Germany and the United Kingdom. The

sampling procedure ensured that the sampled firms operated the same system, thus reducing the effects of variables extraneous to our study (e.g., factors unique to after-sales service for a particular system).³ The data described the firm–supplier relationship over a three-year period (1997–1999). We combined information from four primary sources: (1) a master file describing the characteristics of each customer account, including number and type of contracts; (2) annual billing data for all contracts of each customer, including price and any discounts; (3) internal monthly service operations data (i.e., service quality metrics) for all contracts of each customer; and (4) self-report data regarding satisfaction and criticality from a survey of the decision maker at each firm. (The survey was administered to the person identified by the supplier as the decision maker, after he or she was rigorously screened by telephone to ensure that he or she either recommended or made the final decision on system support contracts.)⁴ We merged these sources to create a comprehensive database that incorporates both cross-sectional and longitudinal observations at the customer account and contract level. Note that we measure the predictor variables (Satisfaction_{*i*}, Criticality_{*i*}, SQual_{*ik*}, Share_{*i*}, Duration_{*i*}) in the period before the upgrade decision, so it is possible to make causal inferences from our data. The service contract’s price and any discount are from the time of purchase.

All firms purchased five or more contracts from the same supplier; the average number of contracts was 19.7, and the standard deviation was 23.7. Of the 120 firms, 43.3% upgraded at least one contract—upgrading occurs only if firms renew contracts (there were no firms in our database that downgraded contracts); of the contracts, 88% (2076) were subsequently renewed, and 8% (165) of the renewed contracts were upgraded. Thus, our analysis database contains the 2076 renewed contracts for the 120 firms. The relatively low percentage of upgraded contracts is likely because most firms purchase a service level that is appropriate for their needs. We conducted preliminary statistical analyses and determined that the upgrade process was the same for both contract levels (low to medium or medium to high); overall, more medium-level contracts were upgraded (18%) than low-level contracts (5%). There was no evidence of a need for interaction effects between contract type and any of the other predictor variables. Thus, we capture this feature of the data by incorporating a dummy variable that represents medium-level contracts. We discuss this issue further in the “Results” section.

³The cooperating company drew the sample with the restriction that the equipment (covered by the service contract) was still in use and would continue in use, thus removing any cases in which the customer no longer owns or uses the equipment and thus does not renew because the equipment is no longer in service.

⁴Service operations data (i.e., resolution time measures) were collected from January 1997 to February 1999; billing records (i.e., purchase data, including upgrade decision [dependent variable], contract type, and price information) were collected in February 1998 and January 1999; the survey data (i.e., satisfaction, criticality, duration, and customer share measures) were collected in July 1998.

Measures

Table 2 reports the predictor variables, their measures, the data source and level (i.e., entire customer account or contract), and descriptive statistics (average, standard deviation, and skewness). The average firm had been purchasing from the supplier for six years and spent 30% of its total system support budget on the supplier's service contracts. Because the majority of the predictor variables were measured in a straightforward way, we discuss only measures that require additional explanation.

Satisfaction. A survey elicited self-report measures from chief information officers or management information system managers who were identified from company records and screened by telephone to ensure that they either recommended or made the final decision on system support contracts. We calculated the average of three survey items to measure the decision maker's satisfaction. The items are similar to items used in other studies (e.g., Bolton 1998; Oliver 1997). They elicit perceptions of (1) the decision maker's overall satisfaction with his or her relationship with the supplier, (2) the value that the supplier adds to the firm's business activities, and (3) the overall satisfaction with customer service. We assessed each question on a five-point scale (1 = "extremely unsatisfied," and 5 = "extremely satisfied").

Criticality. We measure the criticality of the service to the firm by asking the decision maker, "When your system fails, what effect does that have on your business ("not at all serious/very serious")?" Because the distribution of responses was heavily skewed, we collapsed the multiple-response variable to a dichotomous variable based (approximately) on a median split. Thus, the variable is coded as 1 if the service is highly critical and as 0 if otherwise. In total, 71% of the firms consider their services critical for their operations.

Contract-level service quality. Before this study, the supplier had hired a market research company to conduct research with its European business customers. The company conducted face-to-face interviews with 40 decision makers and administered large-scale telephone surveys to decision makers with the dual goals of understanding perceptions of service quality and areas for improvement. The supplier also participated in an industrywide benchmarking study that showed that its satisfaction ratings were roughly comparable to the other two major suppliers in Europe. However, timeliness, completeness, and effectiveness of system support consistently emerged as frequent customer concerns. Specifically, respondents identified speedy resolution time as a key aspect of service quality that they considered in repeat purchase decisions. The following are verbatim comments from four decision makers:

[The supplier needs] to have a more timely response; it would be better to get rid of the callback system—replacing it with a direct connect [to an engineer].

I have a highly technical staff and [the supplier] should recognize that ... we go through our own diagnosis and exhaust our resources. We get a junior helper [at the customer support center] and have to go through the same process with [the supplier] and waste our time.

[The supplier] should shorten the resolution time.

[The supplier] needs to keep up with all the information that we provide them on our problems and resolve them in a more timely manner.

These decision makers' comments reflect the notion that additional supplier resources (e.g., faster connect time, more customer support staff, access to knowledgeable engineers) were necessary to reduce resolution time, thus reducing system downtime and its negative effect on business performance.⁵ Preliminary statistical analyses also supported the notion of a single variable—resolution time—as an indicator of service quality. Respondents' intense dissatisfaction with a single service quality attribute is consistent with recent research. Slotegraaf and Inman (2004) report that as customers approach the end of a service contract period, satisfaction with attributes that can be remedied declines at a faster rate. In our study context, concerns about slow resolution time can be remedied by upgrading the service contract so that resolution time becomes a prominent dissatisfier and a key input into the upgrade decision.

For these reasons, we measured service quality at the contract level by calculating the average resolution time per service request for the focal contract (expressed as minutes/request) from the monthly service operations data during the year before the purchase decision.⁶ A large value of this variable indicates poor service quality (rather than good service quality). We calculated the log of this measure to create a variable with a less skewed distribution. Thus, our model incorporates service quality measured as the log of average resolution time per request for the focal contract. This transformation implies that as resolution time becomes larger, there are diminishing marginal effects of service quality at the contract level.

Price. We obtained the price of each contract from the billing data and measured it at the contract level. We included two aspects of price in the model: contract price (in dollars) and price discount (expressed as a percentage)

⁵Note that resolution time is not the same as response time. Resolution time is the time elapsed until the customer request has been resolved, not the time until first response. However, not surprisingly, quantitative analyses of the operations data (not shown herein) indicated that response time, engineer work time, number of repeat requests, and other service quality/business process metrics were correlated with resolution time (and they might be considered its antecedents).

⁶Our approach is a different from cross-sectional studies that rely on perceptual measures of service quality (which can be standardized across companies and industries). Because we study firms that purchase from a single supplier, we can measure service quality using business process metrics from the service operations database. Our approach is consistent with prior within-company research that uses business process metrics to represent service quality, thus producing actionable results for managers (e.g., Bolton and Myers 2003). In models estimated with perceptual measures, it is frequently possible to capture multiple dimensions of service quality, such as reliability, responsiveness, assurance, empathy, and tangibles. However, our statistical tests indicated that a single measure of service quality was sufficient to explain the upgrade decision. The inclusion of additional variables did not improve the explanatory power of the model.

TABLE 2
Measures and Descriptive Statistics (N = 2076)

Variable (Name)	Description and Measurement ^a	Data Source	Data Level	Average ^b	Skewness
Upgrading (Upgrade _{ik})	Contract upgraded or not. A dichotomous variable determined by comparing billing records for January 1999 and January 1998	Billing	Contract	.079 (.27)	3.11
Satisfaction ^c (Satisfaction _i)	Average of the following questions (Coefficient $\alpha = .70$) How satisfied ... (1 = "extremely unsatisfied," 5 = "extremely satisfied") •as a whole with the customer service which you buy from [the supplier]? •with the value that [the supplier] adds to the business activities? •are you overall with your relationship to [the supplier]?	Survey	Supplier	4.04 (.55)	-.86
Service quality (SQual _{ik})	Log of the average resolution time (in minutes) for the focal contract: 1998 average resolution time per request for focal contract	Operations	Contract	.38 (1.09)	3.11
Criticality ^c (Criticality _i)	"When your system fails, what effect does that have on your business?" Dichotomous variable derived from self-report data (1 = "very serious")	Survey	Supplier	.71 (.46)	-.90
Covariates					
Share of customer (Share)	Percentage of service contracts purchased by customer from the supplier. Calculated as: the total dollar value of contracts purchased from the supplier (from the billing data) divided by the dollar value of the total support budget (as reported by the decision maker)	Survey, master file	Supplier	.30 (.22)	1.07
Relationship duration (Duration _i)	Duration of relationship in years. Calculated as the years between January 1999 and start of relationship	Master file	Supplier	6.41 (3.19)	.15
Price (LogPrice _{ik})	Log of the price level per contract. Dollars per contract (scaled for reasons of confidentiality)	Billing	Contract	.74 (1.55)	-.56
Discount (LogDiscount _{ik})	Log of the price discount per contract. Discount is expressed as a percentage of the dollar price per contract	Billing	Contract	-4.46 (4.04)	-.32
ContractType _{ik}	Contract level (medium = 1, otherwise = 0)	Master file	Contract	.16 (.36)	1.88

^a"Supplier" should be interpreted to mean the business customer's perception of the supplier or service.

^bStandard deviation is in parentheses.

^cFrom a survey administered on July 1998.

for each contract. To allow for nonlinear effects of price and discount while minimizing the potential for multicollinearity, we used a log form for the price variables. This formulation is more parsimonious than including both linear and quadratic price variables.

Covariates. We measured two covariates at the customer account level: share of customer and relationship duration. We calculated share of customer by dividing the dollar value of the number of contracts purchased from the supplier by the dollar value of the firm's total system support service budget (as reported in the survey). The firm-supplier relationship duration is a self-report measure from the survey; it was measured in years. (Note that it is not the same as the length of the decision maker's relationship with the supplier.) Finally, we incorporated a dummy variable to represent contract type (1 = medium, and 0 = otherwise).

Table 3 displays the correlation matrix of the predictor variables. The majority of the coefficients are low. An exception is the correlation (.30) between list price and percentage price discount, suggesting that contracts with higher list prices have higher percentage discounts. This correlation is not surprising given that the European market for system support contracts is highly competitive. Overall, we concluded that multicollinearity among the predictor variables is reasonably low.

Model Estimation

We estimated our model using LIMDEP 8.0, which provides accessible estimation procedures for the random parameter versions of the binary logit model (Greene 2003). We performed simulation in the random parameter model using 100 Halton draws (Greene 2003). We estimated three models: (1) a covariates-only model, (2) a main effects-only model, and (3) a full model including the interaction effects. The fixed coefficients, random coefficients, scale parameters of the random coefficients, and fit statistics of these three models appear in Table 4. This table shows significant scale parameters for the random coefficients for multiple variables. The significant scale parameters imply that there is heterogeneity in the estimated parameters, so we conclude that accounting for heterogeneity with random coefficients is a useful modeling strategy. This feature is important to remember when interpreting the estimated parameters. For example, the scale parameter for LogPrice is rather large, suggesting significant heterogeneity across the sampled firms. Thus, for some customers, the price effect may be smaller, whereas for other customers, the price effect may be larger.

Results

Model Fit

Of the three estimated models, Models 2 and 3 have a much better fit than Model 1. Model 3 has a higher likelihood and R-square than Model 2 and an equal Akaike information criterion (AIC). However, note that AIC imposes a heavy penalty in a random coefficients model because the addition of each predictor variable adds more than one parameter estimate.

We believe that the full model (Model 3) is preferable for three reasons. First, most of the hypothesized predictor variables in the upgrade model are significant ($p < .05$). Second, according to log-likelihood ratio test, the estimated model is highly significant ($p < .0001$). Third, for comparison purposes, we estimated a model that excluded the contract-level variables with their random coefficients. That is,

$$(5) \quad \text{Prob}(\text{Upgrade}_{ik}) = g(\text{Satisfaction}_i, \text{Criticality}_i, \text{Share}_i, \text{Duration}_i) + \varepsilon_{ik}.$$

We compared our proposed model (Equation 4) with the "firm-only" model (Equation 5) and found that the proposed model produces an improved fit (AIC = 1130.28 versus 970).⁷ Thus, our model comparisons suggest that a binary logit model with random coefficients, plus both firm- and contract-level variables, is an appropriate modeling strategy.

We assessed the stability of our estimated model (Equation 4) as follows: We estimated our model using 75% of our sample. We repeated this procedure three times (i.e., three random samples). Of the estimated parameters, 97.2% have the same sign as in our reported model. The significance levels are the same for 86% of the estimated parameters. Consequently, we conclude that our model results are stable.

Hypothesis Tests

We find strong support for the model. The results for the three hypotheses regarding main effects are as follows: Firms experiencing poor service quality at the contract level are indeed more likely to upgrade ($H_1, p = .013$). However, H_2 is not supported; the decision maker's perception of the criticality of the firm's service does not influence upgrading ($H_2, p = .24$). Firms with decision makers who are more satisfied with the overall relationship with the firm are more likely to upgrade contracts, in support of H_4 ($H_4, p < .001$). Current contract price has a positive effect (with diminishing marginal returns) on upgrading ($H_6, p < .001$). We predicted an interaction effect between service quality and criticality (H_3). When decision makers perceive the firm's service needs as critical, we expected that poor service quality at the contract level would lead to a higher probability of upgrading. This hypothesis was not supported ($H_3, p = .49$).

We predicted that there would be an interaction effect between satisfaction and service quality. This hypothesis was supported ($H_5, p < .001$). We conducted simulations for different satisfaction/service quality levels and discovered that this interaction effect captures the following feature: For poor service quality, business customers who have low

⁷We tested models with other functional forms, such as a nonlinear effect of satisfaction (i.e., quadratic). The fit of this model was worse than our model (AIC = 972 versus 970). We also considered whether firms make comparisons across contracts by including the difference between resolution time of the focal contract and the average resolution of all other contracts. The model fit of our reported model was much better than the model fit of the model accounting for a comparison across contracts (AIC = 996 versus 970).

TABLE 3
Correlation Matrix (N = 2361)

Variable	Upgrade _{ik}	Satisfaction _i	Criticality _i	SQual _{ik}	LogPrice _{ik}	LogDiscount _{ik}	Duration _i	Share _i	ContractType _{ik}
Upgrade _{ik}	1.00								
Satisfaction _i	.04	1.00							
Criticality _i	.05	.22	1.00						
SQual _{ik}	-.01	-.03	-.02	1.00					
LogPrice _{ik}	.09	.16	.16	.01	1.00				
LogDiscount _{ik}	-.15	.06	-.14	-.13	.21	1.00			
Duration _i	-.04	.28	.15	-.03	.08	-.03	1.00		
Share _i	.07	.01	-.04	.09	.30	.09	.14	1.00	
ContractType _{ik}	.20	.03	.02	.34	.08	-.12	.02	.04	1.00

TABLE 4
Estimation Results (N = 2076)

Variable (Hypothesis)	Hypothesis	Expected Sign	Covariates- Only Model	Main Effects- Only Model	Full Model
Constant			-2.259**	-5.069**	-6.141**
Supplier Level					
Satisfaction _i	4	+		.498**	.712**
Criticality _i	2	+		-.061	-.159
Contract Level					
SQual _{ik} (resolution time)	1	+		-.490**	1.179*
LogPrice _{ik}	6	+		.297**	.429**
LogDiscount _{ik}				-.131**	-.138**
Criticality _i × SQual _{ik}	3	+			-.103
Satisfaction _i × SQual _{ik}	5	-			-.592**
LogPrice _{ik} × SQual _{ik}	7	-			-.241**
Covariates					
Share _i			.979**	.869**	.999**
Duration _i			-.062**	-.070**	-.159**
ContractType _{ik}			.799**	1.084**	1.011**
Scale Parameters					
Constant			1.097**	.305**	.126*
ContractType _{ik}			.943**	.631**	.964**
SQual _{ik} (resolution time)				.507**	.429**
LogPrice _{ik}				.420**	.469**
LogDiscount _{ik}				.082**	.140**
Criticality _i × SQual _{ik}					.720**
Satisfaction _i × SQual _{ik}					.437**
LogPrice _{ik} × SQual _{ik}					.217**
Model Fit					
Log-likelihood			-502	-471	-465
AIC			1016	970	970
McFadden R ²			.13	.18	.19

* $p < .05$.

** $p < .01$.

Notes: Two-sided p -values for hypothesis tests. Number of observations = 2076.

satisfaction are more likely to upgrade than those who have high satisfaction. However, for good service quality, customers who have high satisfaction are much more likely to upgrade than those who have low satisfaction. This finding is consistent with our hypotheses. Overall, high satisfaction leads to upgrading, except when there is poor service quality on the focal contract. We also predicted an interaction between current contract price and service quality (H₇). We find strong support for this effect, suggesting that poor service quality reduces the effect of price on the upgrade decision (negative interaction effect, H₇, $p < .001$).

Covariates

Firms that devote a larger portion of their total support budget to the supplier (i.e., higher “share of customer”) are more likely to upgrade a contract ($p < .001$), and firms that have lengthy relationships with the supplier are less likely to upgrade ($p < .001$), perhaps because they have already achieved an optimal product–customer fit. In addition to the price effects we reported, percentage price discount has a

negative influence on the upgrade decision ($p < .001$), with diminishing marginal returns. The significant effects of price in this study are rather surprising because price is often not a statistically significant predictor in models of customer retention (e.g., Bolton 1998; Bolton, Lemon, and Bramlett 2006). Contracts at the low service level are more likely to be upgraded ($p < .001$) than service contracts at the medium service level, *ceteris paribus*. This result raises the following question: Are the model results different when we omit the low-service-level contracts from the analysis? However, we conducted this analysis and still found that the effects are much the same as we reported previously.⁸

⁸Another approach would be to specify one model (Model A) to represent the decision to upgrade contracts from low to medium and another model (Model B) to represent the decision to upgrade from medium to high. However, there are some statistical reasons we did not choose to use this approach. First, the number of low-level contracts is relatively small compared with the number of medium-level contracts (325 versus 1751). Because only a small percentage of contracts are upgraded (8%), the number of low-

Theoretical Implications

Our results suggest that the customer upgrade decision is significantly different from the new product/service purchase decision, because prior experience with the customer is critical, and different from the customer renewal decision, because the firm's experience with the supplier appears to influence these decisions in different ways. Overall, we find that the results are consistent with the basic ideas of market matching and congruence. Firms use their experiences with the service contract to determine whether the current service contract fits their needs, and they upgrade when necessary to find the appropriate level of service they require from the supplier. The ways firms use this information to obtain the best match with their needs provide new insights into the firm's upgrade decision and our understanding of B2B customer behavior.

Accounting for Multiple Inputs into the Upgrade Decision

Traditional approaches to choice modeling focus on connecting information on the characteristics of an offering and prior customer experience to behavior (e.g., Guadagni and Little 1983). More recent attention has shifted to understanding how customers' overall attitudes toward and evaluations of an offering explain behavior (Bolton 1998; Gustafsson, Johnson, and Roos 2005; Mittal and Kamakura 2001; Verhoef 2003). Our study underscores the need to combine both approaches to understand the complexities of buyer behavior.

In particular, the results highlight the circumstances under which buyers may pay more attention to objective information (e.g., service quality, price) or summary evaluations (e.g., satisfaction) and the extent to which summary evaluations may actually interact with contract-level experiences to influence buyer behavior. Thus, at the macro level, the results of this study suggest that (1) both contract-level experiences and firm-level decision-maker perceptions influence contract-level decisions directly and (2) decision-maker perceptions of the supplier interact with contract-level experiences to influence these decisions. A model of firm decision making estimated solely at the supplier level or solely at the contract level omits interesting antecedents of the upgrade decision. This finding is particularly novel and important because the majority of prior B2B research has been conducted solely at the supplier or customer account level (i.e., eliciting measures of perceptions of the entire relationship, across contracts) and is based on key-informant data. The significant contract-level effects suggest that it is important to examine these decisions at both the firm level (e.g., decision-maker perceptions, relation-

level contracts that are upgraded becomes small in absolute terms. Second, the small sample also leads to a relatively small number of contracts per enterprise. For a random coefficients model, this is problematic because a sufficient number of observations per enterprise (roughly five contracts per customer) is required. Finally, two separate models are less parsimonious than one model with a dummy variable for contract type and (if appropriate) interaction terms.

ship characteristics) and the contract level (e.g., service quality, price) to gain a complete understanding of the factors that influence firm upgrade decisions.

Specific insights regarding key factors that influence the customer upgrade decision also emerge from this research. First, we find that a firm's experience of poor service quality can increase the likelihood of upgrading an individual contract. Second, high satisfaction (at the overall firm level) leads to a higher probability of upgrade. Third, customers who pay greater prices for a contract are more likely to upgrade. Finally, we find two key interactions that also influence the upgrade decision: service quality \times satisfaction and service quality \times price. Next, we discuss each of these findings and elaborate on how service quality influences the upgrade decision through (combined) main and interaction effects.

Poor Service Quality: How Can It Be Good for the Supplier?

At the contract level, poor service quality can increase the likelihood that the firm will upgrade to a higher level of service contract. On the surface, it may seem counterintuitive that by providing poor service, the supplier can gain additional business from the firm. However, it is important to remember that the firm is implicitly making comparisons across contracts; the decision maker evaluates satisfaction with its relationship with the supplier as well as service quality on the focal contract. We speculate that the multi-dimensional nature of the customer-supplier relationship allows three mechanisms to operate that create a positive main effect of service quality. First, if service quality is poor for the focal contract in an otherwise satisfactory relationship, the decision maker may attribute poor service quality to having purchased a contract level that is insufficient to meet the firm's needs rather than to intrinsically poor service by the supplier. Second, the evaluation of the focal contract quality may lead the decision maker to anticipate regret if he or she repurchases the same level of service contract rather than a higher level of service contract. Third, because customers are committed to buying the service, poor service quality on the focal contract may lead the decision maker to use subtractive framing, whereby he or she realizes that the lower-level service contract is a subset of the higher-level (i.e., augmented) service contract.

Our finding also demonstrates that "snapshots" of contract-level experiences are remembered and that relatively poor service stands out in the mind of the customer in an otherwise satisfactory relationship. It is also consistent with substantial qualitative research showing that critical incidents or moments of truth are important influences on service purchase decisions (Bitner, Booms, and Tetreault 1990) and with prior research on the negativity effect, which suggests that a single negative piece of information carries more weight than a single positive piece of information (Price 1996).

Does this result imply that poor service quality is good for firms? No, certainly not. For this specific firm, the decision to upgrade a contract ultimately depends on the interaction effects. Because most customers are satisfied with the firm and prices are high, the net effect is as follows: The

business customer is less likely to upgrade when quality is poor on the focal contract and the interaction effects are taken into account. We subsequently illustrate this outcome using simulation results.

Higher Prices—More Upgrades?

Firms that currently pay higher prices on a contract (or have lower discounts) are more likely to upgrade. Prior research examining antecedents of the service contract renewal decision (Bolton, Lemon, and Bramlett 2006) has found that price has a negative effect on the renewal decision; the higher the price, the less likely firms are to renew the contract. Thus, it appears that price operates differently on the upgrade decision, perhaps acting as a current reference price against which the increase in price (to move up to a higher-level contract) is considered. This is consistent with recent research on price fairness (Bolton and Alba 2006), which finds that when increases in price are perceived as aligning with increases in vendor costs, such prices are considered fair.

Decision-Maker Perceptions Also Influence the Decision

In addition to effects of contract-level experiences, such as service quality and price, decision makers' perceptions of the supplier, which are firm-level constructs, directly influence firms' contract-level decisions. Examining main effects, we observe that firms with decision makers who are satisfied are more likely to upgrade service contracts. This result is consistent with research in the customer satisfaction and loyalty literature. Notably, we do not find support for a main effect of criticality on the upgrade decision. We believe that this may be a ceiling-effect phenomenon; firms that perceive the equipment as critical to their needs may already have chosen a high level of contract, thereby masking this effect in our data.

Satisfaction Moderates the Effect of Service Quality

Decision-maker perceptions of the supplier moderate the effects of service quality on customer upgrade decisions. Customer satisfaction (the decision maker's evaluation of the supplier's management of the entire account relationship) moderates the effect of service quality on the customer upgrade decision—a rose-tinted-glasses effect. The results suggest that a highly satisfied decision maker can reduce the effects of poor service quality at the contract level, so the firm is less likely to upgrade. A way to interpret this interaction is to consider a firm with low satisfaction (which we believe is driving this result). In this case, it appears that decision makers pay more attention to objective quality information, such as service quality. This implies that they may be in a more active problem-solving mode and is consistent with research by Olsen and Johnson (2003), who find that less satisfied customers focus more immediately on quality perceptions than more satisfied customers. The interplay between supplier perceptions (satisfaction) and contract-level objective experiences of service quality suggests that the firm's decision to upgrade a service

contract entails a consideration of information and assessments at multiple levels and that it is more complex than prior research has indicated. Note that from the firm's perspective, our results suggest that decision makers' perceptions can "bias" contract-level service experiences, leading customers to choose contract levels that may not necessarily be optimal.

Price \times Service Quality Interaction

In addition to main effects of the contract-level measures of service quality and price, we find that these two factors interact to influence the firm's upgrade decision. This negative interaction effect suggests that, consistent with prior research, firms that experience higher service quality are less price sensitive or, conversely, firms that experience lower service quality are more price sensitive (see Bolton and Myers 2003). This result also implies that there may be a ceiling effect for the positive effects of two somewhat negative aspects of a product (poor quality and high price), such that when the price is too high or the quality is too poor, these positive effects are lessened.

Illustrative Simulation Results

It is important for suppliers to assess the "net effect" of changes in service quality (i.e., main and interaction effects combined) on the buying firm's likelihood of upgrading a service contract. For this supplier, we simulated the effects of a 5% change in satisfaction, resolution time, and price. For each of these three scenarios, we calculated the relative effect on the business customer's probability of upgrading the focal service contract (i.e., not the absolute change in probability). First, a 5% increase in satisfaction leads to a 44% increase in the probability that the business customer will upgrade a contract (*ceteris paribus*). Second, for a 5% increase in resolution time (i.e., service quality is worse for the focal contract), we find a 25% decrease in upgrade probability. However, if the firm decreases the resolution time by 5% (i.e., service quality is better for the focal contract), the upgrade probability increases by 123%. (This asymmetry arises because there are diminishing marginal returns to service quality.) Finally, for comparison purposes, we simulated the effects of a 5% increase in price. The result is a 6% increase in the upgrade probability (because customers that pay higher prices are less price sensitive as a result of reference price effects). Note that modest service improvements (i.e., average resolution time for the focal contract decreases by approximately two minutes) have a much greater impact on business customer behavior than price changes.

Methodological Contributions

This study's approach to firm decision making is novel in several respects. First, it incorporates perceptual measures (from surveys) and operations measures (from internal process metrics) into a single model of customer behavior. Second, the model is estimated with a cross-sectional, longitudinal database that enables us to show the causal nature of our findings (i.e., antecedents in time $t - 1$ affect the upgrade decision in time t). Third, the inclusion of random effects in the model enables us to account for individual

firm effects (i.e., customer heterogeneity) and to distinguish them from the hypothesized effects. Thus, our study shows that comprehensive customer relationship databases can help researchers construct richer models of customer behavior.

Implications for Managerial Practice

A recent study suggests that in most industries, more customers change their spending behavior than defect, implying that gains due to increases in the breadth of the relationship may account for up to 25% of increases in revenue, whereas losses due to defections may account for only 3% of losses in revenue (Coyles and Gokey 2005). This observation is consistent with our findings. Small increases in the likelihood of upgrading are potentially highly lucrative. They yield substantial changes in revenues because there are many customers purchasing relatively high-priced service contracts. Our study offers several insights that enable marketers to manage their relationships with customers. Given the enhanced focus on customer relationships and organic growth, this research is relevant to most industries that provide goods and services in B2B environments, including service firms and traditional manufacturers that now differentiate their offerings by augmenting their tangible goods with service (e.g., delivery guarantees, contracts, consulting). In the following subsections, we offer some guidelines for managers.

Manage at Both the Account and the Contract Level

Suppliers must consider (and manage) business customer experiences simultaneously at the account level (i.e., perceptions that encompass the entire relationship) and at the contract level (e.g., service quality, price, discount) over time. This observation is consistent with prior qualitative research that conceptualizes the evolution of B2B relationships in terms of social exchange processes that arise from discrete episodes or transactions (Narayandas and Rangan 2004).

Understand the Role of Goods and Services

At the account level, suppliers should strive for high customer satisfaction and should also monitor information regarding the objective aspects of the service. The interaction between satisfaction and service quality suggests that account management teams—both sales and service professionals—within the supplier’s organization must gain a deep understanding of each business customer’s needs so that they can justify to the decision maker the need to upgrade a service contract when satisfaction is low and the service quality is poor (Piercy and Lane 2006). As one decision maker remarked, “[The supplier] needs to be more knowledgeable about our configuration so as to help us more with purchases.” In other words, customer dissatisfaction can be an opportunity for account management teams to “migrate” contracts to higher service levels because it may represent a situation in which the decision maker is paying particular attention to the service contracts and is in

problem-solving mode. The persuasion process requires an intimate understanding of the environment within the customer organization and how the supplier’s product can serve it.

Measure and Manage Service Delivery Metrics

Suppliers must also manage the relationship at the individual contract level. In a B2B context, customers hold many contracts and the contracts are fairly complex, so contract management is a significant challenge. Consequently, suppliers should measure and manage service operations metrics and price levels at the contract level so that account managers are aware of the actual (not promised) service quality levels for every contract the customer purchases and the current price paid on each contract. This knowledge will ensure that appropriate levels of service are being delivered across all contracts. More important, this knowledge will enable the supplier to identify proactively contracts with poor service quality delivery because these contracts represent both a risk and an opportunity. Situations in which the decision maker perceives the supplier’s management of the account relationship as satisfactory but objective service quality varies noticeably across contracts simultaneously represent an opportunity for upgrading to a higher-level service contract and a risk of losing the contract. Account management teams should view this situation not only as a critical moment but also as a “teachable moment,” when they can discuss an upgrade to a higher-level contract and demonstrate its value (encourage subtractive framing). Similarly, firms that hold contracts that were negotiated at a higher price may be key targets for upgrades because they constitute a market segment that may be more willing to (and interested in) an upgrade.

Manage a Multiple Service Contract Environment

Popular services management heuristics, such as “underpromise, overdeliver” or “a rising tide raises all boats” (i.e., always attempt to exceed customers’ quality expectations), are appropriate slogans for encouraging customer retention but not for encouraging upgrading of service contracts. Indeed, these approaches are overly simplistic and difficult to execute in an environment with multiple service contracts. Extremely high service quality on all contracts eliminates the critical moments that suppliers can use to demonstrate the value of a service upgrade for a particular contract. Moreover, if the supplier delivers extremely high service quality for some (but not all) service contracts, the buying firm’s expectation or norm is likely to be higher, so contracts with good, but not outstanding, service quality will seem poor in comparison. There may be a tipping point at which rather than upgrading, the buying firm infers that service is unsatisfactory and chooses not to renew the contract.

Improve Customer Decision Making

We must sound a note of caution for managers, such as chief information officers and telecommunication decision makers, who are responsible for managing service contracts. From the buying firm’s perspective, our results indi-

cate that a decision maker's perception may color the contract-level experiences, leading him or her to choose contract levels that may not be optimal. It behooves the firm to ensure that the decision maker does not rely solely on his or her impression of how the account is managed. The decision maker must be familiar with individual service contracts, collecting information from the end users of the service so that he or she knows which contracts should be upgraded and which should not.

Overall

In summary, our research suggests that the supplier firm needs to understand the nature and history of customers' experiences with the firm over time, at both the account and the contract levels. Both superior account management and service delivery (through people and technology) are necessary if a supplier firm intends to grow its relationships with customers by means of service contract upgrades. Achieving these synergies may be particularly difficult in firms that isolate marketing, sales, and operations in separate functional silos. Our research is also related to recent research in the area of key account management (KAM). For example, Homburg, Workman, and Jensen (2002) find that activity proactiveness and activity intensity on the part of the supplier firm increase KAM effectiveness. Understanding and monitoring service quality of each contract is a specific example of such proactive activity. In addition, Piercy and Lane (2006) suggest that understanding customer requirements is a key element of KAM effectiveness. The findings of this study suggest specific aspects of customer requirements on which supplier firms should focus. The findings also suggest that suppliers should be asking the following questions about their relationships with their business customers: What is happening in the buyer-seller relationship (i.e., at the account level)? What is happening (operationally) on a contract-by-contract basis? and What is happening when we consider the decision maker's frame of reference (prior satisfaction, perceptions of the environment) and place the focal contract in that context? Answers to these three questions will help suppliers proactively manage their relationships with business customers and enable them to determine which customers may be interested in upgrading and which service contracts they may be willing to upgrade.

Concluding Remarks

There are many avenues for further research regarding upgrading in B2B contexts. First, we conducted our study in only one industry context. However, we believe that this limitation is reduced by the richness of our data, which allows us to eliminate competing explanations for our findings. In a cross-sectional, longitudinal database with multiple contracts at each customer account, we can gain many insights into the factors that influence the upgrade decision. Nevertheless, further research should investigate this decision in different study contexts, as well as experimental settings in which the constructs (e.g., satisfaction, service quality, price) can be manipulated rather than measured. In addition, we incorporated heterogeneity across firms through a random coefficients model. Alternatively, a latent class model could be used to capture unobserved heterogeneity.

Second, we were able to link service operations measures to the customer upgrade decision. However, managers are interested in understanding which improvements in service will "pay off." Thus, further research should link service operations to other business performance metrics, such as customer lifetime value or customer equity. Moreover, it should investigate the effect of service operations improvements on new customer acquisition, retention, upgrading, and cross-buying, perhaps by specifying and estimating systems of equations. For example, understanding the relative influence of service quality variables versus other marketing-mix variables (e.g., price) on these three distinct customer behaviors would also be helpful.

Third, our analyses focus on short-term (i.e., year-to-year decisions) rather than long-term decisions, whereby a customer might choose to stop purchasing any contracts from a given supplier (i.e., completely terminate the relationship). Our model provides insight into the customer upgrade decision over time, but it cannot explain discontinuities, such as when a firm creates a committee to formally evaluate its relationships with suppliers). A worthwhile extension of our work would be to examine switching and upgrade behavior and incorporate transaction costs. It would be helpful to understand the role of competition and brand equity in such decisions, an issue that was beyond the scope of this study.

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