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*EFFECT OF RELATIONSHIP QUALITY AND COST TO SERVE
ON CUSTOMER VALUE IN BUSINESS MARKET*

By

Maria Gabriela Piscopo

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy
in the Robinson College of Business of
Georgia State University

GEORGIA STATE UNIVERSITY
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ACCEPTANCE

This dissertation was prepared under the direction of the *Maria Gabriela Piscopo* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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ABSTRACT

EFFECT OF RELATIONSHIP QUALITY AND COST TO SERVE ON CUSTOMER VALUE IN BUSINESS MARKET

BY

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May 6, 2013

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Traditionally, marketers have assumed that investing in the quality of relationships with customers would generate superior profitability to the selling firm. The assumption is that coordination and collaboration between buyer and seller create value for both firms by reducing costs and expanding revenue opportunities. However, such value creation mechanism does not work every time. Closer relationships require customer specific investments and a higher level of service that may create more cost to the seller than the potential gain in revenue, negatively impacting profitability of the selling firm. This research explores the effect of buyer-seller relationship quality on value creation for the selling firm, emphasizing the understanding of costs associated with serving the relationship. Two studies were conducted: *Study 1* qualitatively examines the cost associated with serving customers and estimates actual cost-to-serve for individual customers. *Study 2* measures the quality of customer relationships, past customer profitability and customer lifetime value for each

customer relationship in the proposed sample. Finally, the effect of RQ on customer lifetime value is evaluated. Results suggest that investing in customer relationships have an effect on the drivers of customer cost and profitability. However, the net effect on customer value is not as clear as it depends on the trade offs of the different drivers of cost and profit.

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CHAPTER 1

INTRODUCTION

Much has been discussed in the marketing literature about the benefits of establishing deeper, stronger relationships with customers. Numerous scholars and practitioners have advocated the need to build closer buyer-seller relationships, which would result in increased loyalty and stability, improving the long-term financial performance of the selling firm. However, studies of the impact of relational constructs on the selling firm performance have shown mixed results at best (Palmatier, Dant, Grewal, & Evans, 2006; Reinartz & Kumar, 2000).

At the same time, the accountability of the marketing function has taken a central stand in both business research and practice (Rust, Lemon, & Zeithaml, 2004). Marketers need to demonstrate the contribution of their actions to shareholder value creation. Customers are deemed assets and as such, need to be managed in the most optimal way (Reinartz & Kumar, 2003). Customer Profitability and Customer Lifetime Value have taken a central stand in marketing strategy. Understanding how relationship-marketing efforts impact the value of customers to the selling firm becomes a priority in today's marketing environment.

The purpose of this study is to explore the effect of buyer-seller relationship quality on value creation for selling firms in business-to-business markets, emphasizing the understanding of costs associated with serving the relationship.

1.1 Problem Statement

Business marketers face the challenge of building successful relationships with customers while ensuring the profitability of their actions. Selling firms invest time and resources to develop ties with customers where trust, commitment, satisfaction and cooperation are the norm (De Wulf, Odekerken-Schroder, & Iacobucci, 2001). The

underlying assumption is that stronger relationships between buyer and seller create value for both firms by reducing costs and expanding revenue opportunities (Narayandas & Rangan, 2004). However, such value creation mechanism does not work every time. Empirical evidence of the impact of relationship quality on objective measures of profitability has been insufficient and inconsistent thus far (Palmatier et al., 2006). to better understand the influence, if any, of relationship quality on customer value and customer profitability.

One of the potential reasons for the inconsistency of results in this area is the behavior of customer cost. Closer relationships may require customer specific investments and a higher level of service that could create more cost to the seller than the potential gain in revenue, negatively impacting profitability of the selling firm (L. J. Ryals, 2001). Thus, cost-to-serve represents a key concept in understanding the impact of relational efforts on profits. Based on the notion that not all costumers consume the same resources from the supplier firm, cost-to-serve is a measure of the cost incurred servicing specific customers (Kaplan & Narayanan, 2001).

Understanding cost-to-serve is particularly important in business marketing situations in which the cost of maintaining relationships can be significant (Braithwaite & Samakh, 1998b). Organizational customers tend to be more demanding and expect higher level of customized service than consumers do. Selling to organizations require a more personalized approach with different members of the buying center and higher level of technical support, especially when the firm's offering impacts the customer's production process (Niraj, 2001).

1.2 Research Questions

Thus, based on the need to better understand the effect of customer relationships on value creation to the selling firm, this study asks the following research questions:

1. Are higher quality customer relationships more profitable to the selling firm when looking at measures of past profitability?
2. What are the real costs of developing and maintaining customer relationships in business-to-business markets?
3. If relationship quality has a positive effect on customer profitability, how does this effect occur?
 - a. Do customers in higher quality relationships with suppliers pay higher prices than other customers?
 - b. Do customers in higher quality relationships with suppliers buy more from those suppliers?
 - c. Do customers in higher quality relationships with suppliers buy a more profitable mix of products?
 - d. Are customers in higher quality relationships more or less costly to serve?
4. Can selling firms expect higher quality relationships to generate greater customer value in the future?

To address the above research questions, I conducted two separate studies using data from a manufacturing firm selling to business customers. *Study 1* focused on the cost of serving individual customers. A qualitative analysis provided insights into the factors that drive customer costs in business-to-business settings, thus addressing question number 2. Through in-depth interviews with marketing managers from the selling firm, I uncovered activities performed and resources employed to maintain relationships with customers. Once drivers were uncovered, cost-to-serve was objectively estimated for all customers in the sample by attributing costs based on the actual recorded consumption of such drivers.

Study 2 addressed the remaining research inquiries. The study assessed the quality of individual customer relationships as perceived by the customers, through the application of a questionnaire. Past customer profitability and customer lifetime value were then calculated for each customer relationship, based on objective historical sales and margin data from the

financial records of the focal selling firm. The impact of both RQ and cost-to-serve on customer value was empirically evaluated.

1.3 Contributions of the Study

This dissertation makes key contributions to the understanding of customer value creation in business markets. First, this study represents one of few attempts to test the effect of buyer-seller relationship's attributes on objective measures of seller firm's performance. Most existing studies in relationship marketing are survey based and measure outcomes of relationship marketing efforts subjectively, as reported by key informants. While some of the effects in the proposed model might have been partially tested using objective measures, no other research adopts the holistic approach of this dissertation.

Second, this research contributes to the understanding of costs involved in developing and maintaining relationships. Cost-to-serve has been defined in the accounting literature and it is used by businesses in the industry, however the knowledge has not been incorporated into an overall framework including buyer-seller relationship closeness. There are relatively few cases in the marketing literature that shed light on the cost to serve customers, beyond the communication and direct sales aspects of it. Previous research has attempted to link relational constructs with value creation to the selling firm, but none has included a throughout analysis of customer cost. The majority of previous studies involving CLV calculations only include communication and direct costs, ignoring cost drivers that could be of high impact in a B2B relationship. This is an area that has not received enough attention by marketing scholars, but can be of high impact both for academics and practitioners.

Third, this study expands the understanding of the trade-off between benefits and costs when managing customer relationships. It makes sense to strengthen efforts in relationship building as long as the incremental benefits of such efforts surpass the incremental cost. Understanding the drivers of customer cost and its behavior can greatly

help managers decide the right amount of resources dedicated to different customers to maximize profit.

The remainder of this research proposal is organized as follows. Chapter 2 reviews the extant literature in the areas of relationship quality, customer profitability and customer value and it identifies the important gaps this study seeks to fill. Chapter 3 describes the research design and methodology that will be utilized to test the hypothesis, including key constructs, measures, and data collection procedures. Chapter 4 summarizes the results of our analyses. Finally, Chapter 5 expands on key contributions of the study, as well as managerial, research, and theoretical implications. It will conclude with an evaluation of the study's key limitations and directions for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Relationship Marketing and Customer Relationship Management

In the last two decades, relationship marketing has become one of the dominant paradigms of both marketing practice and academic research (Eiriz & Wilson, 2006; Palmatier et al., 2006). In their seminal 1994 article, Morgan and Hunt (see 1994 p. 22) define Relationship Marketing as “all marketing activities directed towards establishing, developing, and maintaining successful relationship exchanges”. What possibly started with Dwyer, Schurr and Oh (1987) proposing a framework for developing buyer-seller relationships, evolved into a robust school of thought within marketing emphasizing relationship building as opposed to transaction based exchanges (Cannon & Perreault Jr, 1999).

More recently, the relationship marketing literature has evolved towards the concept of Customer Relationship Management (CRM). CRM emerges from the integration of the extant knowledge on buyer-seller relationships, customer centricity, and value creation combined with the availability of new technologies to collect and manage data (Boulding, Staelin, Ehret, & Johnston, 2005). Although often CRM has been equated to a technological application, such view is incomplete. Zablah, Bellenger and Johnston (2004) notice little consensus in the definition of CRM and attempt to provide a unified conceptualization, defining CRM as “an ongoing process that involves the development and leveraging of market intelligence for the purpose of building and maintaining a profit-maximizing portfolio of customer relationships” (Zablah et al., 2004, p. 480). CRM thus relates to the efforts to develop close interaction with selected customers through cooperation and collaboration.

Under the CRM paradigm, establishing deeper, stronger relationships with customers should increase loyalty and stability, making the relationship inimitable by the competition. Customer Relationship Management is expected to offer protection against imitation, transfer or substitution from competition. In the extent that a firm develops a portfolio of strong customer relationships, its long-term performance and profitability would be superior (Reimann, Schilke, & Thomas, 2010).

2.2 Relationship quality

As buyer-seller relationships became the focus of a vast stream of research, the notion of relationship quality emerged. The underlying assumption is that forging stronger and closer relationship with customers leads to positive relational outcomes and eventually to superior firm performance (Dwyer et al., 1987; Narayandas & Rangan, 2004; Storbacka, Strandvik, & Gronroos, 1994). Trust, commitment, relational norms, long-term orientation, communication, satisfaction, adaptation and cooperation are among the many constructs that the extant literature links to a preferred form of relational exchange (Dwyer et al., 1987; Leonidou, Palihawadana, & Theodosiou, 2006; Morgan & Hunt, 1994). However, it wasn't until the early 90s that relationship quality emerged as a construct itself, defined as an overall holistic assessment of the many aspect of a relational exchange (Crosby, Evans, & Cowles, 1990).

Crosby, Evans and Cowles (1990) were probably the first marketing academics to adopt and measure the relationship quality construct. They set their study in the context of service selling, and focus on the quality of the salesperson-customer relationship as perceived by the customer. They define a high quality relationship as one in which the customer is able to rely on the salesperson based on past satisfaction. Hence, two factors are included as indicators of relationship quality: (1) trust in the salesperson and (2) satisfaction with the salesperson. Crosby and colleagues found evidence that relationship quality exerts influence on customer's anticipation of future interaction but not on sales effectiveness.

They also found evidence that relationship-selling strategies have a significant impact on relationship quality. Subsequent studies validated the importance of the relationship quality construct in a sales context and its influence on behavioral outcomes (see Boles, Johnson, & Barksdale Jr, 2000; Lagace, Dahlstrom, & Gassenheimer, 1991).

Proponents of the relationship quality construct take a multi-dimensional perspective (Woo & Ennew, 2004). Hence, relationship quality is conceptualized as a higher order construct composed of several distinct, though related, dimensions (Naude & Buttle, 2000; Roberts, Varki, & Brodie, 2003). In a recent meta-analysis, Palmatier and colleagues (2006, p. 149) find that “different dimensions of a relationship might be synergistic, and superior performance may be possible only when the relationship is sufficiently strong on all critical aspects”. They propose that a composite measure of relationship quality best captures the impact of relational efforts on performance.

2.2.1 Dimensions of Relationship Quality

Most scholars agree that relationship quality is best conceptualized as a higher order construct. However, scholars lack consensus on the dimensions that the concept comprises. Among the first order constructs regarded as dimensions of relationship quality are: trust, commitment, satisfaction, conflict, mutual understanding, reciprocity norms, and expectations of continuity. Based on an exhaustive review of the extant literature, one can conclude that trust, commitment, and satisfaction generate the widest acceptance as indicators of a high quality relational exchange. Table 1 below shows a summary of selected empirical studies on relationship quality and their conceptualization of the construct.

Table 1
Existing Studies on Relationship Quality

Study	Definition	R.Q. Indicators	R.Q. Antecedents	R.Q. Outcomes
Crosby et al. (1990)		Trust , satisfaction (with the salesperson)	Similarity, expertise, relational selling behavior	Sales effectiveness, anticipating of future interaction
Lagace et al. (1991)		Trust , satisfaction (with the salesperson)		None
Kumar, Scheer & Steenkamp (1995)		Conflict, trust, commitment, willingness to invest , expectation of continuity	Procedural fairness, distributive fairness, outcomes given alternatives, age of relationship	None
Bejou, Wray and Ingram (1996)		Trust , satisfaction	Salesperson expertise, ethical orientation, relationship duration, customer orientation, selling orientation	None
Jap, Manolis & Weitz (1999)	Evaluations of various aspects of relationship: attitudinal, process and future expectations	Trust, conflict, expectation of continuity , disengagement	None	Buyer-seller interaction, friendliness, question asking, disagreement, compliance, time spent talking
Naude and Buttle (2000)		Trust, power, integration, mutual understanding , profit	None	None
Boles, Johnson and Barksdale (2000)		Trust , satisfaction (with the salesperson)	Similarity, expertise, equity, relational selling behavior	Sales effectiveness, anticipating of future interaction
Jap (2001)		Satisfaction, outcome fairness, willingness to collaborate in the future.	Relationship conditions and sharing principles	None
De Wulf, Oderken-Schroeder and Iacobucci (2001)	Overall assessment of the strength of the relationship	Trust, commitment, satisfaction	Perceived Relationship Investments	Loyalty
Hewett, Money and Sharma (2002)		Trust, commitment	None	Repurchase intentions.
Roberts et al. (2003)	Higher order construct composed of trust, commitment and satisfaction	Trust, commitment, satisfaction , affective conflict	Service quality	Loyalty
Woo & Annew (2004)	Higher order construct denoting an overall evaluation of the relationship between buyer and seller.	Cooperation, adaptation and atmosphere	None	Service quality, customer satisfaction and behavioural intentions
Huntley (2005)		Technical dimension (satisfaction w product), social dimension (satisfaction w srvice), economic dimension (value), partnership, time	Trust, Commitment	Sales, recommendation intention
Ivens and Pardo (2006)	Complex construct measuring the atmosphere in a dyad	Trust, commitment, satisfaction	Key account classification. Prioritization.	None
Ulaga & Eggert (2006)	Higher order construct composed of trust, commitment and satisfaction	Trust, commitment, satisfaction	Relationship Value	Anticipated expansion, intention to leave
Palmatier (2008)	Higher order latent construct that captures the caliber of relational ties	Trust, commitment, reciprocity norms, exchange efficiency	None	Customer Value (measured as "commissions" as an indicator)

Trust

Trust has been defined as the belief by one party in a relationship that the other party will act with fairness, honesty and reliability (Anderson & Weitz, 1992; N. Kumar, Scheer, & Steenkamp, 1995; Leonidou et al., 2006; Palmatier, 2008). Morgan and Hunt conceptualize trust as “existing when one party has confidence in an exchange partner's reliability and integrity (Morgan & Hunt, 1994, p. 23). Trust has also been defined as the expectation that the relationship partner will act in the best interest of the relationship (Walter & Ritter, 2003) and would not act opportunistically (Jap, Manolis, & Weitz, 1999). Most researchers in marketing agree on the notion of trust as a belief. However, trust has also been conceptualized as the behavioral intention or willingness to rely on the partner (Moorman, Deshpande, & Zaltman, 1993).

As with many other relational constructs, researchers suggest that trust is a multidimensional construct. Two dimensions of trust are usually recognized: credibility and benevolence. Credibility refers to the belief that a partner has the expertise and capabilities to meet the expectations of the other partner in the relationship, so such partner's promises can be relied on. Benevolence refers to a firm's confidence that the exchange partner will act in the best interest of the firm and will not act opportunistically (Ganesan, 1994). Previous research in marketing has clearly established the importance of trust for relationship performance (Palmatier et al., 2006). Morgan and Hunt's theory (1994, p. 22) propose a “key mediating variable model of relationship marketing”, where trust and commitment are the key central constructs mediating the impact of relationship marketing efforts on outcomes. Of all relational constructs in the relationship marketing literature, trust has been the one most often examined and has been found to increase commitment, enhance cooperation, strengthen loyalty and reduce conflict (see Bejou, Wray, & Ingram, 1996; Crosby et al., 1990; N. Kumar et al., 1995; Leonidou et al., 2006; Palmatier, 2008). Both scholars and marketing managers strongly associate trust with successful relationship development (Naude & Buttle, 2000).

From the numerous papers reviewed for this dissertation, only two did not include trust as an indicator of relationship quality. Jap (2001) focuses on the perceived fairness and satisfaction with the relationship and does not explicitly include trust in her model. Huntley (2006), measures relationship quality as a form of satisfaction and posits trust as an antecedent of the construct instead of as an indicator of it. Except for those two studies, consensus exists that the existence of trust accompanies high quality relationships.

Commitment

Morgan and Hunt situate commitment, along with trust, at the center of their “key mediating variable model of relationship marketing” and define it as the belief that “an ongoing relationship with another is so important that as to warrant maximum efforts at maintaining it” (Morgan & Hunt, 1994, p. 23). It has also been defined as the “desire to develop a stable relationship, a willingness to make short-term sacrifices to maintain the relationship and a confidence in the stability of the relationship” (Anderson & Weitz, 1992, p. 19). Commitment is not present in transactional types of exchange; it develops as relationships reach a deeper level of closeness. The presence of commitment in a relationship implies a long-term orientation, a desire to maintain the relationship in the future (Dwyer et al., 1987).

Two dimensions have been assigned to commitment in the marketing literature: credible and attitudinal. Credible commitment is behavioral in nature and comprises the investments and actions that keep parties attached. Attitudinal is the attachment bond itself, independent of past actions. Attitudinal commitment can take two forms: an emotional, social sentiment (loyalty) and a rational, economic calculation (calculative) (Gilliland & Bello, 2002).

Previous research has included commitment as a dimension of relationship quality (Hewett, Money, & Sharma, 2002; Ivens & Pardo, 2007; N. Kumar et al., 1995; Palmatier, 2008; Roberts et al., 2003; Ulaga & Eggert, 2006). Commitment is generally regarded as a

relationship-enhancing bond (Gilliland & Bello, 2002). Relationships that exhibit high levels of commitment have been shown to be more valued, more stable, less conflictive and to experience higher levels of cooperation and loyalty (Palmatier et al., 2006).

Relationship Satisfaction

Researchers have also indicated that a high quality relationship is one in which exchange partners are satisfied. A customer not satisfied with the product or services received from a supplier, cannot be expected to have a good relationship with such vendor (Roberts et al., 2003). An exchange partner who receives less than expected from a relationship would hardly regard the liaison a high quality exchange.

Satisfaction is an affective state resulting from an evaluation. It is not an absolute measure but a relative one, which depends on a comparison standard (Leonidou et al., 2006). The disconfirmation paradigm explains the concept of satisfaction. This paradigm states that satisfaction results from a contrast between perceived performance and a comparison standard, mainly expectations. Satisfaction exists when performance meets expectations (confirming). If performance exceeds expectation, a positive disconfirmation means higher satisfaction. If performance falls below expectations, a negative disconfirmation means dissatisfaction (Cadotte, Woodruff, & Jenkins, 1987).

In the context of relationships, satisfaction is regarded as a cumulative measure influenced by all past exchange episodes (Crosby et al., 1990). Storbacka and colleagues state the cumulative nature of customer's satisfaction when they define it as a "cognitive and affective evaluation based on the personal experience across all service episodes within the relationship (Storbacka et al., 1994, p. 26)."

2.2.2. Outcomes of Relationship Quality

The extant literature recognizes diverse outcomes of relationship quality, depending on the context and perspective of the research. In a personal selling context, researchers have found evidence that relationship quality has a positive effect on the anticipation of

future interaction with the salesperson (Boles et al., 2000; Crosby et al., 1990) and on sales effectiveness (Boles et al., 2000). In the context of consumer-marketer relationship, the quality of the liaison has been positively linked to increased loyalty (De Wulf, Odekerken-Schroder, et al., 2001; Roberts et al., 2003). From an inter-organizational perspective, high quality relationships have been found to exhibit more friendliness, less disagreement and less compliance than lower quality ones (Jap et al., 1999). Relationship quality has been also found to positively influence the future level of business in the relationship by increasing repurchase intentions (Hewett et al., 2002), anticipated expansions (Ulaga & Eggert, 2006), and actual sales (Huntley, 2006); and decreasing intentions to leave (Ulaga & Eggert, 2006).

Of particular relevance for this dissertation is the work of Palmatier (2008), which integrates social network and exchange theory to develop a model of customer value. In his model, Palmatier proposes relationship quality as one of three drivers of customer value. The study finds evidence that the quality of the exchange relationship, along with the number of ties among firms and the contact authority, creates value to the selling firm.

2.3 Value Creation in Buyer-Seller Relationships

The extant literature in marketing has adopted three different perspectives when looking at value in business markets. The first one is the buyer's perspective or the assessment of how suppliers create value for their customers. The second is the seller's perspective, which deems customers as a key asset to the seller firm, focusing on how to maximize value creation to the supplier by optimal customer equity management. The last perspective looks at how firms jointly create value through relationships and alliances (Ulaga & Eggert, 2005). Without discounting the importance of the other two perspectives, this study adopts the seller's perspective. It focuses on understanding creation of value to the selling firm by managing relationships with customers.

2.3.1 Measuring Value to the Selling Firm: Customer Profitability, Customer Value and Customer Equity

In the last two decades, both business practitioners and academics have shown growing interest on the value that customers represent to the selling firm. Most scholars agree on the importance of measuring, managing and maximizing this value in order to optimize firm performance (Blattberg, Getz, & Pelofsky, 2001; V. Kumar & Shah, 2009). However, the literature lacks consistency in the treatment and conceptualization of the subject, specially across business sub-disciplines (Gleaves, Burton, Kitshoff, Bates, & Whittington, 2008). Frequently, researchers refer to the financial value of customers as Customer Profitability and use this term interchangeably with several others. For instance, Mulhern (1999) identifies seven terms that, in his view, refer to the same concept: lifetime value, customer lifetime value, customer valuation, customer lifetime valuation, customer relationship value, customer equity and customer profitability. Jain & Singh (2002, p. 37) indicate: “In the literature, CLV also appears under other names such as customer equity and customer profitability”.

Alternatively, some researchers argue that Customer Profitability, Customer Lifetime Value and Customer Equity are interrelated but distinct concepts. Jacobs, Johnston and Kotchetova (2001) differentiate between the retrospective and prospective view of customer profitability. The retrospective view is historical and imitates traditional, end-of-period financial statements, while the prospective view focuses on the future and the value of customers as assets. Pfeifer, Haskin and Conroy (2005) attempt to provide consistent and inclusive definitions of Customer Profitability (CP) and Customer Lifetime Value (CLV) but do not define Customer Equity (CE). They base the distinction between CP and CLV on the difference between profit and value as defined by the finance discipline. The underlying assumption is that customer relationships are intangible assets to the selling firm. Financial value reflects what an asset is worth at present time or what someone would be willing to

pay to own the future cash flows generated by the asset. Profit is the difference between accrued revenues and costs associated to that revenue in a given period. Pfeifer and colleagues then apply those definitions to the individual customer relationship. Hence, they define customer profitability as the difference between past revenues and cost from a customer relationship, and Customer Lifetime Value as the net present value of the future cash flows generated by such relationship. Miller (2008) also provides distinct definitions related to customer value, introducing the term customer valuation or “the lifetime value of individual customers/customer segments”. For him, customer profitability reflects “in-the-bank profits” and consists on “the periodic reporting of the profits earned on individual customers/customer segments” (Miller, 2008, p. 63).

In a 2008 paper, a group of researchers from both marketing and accounting attempt to provide clarity to the inter-relation among CP, CLV and CE. They suggest that all three concepts are measures of customer value that differ in the timescale and the customers included in the analysis. Calculated for a single customer, CP can be considered a special case of CLV with a lifetime period of one and no discounting. CE results from aggregating the CLV of all customers of a firm (Gleaves et al., 2008).

An alternative approach posits the assessment of customer value to the selling firm as a multi-stage process. Such process starts with customer profitability analysis or the retrospective view of earned profits from the relationship (Weir, 2008). The calculation of customer profitability is regarded as a pre-requisite for the next stage of customer valuation, in which the customer lifetime value is estimated (Niraj, 2001). The last stage aggregates customer lifetime value to arrive to the assessment of customer equity, defined as the sum of all present and future individual customer lifetime values (Blattberg et al., 2001).

Adopting the multistage approach to customer valuation, the current study starts with the retrospective analysis of individual customer profitability to subsequently estimate customer lifetime value for individual customers. This study will not calculate the aggregated measure for all customers, thus not examining Customer Equity.

2.3.2 Customer Profitability Analysis

Businesses have been interested in measuring profits as long as they existed. Traditionally, accounting has provided the means to calculate firm profitability an aggregate level. More recently, advances in data management technology have facilitated the measurement of profitability at different levels of analysis (Berger & Nasr, 1998). Firms can calculate profits by business units, product lines, individual products, market segment, etc. The individual customer represents one of the last dimensions added to this list. Database marketing and CRM have provided the tools to capture data at the individual customer level, allowing the assessment of the contribution of individual customers to the selling firm's income and profits (Mulhern, 1999).

Customer Profitability represents the retrospective view of customer value, by which the selling firm assesses the profits already generated by individual customer relationships (Jacobs et al., 2001; Miller, 2008). It has been defined as “the net dollar contribution made by individual customer to an organization” (Mulhern, 1999) and “the difference between the revenues earned from and the cost associated with the customer relationship in a specific period of time” (Pfeifer et al., 2005). Similarly, Customer Profitability Analysis has been defined as “the process of allocating revenues and costs to individual customers accounts, such as the profitability of those accounts can be calculated (E. M. van Raaij, Vernooij, & van Triest, 2003).”

Benefits of Customer Profitability Analysis

Customer Profitability Analysis is central to CRM (Mulhern, 1999; Niraj, 2001). Many scholars advocate the use of Customer Profitability Analysis (CPA) to improve customer relationship management decisions. Some of the benefits of CPA found in the literature are listed below:

1. Managing cost and revenue: the allocation of revenues and cost to individual customers exposes disparities in customer's ability to generate enough cash inflows

to cover expenses. More importantly, by applying CPA, managers determine drivers of revenues, costs, and expenses and reach a better understanding of the causes of profit variability across customers (E. Van Raaij, 2005). Such understanding leads to strategic decisions that can bring expenditures in line with current and potential revenues. CPA can influence decisions in several areas that directly impact revenues and cost:

- a. Pricing decisions: price directly impacts revenue. Customer profitability allows selling firms to make more informed pricing decision (Miller, 2008). For instance, without understanding of the profitability of a customer, sellers can base discounts on volume, facing the risk of giving a discount larger than the contribution margin (E. Van Raaij, 2005).
 - b. Service alignment: a throughout analysis of services provided to customers is necessary to capture accurate profitability measures. Many customers are unprofitable due to a disproportionate amount of premium services received free of charge. Other customers receive services that do not add value to either side of the relationship. CPA helps managers to align service levels with revenue by either eliminating unnecessary services or charging for extra offerings (Niraj, 2001).
 - c. Activities and processes streamline: as CPA reveals details about cost drivers and its consumption, it also highlights activities and processes in the selling firm that add costs and expenses. Cost and expenses can be reduced be controlled by streamlining some of those activities that do not add value. The result in the end should be improvement in both customer and firm profitability (Guerreiro, Bio, Vazquez, & Merschmann, 2008; Niraj, 2001).
2. Market Segmentation and Targeting: some marketing scholars propose the use of profitability as a basis for segmentation (Helgesen, 2006; Mulhern, 1999; Storbacka, 1997). Storbacka (1997) offers four alternative ways of segmenting customers: 1)

based on combined relationship revenue and cost; 2) based on sales volume; 3) based on customer profitability, and 4) based on combining relationship volume and customer relationship profitability. His retail banking study provides empirical support to the use of profitability for market segmentation. Other scholars propose the formation of segments along customer profit, classifying customers into profitable, break-even and unprofitable. The strategy for each segment will vary according to the different objectives: for the most profitable segment, retention is the goal; for the “not-so-profitable”, small changes might represent the move to a more lucrative position, while the most unprofitable group might require more extreme actions (Mulhern, 1999; E. Van Raaij, 2005).

3. Resource Allocation: some experts in customer management advocate the use of customer profitability as the guiding principle for resource allocation. With information from CPA, resource allocation can be done in a way that maximizes return on investment (Bowman & Narayandas, 2004; Reinartz, Thomas, & Kumar, 2005). Mulhern (1999) suggests the combined used of profitability and responsiveness for an optimal allocation of resources across customers.
4. Risk Management: CPA also provides insight on the “vulnerability of future cash flows from customers (E. Van Raaij, 2005, p. 377)”. Two measures of risk originate from an aggregated look at customer profitability: subsidization (or the extent by which profits from some customers subsidize the losses generated by unprofitable accounts) and dependency (or the extent of which the firm profitability depends on a small group of customers). High degrees of both subsidization and dependency represent a high-risk situation. Managers can take actions to mitigate risks related to customer profit distribution, making sure profitable customers are retained and unprofitable ones are either disengaged or offered a more profitable mix (L. Ryals, 2006; Storbacka et al., 1994).

Measurement of Customer Profitability

There is general consensus about the theoretical concept: a customer is profitable to a supplier if the stream of revenue from the exchange exceeds all cost related to doing business with such customer. In contrast, the existing literature lacks consistency when measuring profitability at the customer level. In particular, the categories of cost traced to customers represent a source of divergence among researchers (Pfeifer et al., 2005; Weir, 2008).

Measuring customer profitability can be very complex. Traditional accounting does not capture revenue and costs at the appropriate level of detail for customer profitability calculations (Gleaves et al., 2008). However, the development of customer databases has facilitated the task by providing data at the individual customer level. Researchers in the area propose different models to estimate customer profits. A summary of components of customer profitability measurement is presented below:

Specification of customer: the customer unit needs to be clearly defined. In consumer marketing the options are usually individuals or households, but in business marketing the definition of customer unit is more complex. Customer units could be entire corporations, SBUs or locations. Also, the analysis may include prospective customers or be conducted only for existing ones (Mulhern, 1999). Another important task in the specification of customers is determining if a customer is active or inactive (Reinartz & Kumar, 2000).

1. *Specification of Product/Services:* profitability analysis can include only certain product and services or can be done for the entire product and service mix provided to a customer (Mulhern, 1999). Not all products are equally profitable so product mix is a driver of customer profitability. Visibility of customer-specific product mix permits a more complete and precise analysis (E. M. van Raaij et al., 2003).
2. *Time frame of the analysis:* profitability can be assessed for any period of time (annual, quarterly, etc.); the only requirement is that the different elements of revenue and cost be measured at the same time frame and unit of analysis.

3. *Customer profitability measure*: there is no unique approach in the literature to the choice of core profit measure. Often, customer profitability models use absolute dollar contribution (Mulhern, 1999). Other valid measures mentioned in the literature are: profit as percentage of sales, profitability relative to average or benchmark figures, and return on investment (Weir, 2008). Some researchers use revenue as an adequate approximation to profitability (Borle, Singh, & Jain, 2008; Palmatier, 2008), while others measure customer profit as gross margin defined as revenues minus cost of goods sold, without allocating marketing and sales expenses to individual customers.
4. *Cost allocations and the use of ABC*: the decision of which costs to allocate and the proper allocation technique can add significant variability to CPA. Some customer profit models stop at gross margin, evaluating only the impact of sales volume, pricing and product mix (i.e. example needed). Others agree that gross margin yields an incomplete picture of customer profitability (Van Triest, Bun, Raaij, & Vernooij, 2009). Allocation of marketing and sales expenses to customers allows a more precise picture of the actual contribution of a customer to the firm profits. Often the only marketing expenses included in the analysis have been direct expenses such as communication, promotion or samples (e.g. Reinartz & Kumar, 2000; Reinartz et al., 2005). However, a growing group of marketing scholars propose the allocation of indirect costs of activities performed to serve individual customers. The concept of cost-to-serve or customer-specific service cost becomes relevant in any calculation of customer profitability, especially in business markets (Guerreiro et al., 2008; Van Triest et al., 2009). Activity Based Costing (ABC) has been frequently discussed in the literature as the optimal allocation methodology for CPA (Jacobs et al., 2001; Mulhern, 1999; Niraj, 2001).

Measurement of customer profitability paves the way for a projection of customer value into the future (Weir, 2008). One alternative is to extrapolate the stream of revenues

and costs generated by past exchanges with a customer into the future. Such approach assumes that past profitability indicates the level of future profits and that customer behavior will remain unchanged in the future. In reality, customer behavior changes for several reasons, creating the need for a forward-looking measure of customer value (V. Kumar, 2008). However, retrospective profitability analysis allows the uncovering of profit drivers, which can be incorporated in models to predict future revenue, costs and customer behavior and arrive to a measure of customer lifetime value (Blattberg, Malthouse, & Neslin, 2009).

2.3.3 Customer Lifetime Value (CLV)

Customer Lifetime Value (CLV) is a forward-looking measure of the value a customer generates to the selling firm. It has been defined as the net present value of all cash flows generated by a customer over the lifetime of the relationship. In more detail, CLV is the sum of all future contribution margins from sales to a customer, minus the sum of all expenses attributable to such customer, discounted by the average cost of capital (Berger & Nasr, 1998; Reinartz & Kumar, 2000).

The study of Customer Lifetime Value (CLV) started in direct marketing but has expanded into all areas of marketing (Jain & Singh, 2002). As the focus of marketing shifted from studying transactions to the study of relationships, the customer acquired a more central role. From a product-centric perspective and the analysis of product life cycle and brand equity, the interest of academics and practitioner switched to the analysis of customer life cycle and customer equity (Rust et al., 2004). A firm adopting a customer-centric approach treats each customer as an asset and hence needs to assess its value (Johnson & Selnes, 2004).

CLV provides a metric for managing customer relationships in an optimal way (V. Kumar & Shah, 2009). The Customer Lifetime Value approach recognizes that not all customers are equally attractive or profitable and that firms cannot build close relationships

with all customers (V. Kumar & Morris, 2007). It allows the allocation of resources among customer, based on the value that they generate to the firm (Venkatesan & Kumar, 2004).

Customer Lifetime Value is the only customer management metric that not only incorporates future customer behavior but also includes all the elements of revenue, cost and expenses that impact value. It is a powerful metric to guide the adoption of strategies to maximize future profitability (V. Kumar, Rajkumar, Tim, & Denise, 2008).

Measuring Customer Lifetime Value

The most basic structural model for the calculation of CLV can be expressed in the equation below (Jain & Singh, 2002):

$$CLV_t = S (CM - M) / (1 + d)^t$$

Where CM = future customer gross contribution margin per period

M = future marketing cost allocated to customer

d = adequate discount rate

t = length of time

The basic structural model estimates future gross margin per customer as revenue minus cost of goods sold and deducts the portion of marketing cost attributable to each customer. Future profits are discounted to reflect the time value of money. From the equation above one can infer the different components of lifetime value. If the value of the components of CLV were known with certainty, the calculation would be of great simplicity by only applying the above formula. However, uncertainty is always present when considering future events, even in the presence of contracts. To calculate CLV, the future stream of revenues and expenses needs to be predicted and discounted at a proper discount rate. Components of customer lifetime value are summarized below:

The first component is the future gross contribution margin per period (CM), defined as revenue minus cost of goods sold from sales to the particular customer in the period of interest. Several approaches can be adopted to estimate future CM. One can separately

predict contribution margin from an average transaction and purchasing frequency per period of analysis (e.g. Borle et al., 2008; Venkatesan & Kumar, 2004). Multiplying frequency by the average contribution per transaction, the customer contribution per time period is obtained. Another approach can be to project purchase volume and multiply by average margin per product unit (e.g. Venkatesan, Kumar, & Bohling, 2007). Prediction of contribution margin reflects the purchasing behavior of customers and hence involves uncertainty. Marketing scholars have paid particular attention to modeling the subcomponents of customer contribution margin incorporating the stochastic nature of customer behavior (Gleaves et al., 2008). The customer base analysis section of this literature review explains in more detail some of those models.

Customer contribution margin does not offer a complete picture of customer profitability. Marketing Costs (M) attributable to the customer ought to be included (V. Kumar, 2008). Marketing costs have also been called cost-to-serve and refer to the cost of all programs and efforts dedicated to maintain and increase the value of existing relationships with customers (Guerreiro et al., 2008). Such costs may include direct communication, technical support, problem solving, sales efforts, order processing, etc. The importance of different types of cost varies by industry and type of business. Cost-to-serve is the result of marketing management decisions and reflect the selling firm's behavior (Venkatesan et al., 2007).

Marketing costs are deducted from contribution margin to arrive to the profit per period of analysis. Then, expected duration of the relationship (t) is required to project the total lifetime profit. "Although duration seems like a simple concept, it can be complicated" (Reinartz & Kumar, 2000, p. 18), especially in non-contractual settings. Predicting when a customer stops being active is not easy, many apparently inactive customers become active again after a period of temporary inactivity (Dwyer, 1989). The probability of a customer being active is key in several CLV modeling efforts in the literature (Reinartz & Kumar, 2000, 2003). The duration of a customer relationship varies greatly among industries. A common approach is to assume duration to be a reasonable time period for the specific

business. Beyond such period, uncertainty and attrition may be high enough that the majority of customer's lifetime value is captured in the first few years (see V. Kumar, Rajkumar, et al., 2008).

Finally, the future profit is discounted at an appropriated discount rate to reflect the time value of money and the risk associated with future cash flows (Mulhern, 1999). The weighted average cost of capital incurred by the firm is usually considered appropriate to discount CLV.

Measurement of Customer Lifetime Value in the literature

The measurement of Customer Lifetime Value involves prediction of future customer activity. The basic structural model assumes a set of unrealistic assumptions. In such model, contribution margin and marketing cost are constant over time and purchases occur uniformly every time period. Also customers are assumed to remain active with certainty for a specific period of time, at the end of which they leave the relationship and do not return. The use of this type of model is limited, especially if critical strategic decisions will be based on the CLV calculations (Bechwati and Eshghi 2005).

Customer Lifetime Value can be estimated at different levels of aggregation: at the individual customer or as an average based on existing customer relationships. The decision to adopt one approach or the other depends on the intended use of the measure. In general, when CLV is used for prospecting decisions, or when it is either infeasible or uneconomical to calculate individual differences, an average estimation suffices (Pfeifer & Bang, 2005). Average CLV can be useful also for competitor analysis (V. Kumar, 2007a). For specific customer strategies and resource allocation decisions, it is necessary to calculate CLV of individual customers (V. Kumar, Rajkumar, et al., 2008).

Several approaches can be used to calculate average CLV. In one approach customer equity (CE) is calculated as the sum of all discounted contribution margin from customers, then CE is divided by number of customers to arrive at average CLV (V. Kumar, 2006).

Another approach takes into account the average customer contribution margin, the average marketing cost per customer and the average retention rate for a cohort or segment of customers (Jain & Singh, 2002). Pfeifer and Bang (2005) propose a different methodology to use data from a random sample of customer relationships to calculate an appropriate average CLV. They only consider non-parametric estimation methods, in other words they do not assume any particular probability distribution. The authors suggest that the simple un-weighted average is appropriate when the sample contains only completed relationships. However, when the sample contains a mix of active and completed relationships, a simple average will be a biased estimate because the observed lifetime of active relationships is just a lower bound on the eventual lifetime. Their study presents several non-parametric estimation methods for correcting for this bias.

However, to make customer level marketing decisions, CLV needs to be measured for individual customers (V. Kumar, 2008). The disaggregated or bottom-up approach involves estimating the lifetime value of each individual customer. For this type of analysis, future customer behavior needs to be incorporated into lifetime customer valuation. The exercise requires not only a projection of past behavior, but also a prediction of future behavior based on different customers traits and characteristics (Fader, Hardie, & Lee, 2005b).

Future customer behavior is uncertain, so CLV models need to reflect the stochastic nature of such behavior. As a result, researchers incorporate retention and migration rates into CLV calculations. In an early CLV research paper, Dwyer (1989) groups customers into two categories based on purchasing patterns: lost-for good and always-a-share. Lost-for-good customers are either totally committed to a vendor or totally lost once they leave the relationship. Customer retention models, better replicate lost-for-good customer behavior. The retention probability (the probability that the customer will stay in the relationship) is the focal calculation of customer retention models. The always-a-share approach assumes that customers purchase from different vendors at any point in time; customers can switch

from one vendor to another easily, and purchase from each is only a share of their total consumption. A customer migration model better models always-a-share behavior.

Berger and Nasr (1998) offer an illustration of CLV calculations in five different customer behavior scenarios, including the two models offered by Dwyer (1989). Four cases address customer retention situations and one applies a customer migration model. They start with a basic case, which assumes annual sales, retention rate and profit to be fixed over time and across customers. Subsequent cases relax the basic assumptions and show how different purchasing patterns require different models. Their work illustrate how sales occurring at time periods different than a year require the discount rate to be adapted; how accelerating profit over time require to incorporate contribution margin as a mathematical function where time is the independent variable; how continues versus discrete sales over time require the use of integrals; and how a declining probability of purchase over time can be incorporated into the CLV computation (Berger & Nasr, 1998).

Despite the level of sophistication achieved by modelers of lifetime value, there is still reservation about the accuracy of CLV estimates. The accuracy with which past behavior can predict future customer value can be anything from perfect prediction to a complete mismatch (Malthouse and Blatterg 2005). Such accuracy depends on the assumptions made, on the quality of input to the models and on the time horizon. A significant obstacle has been the ability to accurately model future revenues, particularly in non-contractual settings (Fader et al., 2005b). The longer the projection period, the lower the expected accuracy. To achieve higher prediction accuracy, CLV researchers have dedicated increasing attention to customer base analysis.

Customer Base Analysis

Customer base analysis focuses on studying individual customer behavior to predict the probability of future purchase. Instead of concentrating on the computation of lifetime

value, customer base analysis research attempts to estimate some of the input required for the calculation models (Jain & Singh, 2002).

Proposed by Schmittlein, Morrison and Colombo in 1987, the Pareto/NBD model is often used to predict the probability that a customer is still active and the frequency of purchase (Zhang, Dixit, & Friedmann, 2010). Such probability has been called $p(\text{alive})$ in the literature. The Pareto/NBD model bases its estimation on the frequency and recency of past purchases to calculate future purchase likelihood. It is basically a probabilistic model that takes into account the stochastic nature of purchasing behavior. It assumes that customers' transactions follow a Poisson distribution and heterogeneity in the transaction rate across customers follows a gamma distribution; each customer has an unobserved lifetime and transaction rate and dropout rate vary across customers. Major criticisms to the Pareto/NBD model have been that it is difficult to implement and it has had limited empirical validation (Fader, Hardie, & Lee, 2005a).

Reinartz and Kumar (2000) extend the Pareto/NBD model by transforming the continuous probability of a customer being active into a dichotomous alive/dead measure. Using a lost-for-good approach and assuming that a customer becomes inactive when $p(\text{alive}) < 0.5$, the time at which the customer would leave the relationship is estimated. Such time becomes a finite approximation of lifetime for each customer, which is an input into CLV. Then they calculate CLV by subtracting marketing cost from average monthly contribution margin per customer and discounting at the cost of capital for the estimated lifetime.

In a later article Reinartz and Kumar (2003) also use the Pareto/NBD model to estimate the $p(\text{alive})$ of each customer in their sample. However, they use a different approach to obtain a finite customer lifetime estimation. The authors use the estimated $p(\text{alive})$ to calculate the net present value of the expected future customer margin. Next, their model assumes that the firm would terminate the relationship with the customer when the expected discounted contribution margin is smaller than the expected marketing cost.

Such point in time determines the finite lifetime duration of customers. Antecedents of profitable lifetime duration are then studied, finding evidence that level of customer spending, degree of cross-buying, frequency of purchase, the presence of loyalty instruments and degree of marketing efforts all are positively related to lifetime duration.

Fader, Hardie and Lee (2005) develop a easier to implement variation of the Pareto/NBD. The authors simplify the way the dropout of a customer is calculated and the distribution of the dropout rates. Their model assumes that the number of transactions an active customer makes per time period follows a Poisson distribution, that heterogeneity in the transaction rate across customers follows a gamma distribution, and that the transaction rates and dropout probability vary independently across customers.

A different study incorporates strategic consumer behavior into customer valuation (Lewis, 2005). In a lost-for-good scenario, Lewis uses structural dynamic programming to model customer's dynamic decision process. In this way, the model measures the effect of marketing variables like promotion and pricing on consumer behavior and hence on customer value.

The lost-for good approach is more appropriate for contractual settings where managers are interested in estimating the retention probability. In non-contractual settings customers may purchase at any time and managers are interested in predicting future level of customer activity. Venkatesan and Kumar (2004) assume an always-a-share approach to predict future customer activity. Instead of calculating the probability of a customer being active or the lifetime duration, they predict the frequency of customer purchases given previous activity. They model inter-purchase time and contribution margin independently and later used them together to predict CLV. Purchase frequency is modeled by a generalized gamma distribution using supplier-specific factors (channel communication) and customer specific factors (involvement, switching costs and previous behavior) as antecedents. They model customer contribution margin using panel-data regression

methodologies with lagged contribution margin, lagged total quantity purchased, industry category and total marketing efforts as independent variables.

A novel approach is the one proposed by Fader and colleagues in a model that links RFM measures with CLV (Fader et al., 2005b). Rather than including RFM measures in a scoring model, they estimate customer's latent traits as a function of observed frequency and recency and use those latent traits to predict future behavior. Based on the Pareto/NBD framework, a sub-model for the expected flow of transactions is developed. A separate model uses the gamma-gamma distribution to predict monetary value. The authors analyze the trade-offs among RFM measures and CLV by grouping customers with similar future valuation in what they call "iso-value" curves.

More recently CLV researchers have favored a Bayesian approach to predict customer future behavior and estimate lifetime value. They argue that Bayesian decision theory is ideally suited to make inferences with limited information, allowing to specify highly uncertain models and incorporate prior data into prediction of expected outcomes (see Borle et al., 2008; V. Kumar, Rajkumar, et al., 2008; V. Kumar & Shah, 2009; Venkatesan et al., 2007). In a study that uses CLV for customer selection, Venkatesan and colleagues (Venkatesan et al., 2007) take a multistep approach to calculate lifetime value. They first specify a probability model that explains customer-purchasing behavior (i.e. purchase timing and quantity). Next they estimate the model using a Bayesian approach and Markov chain Monte Carlo (MCMC) simulation to predict customer behavior given different levels of decision variable (i.e. frequency and type of customer contact). Expected CLV is then calculated as the average of the CLV values obtained from each sample from the model parameters posterior distribution.

Another study develops a hierarchical Bayesian model to jointly predict a customer risk of defection and purchasing behavior at each purchase occasion (Borle et al., 2008). The authors model three main dependent variables: inter-purchase timing, purchase amount, and probability of leaving, allowing a correlation structure across these three sub-models to

develop a joint model of the three variables. Customer Lifetime Value is estimated as the predicted revenue stream from each customer.

In a case study of how IBM uses CLV to allocate resources among customers, Kumar and colleagues also develop a joint model of the focal variables (V. Kumar, Rajkumar, et al., 2008). Their computation of CLV requires predictions of three aspects: level of customer contacts, probability of purchase and contribution margin. The authors allow correlation among the three aspects to reflect their interdependence. Modeling the focal variables jointly solves the problem of endogeneity (i.e. situation in which is likely that the dependent variable also causes the dependent variable).

Another issue that might result in biased CLV estimates is heterogeneity. Previous CLV models assume similar coefficients for independent variables and covariates for all customers, implying similar response across the customer base. In reality customers respond differently to marketing efforts. Kumar and Shah (2009) solve the problem by allowing all parameters used in CLV prediction to be customer specific. The authors also incorporate SOW information into the model to infer customer transactions with competitors. Those model refinements increase predicting accuracy.

Resource allocation based on CLV

CLV is considered a metric for designing marketing strategies and managing customer relationships. Researchers have proposed the use of CLV as a tool for resource allocation decisions. Optimal resource allocation models attempt to find the optimal level of acquisition and retention spending that maximizes CLV. The goal is to use CLV as a base for making optimal decisions of how much to invest in acquisition versus retention and what group of customers to devote those investments (Venkatesan & Kumar, 2004). In this area researchers have been incorporating increasing complexity into their models. Blattberg and Deighton's framework is the most basic attempt to calculate optimal levels of acquisition and retention spending that maximizes CLV, assuming a budget constraint. They do not

empirically test their model. Posterior work incorporates cross buying into the model (Blattberg et al., 2001). Later Reinartz, Thomas and Kumar (2005) identify the key drivers of customer profitability at the individual level and proposed a model of resource allocation optimization that can be utilized by management. They find that when retention spending is optimal and contacts are optimally allocated, under-spending on acquisition is worse than overspending by the same amount and that the optimal solution for acquisition or duration will not necessarily be the optimal solution for a profit objective.

2.4 Cost to Serve

Firms incur a series of cost and expenses to develop and maintain relationship with customers. Such costs may include communication, support service, loyalty programs and order management among others (V. Kumar & Rajan, 2009; Niraj, Foster, Gupta, & Narasimhan, 2008). However, customers are not equal in the amount of services and activities they demand from suppliers, consuming unequal amount of resources. Activities such as order management; logistics, sales and marketing support are performed at different levels for different customers. The cost of maintaining relationships can vary greatly across customers, impacting the profit generated from relationships (Van Triest et al., 2009). An assessment of the value generated by a customer relationship is not complete without including all costs and expenses dedicated to serve such relationship (Guerreiro et al., 2008; Niraj, 2001).

Different terms are found in the literature to refer to the cost of serving and maintaining customer relationships, being some: customer-specific cost (Niraj, 2001), customer relationship costs (E. Van Raaij, 2005), customer-specific marketing expenses (Van Triest et al., 2009), marketing cost (V. Kumar, 2008), relationship cost (Stahl, Matzler, & Hinterhuber, 2003), cost of sales (Berger & Nasr, 1998), customer service cost (Niraj et al., 2008) and cost-to-serve (Braithwaite & Samakh, 1998a; Guerreiro et al., 2008; Kaplan & Narayanan, 2001; L. Ryals, 2006). The current study will adopt the term cost-to-serve.

Cost-to-serve (CTS) has been defined as the total pre-sale, order related, distribution, and post-sale service cost required to maintain an ongoing exchange relationship with a customer firm (Guerreiro et al., 2008). Cost-to-Serve® also refers to a quantitative, financial-driven methodology developed and registered by Braithwaite and Samakh (Braithwaite & Samakh, 1998a). Their method analyzes how costs are consumed throughout the supply chain and estimates the profitability of products, customers and marketing channels. The information is then used in decision making to optimize firm's profitability. Cost-to-serve is a more inclusive concept than customer-specific marketing cost, including relevant logistic and financial costs related to servicing individual customers.

A pioneer work in the area is the case analysis of Swedish company Kanthal ("Kanthal (A)," 1989). The case illustrates the use of activity-based costing to allocate costs to individual customers for customer profitability analysis. The authors emphasize how the use of ABC and CTS to manage customer relationships improve decision making over traditional SG&A allocations.

Kaplan and Cooper (1999) later expand their cost-to-serve analysis and develop a model to classify customers based on how costly they are to serve (dividing customers into high and low cost-to-serve). In their conceptualization, drivers of high cost-to-serve customers comprise:

- Demand for customized products
- Customization and changes in delivery requirements
- Small and unpredictable orders
- Large amount of presales support (marketing, technical and sales resources)
- Large amount of post-sales support (installation, training, warranties, etc)
- Inventory requirements

The authors state that low cost-to-serve customers are not necessarily profitable; profitability depends on the gross margin the customer generates, which ultimately depends on relationship specific policies. Their model proposes a two by two matrix in which the

horizontal axis represents the cost-to-serve and the vertical axis reflects net margin (revenue minus cost of goods sold). Customers above the diagonal line are profitable while the ones below generate losses. There is no problem with customers demanding high service level as long as they are willing to pay for them. Selling firms strategy should attempt to move all customers to the profit area, by either reducing cost-to-serve or improving the margin of customers. Customers in the bottom right quadrant (low-margin, high CTS) represent a major challenge.

Niraj, Gupta and Narasimhan (2001) develop a model to estimate customer profitability from a supply chain perspective. The authors calculate customer-specific costs by determining the portion of supply chain activities that are attributable to individual customers. Their model includes both complexity and efficiency factors that can either increase or decrease customer-specific costs. They found empirical evidence that although sales volume remains an important indicator of customer profitability, differences in the cost of serving the customer play an equally important role.

In a later study Niraj and colleagues (2008) estimate the cost of servicing customers by using an activity-based costing approach and including seven major activities areas: order processing, sales, delivery, expedited delivery, quality management, purchasing and warehousing. Costs of these activities are allocated to customers using three categories of cost drivers: volume related drivers, complexity related drivers and efficiency related drivers.

Customer-specific marketing expenses have also been used to estimate the profitability of individual customers. A 2009 study classifies marketing expenses in two categories: general and customer-specific, which they define as those “made to increase profitability in specifically target customers” (Van Triest et al., 2009, p. 49). The authors found evidence that customers receiving higher customer-specific expenses show higher retention rate, sales and profits. However, their panel study also shows that volume is the main driver of both retention and customer profitability. Since cost-to-serve includes all

sales, marketing, administrative and logistic costs incurred while serving a customer, customer-specific marketing investment can be considered a sub-set of cost-to-serve.

Cost-to-serve has been widely used by managers of large manufacturing firms and consulting companies. For instance, Deloitte Consulting has the following statement in their website: "Cost-to-serve is a well-established approach for learning which customers and products matter most, and how to manage them at the appropriate cost. Among top packaged goods companies, cost-to-serve (CTS) is part of their DNA – and the approaches they use are highly evolved." ("Deloitte Debates: Is CTS worth digging for?," 2010)

Most customer profitability models in the business literature incorporate some measure of cost-to-serve, but the approaches are not consistent. The accounting literature focuses on the retrospective look at customer profit, emphasizes the use of activity base costing and includes a broad array of activities in the calculation (see Kaplan & Narayanan, 2001; Miller, 2008; Pfeifer et al., 2005). In the marketing literature the allocation of cost to customers is less rigorous and models generally include less cost categories. In particular CLV models limit the customer specific costs to direct marketing costs such as communication and promotion expenses (e.g. V. Kumar, 2008; Reinartz & Kumar, 2000; Venkatesan & Kumar, 2004; Venkatesan et al., 2007). One reason for such partial cost inclusion may be that most CLV studies have been conducted in direct marketing context, where communication is a significant cost of serving customers. Another reason may be the difficulty of tracking and allocating activities costs to the individual customers (Niraj, 2001).

An area of disagreement among scholars is the treatment of acquisition expenses and its inclusion in the calculation of customer value. Acquisition costs are the costs incurred to attract and acquire new customers. Some argue that acquisition expenses are an important component of the customer specific marketing cost and should be deducted from profit to arrive at customer lifetime value (Jain & Singh, 2002; V. Kumar, 2007b) . Others argue that although acquisition costs are an important measure to track, should not be included in the calculation. Berger and Nasr (1998) defined CLV as the future profit from customers once

acquired and suggest that managers estimate the CLV of potential customers to use it as a maximum to incur as acquisition cost. (Pfeifer et al., 2005) offer a sound explanation of how to treat acquisition expenses in the calculation of lifetime value. Since customer lifetime value is a forward looking measure, the authors suggest that acquisition expenses should be included only when the expense would be incurred in the future, that is in the case of a prospect. In the case of already acquired customers, acquisition expenses have already been incurred (i.e. are sunk costs) which should not be included in a net present value calculation.

Cost-to-serve is a decision variable controlled by the selling firm (Venkatesan et al., 2007) but also depends on customer behavior (Guerreiro et al., 2008). Customers vary in their demands for service, their customization requests, their ordering patterns, and their propensity to return sales to name a few behaviors. The more bargaining power customers have over suppliers, the more demanding they would be and the more costly to serve. Customers bargaining power is strong when customers are large, concentrated and educated about the product they are buying (Porter, 2008).

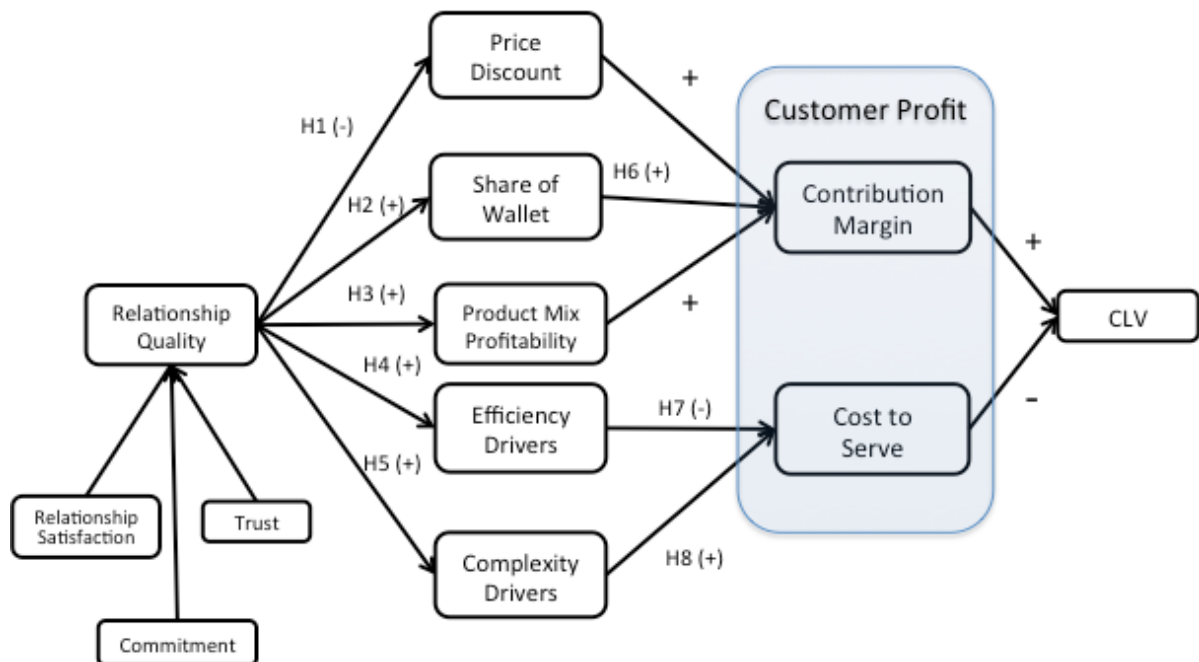
Cost-to-serve is of particular relevance in business-to-business marketing, where customers tend to have more bargaining power over suppliers due to their size and concentration. Organizational customers tend to be more demanding and expect a higher level of customized service. Organizations usually need higher level of technical support than consumers do, especially when the firm's offering impacts the customer's production process. In general, the cost of maintaining relationships in business-to-business markets is more significant than in consumer markets.

CHAPTER 3

MODEL DEVELOPMENT AND HYPOTHESIS

Selling firms invest in building relationships with customers under the assumption that it will create value to the firm (Cannon & Perreault Jr, 1999; Morgan & Hunt, 1994). Previous research in relationship marketing has attempted to validate the presumed connection between relationship quality and selling firm performance. However results have been mixed at best (Crosby et al., 1990; De Wulf et al., 2001; Palmatier et al., 2006). One possible reason for the ambiguous evidence of the effect of relationship quality on profitability may be the divergent effects RQ triggers on customer revenue and customer cost. This study proposes a model to explain the influence of relationship quality on the value that customers generate to the selling firm in a business-to-business context.

Figure 1: A proposed model of relationship quality - customer value



The proposed model integrates the extant knowledge on relationship marketing, customer profitability analysis and customer lifetime value. Based on existing literature, the model suggests that relationship quality impacts a series of mediators that will affect the revenue stream and the cost of serving customers, ultimately influencing customer profit and customer lifetime value. The remainder of this chapter provides the rationale for the proposed nomological network of relationships presented in Figure 1.

3.1 Research Constructs and Variables

Table 2 defines the constructs and variables included in the proposed research model.

Table 2
Constructs and Variables Definitions

Construct	Definition	References
Relationship Quality	Overall assessment of the atmosphere of a buyer-seller relational exchange. Higher order construct composed of trust, commitment and satisfaction.	(Crosby et al., 1990; Palmatier et al., 2006; Woo & Ennew, 2004)
Trust	Belief in the other partner's benevolence, integrity and competence	(Doney & Cannon, 1997; Morgan & Hunt, 1994; Palmatier et al., 2006)
Commitment	Desire by relationship partners to incur in the effort to maintain a relationship in the future.	(Cannon & Perreault Jr, 1999; Morgan & Hunt, 1994)
Relationship Satisfaction	Customer's cognitive and affective evaluation of all exchange experiences with a particular supplier. This study regards satisfaction as a cumulative measure influenced by all past exchange episodes.	(Crosby et al., 1990; Homburg, Droll, & Totzek, 2008; Storbacka et al., 1994)

Customer Contribution Margin	The sum of all revenue generated by sales to a particular customer minus the manufacturing cost or cost of goods sold. Contribution margin does not take into consideration any marketing, sales or administrative expenses.	(Niraj, 2001; Venkatesan & Kumar, 2004)
Price Discount	Percentage discount over list price paid by a customer when purchasing from a supplier.	
Share of Wallet	Percentage of product a customer purchases from the focal supplier in a specific category.	(Cooil, Keiningham, Aksoy, & Hsu, 2007; Garland, 2004)
Product Mix Profitability	Profitability generated by a larger proportion of premium/ higher-margin items in the mix of product purchased by a customer.	
Cost to Serve	Total pre-sale, order related, distribution, and post-sale service cost required to maintain an ongoing exchange relationship with a customer firm.	(Kaplan & Narayanan, 2001; Van Triest et al., 2009)
Efficiency Drivers	Result from better communication and coordination between buyer and seller and reduce cost-to-serve. Those are activities that make the exchange more efficient such as coordinated order planning, order automation and faster conflict resolution.	(Niraj, 2001; Niraj et al., 2008)
Complexity Drivers	Complexity drivers capture variables that represent a deviation from the norm when serving customers: customization of products, orders or services, more technical, marketing or sales personnel attention.	(Kaplan & Narayanan, 2001; Van Triest et al., 2009)
Customer Profit	Net dollar contribution made by an individual customer to supplier. It is the difference between the revenues earned from and the cost associated with the customer relationship in a previous period of time.	(Mulhern, 1999; Pfeifer et al., 2005)
Customer Lifetime Value	Net present value of all cash flows generated by a customer over the lifetime of its relationship with a supplier. That is, CLV is the sum of all future contribution margins from sales to a customer, minus the cost-to-serve such customer, discounted by the average cost of capital.	(Berger & Nasr, 1998; V. Kumar & Rajan, 2009; V. Kumar, Rajkumar, et al., 2008)

3.2 The effect of relationship quality on contribution margin

Previous research suggests that buyer-seller relationship quality may increase contribution margin. Customer contribution margin (CM) is defined in this research as the

sum of all revenue generated by sales to a particular customer minus the manufacturing cost or cost of goods sold. Customer contribution margin does not take into consideration any marketing, sales or administrative expenses (Niraj, 2001). Customer contribution margin for any period of time can be expressed as follows:

$$CM_i = \sum_{s=1}^n (P_s - C_s) \times Q_s$$

Where

CM_i = Contribution Margin of customer i

P_s = unit price paid for product s by customer i

C_s = unit manufacturing cost of product s

Q_s = volume of product s purchased by customer i

The equation above captures how the margin that a customer contributes to a selling firm depends on several key variables: sales volume, price, manufacturing cost and product mix. Previous research has found evidence of the link between relationship quality and some of the components of contribution margin, particularly price, revenue and product mix.

Relationship quality enhances customer cooperative and adaptive behavior (Cannon & Perreault Jr, 1999), making customers more willing to repurchase from supplier, increase share of wallet, adapt to changes and try new products (Hewett et al., 2002; Huntley, 2006; Ulaga & Eggert, 2006). Those customers are also more comfortable sharing proprietary information with suppliers, increasing the chance of effective cross-selling, increasing revenue and margin from the relationship (Jap et al., 1999; Palmatier, 2008).

It has been argued that relational mediators such as trust, commitment and satisfaction increase customer loyalty, reducing price sensitivity. Under such scenario, customers in higher quality relationships with suppliers would pay higher prices. However, while little empirical evidence exists of such assertion, research has shown evidence of the opposite (Reinartz & Kumar, 2000). In business markets, where prices are often negotiated with the customer, volume discounts are common. Customers in high quality relationships

tend buy larger volumes and most likely pay lower prices (Huntley, 2006). The link between RQ and customer prices requires further evaluation. Although evidence is not sufficient to clearly state if the relationship is positive or negative, this study will assume that relationship quality positively impacts the price paid by the customer. Thus the following hypothesis is offered:

H1: The quality of the relationship between customer and supplier is positively related to the price that the customer pays for purchased products.

H2: The higher the quality of the relationship between customer and supplier, the higher the percentage that the supplier represents of the customer's total category purchases.

Also, customers purchase a mix of products from a supplier. Some products are more profitable than others, leading to different margin even for the same volume of sales.

H3: The quality of the relationship between customer and supplier is positively related to the proportion of high margin products that the customer purchases.

3.3 The effect of relationship quality on cost

It has been argued that closer relationships with customers represent cost savings for suppliers due to better coordination and collaboration between buyer and seller (Cannon & Perreault Jr, 1999; Jap, 2001). However, there is also evidence that higher quality relationships demand more services, time and customization from suppliers. Niraj and colleagues (Niraj, 2001) explain the issue by introducing a classification of cost drivers into efficiency and complexity drivers. Efficiency drivers result from better communication and coordination between buyer and seller and reduce cost-to-serve. Those are activities that make the exchange more efficient such as coordinated order planning, order automation and faster conflict resolution. Complexity drivers capture variables that represent a deviation from the norm when serving customers: customization of products, orders or services, more

technical, marketing or sales personnel attention. Higher levels of relationship quality may increase both types of drivers. Thus the following hypothesis are offered:

H5: The quality of the relationship between and customer and supplier is positively related to the existence of efficiency drivers in the relationship.

H6: The quality of the relationship between and customer and supplier is positively related to the existence of complexity drivers in the relationship.

The expected effect of efficiency drivers on customer-specific cost is a negative one, as more efficient exchanges decreases transaction cost, waste, rework and duplication of tasks, ultimately reducing the cost of servicing the customer.

H7: The presence of efficiency drivers in a customer relationship reduces the cost-to-serve such customer.

The expected effect of complexity drivers on customer-specific cost is a positive one, as any deviation from standard, customization and special requests from customers represent additional expenses and cost to the seller. Hence, the following hypothesis is offered:

H8: The presence of complexity drivers in a customer relationship increases the cost-to-serve such customer.

The net effect of relationship quality on customer-specific cost depends on the relative magnitude of those effects. This study intends to examine the different conditions and circumstances in which each type of effects dominates the other, causing the cost-to-serve to move in one or the other direction.

Based on the definition and equation of customer lifetime value, one can deduct that and increase in customer contribution margin leads to and increase in lifetime value. At the same time, an increase in cost-to-serve will lead to a decrease of lifetime value. The net effect of relationship quality on customer lifetime value depends on the trade-off between

revenue and cost. However, this study puts to the test the assumption that higher quality relationships are more profitable, thus the hypothesis offered in this regard is as follows:

H9: The higher the quality of the relationship between and customer and supplier, the higher the customer lifetime value of such relationship.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

This chapter describes the research design used to test the proposed model and hypothesis. It discusses the scope of the study, the sampling frame, the measures used in the study and the data collection procedures.

The research comprises two studies. This approach allows us to apply the multi-method, multi-sample research plan effectively. *Study 1* explores the cost associated with serving customers in business-to-business settings. Through qualitative analysis, the study identifies cost-to-serve drivers: activities performed and resources employed to maintain relationships with individual customers. After cost drivers were uncovered, we estimated actual cost-to-serve for individual customers by attributing costs based on the actual recorded consumption of such drivers.

Study 2 measures the quality of individual customer relationships, past customer profitability and customer lifetime value for each customer relationship in the proposed sample. This study evaluates the effect of RQ on profit mediators and customer value.

4.1 Research Context

The research was conducted using relationship data from a manufacturing firm selling to business customers. The selling firm supplies chemicals to other manufacturers in a variety of industries. Products sold are relatively standard commodity, which customers use as raw material and thus purchase regularly. Since most products offered by the company have close substitutes by competitor firms, the way to create value for customers is through post-sales support service and logistics excellence. However, some grades of products are considered specialty and are sold at a premium. Product development and

customization are also perceived as value creating offerings. Being the products sold critical components of the customer's production process, long-term relationships between buyers and sellers play an important role.

4.2 Study 1: Understanding Cost-to-Serve

Cost-to-serve has been defined in the accounting literature and it is used by businesses in the industry, however it has not been fully studied in the marketing literature. When it comes to the level of service and dedicated resources, not all customers are equal. Some customers consume more time, effort and resources from the selling firm and hence are more costly to serve (Niraj, 2001). To better understand what generates such disparity in the cost of serving customers, it was necessary to inquire into the different activities performed to maintain relationships with customers. A qualitative analysis provided insight on activities associated with maintaining customer relationships. A qualitative study was appropriate in this case because the area is not well researched and there is a great deal of undocumented data in the practices of marketing and sales managers (Strauss, 1998). After the qualitative analysis identified the main cost drivers associated with serving customers, individual customers' cost-to-serve was estimated through a quantitative exercise.

4.2.1 Qualitative analysis of cost drivers

This phase of the research was exploratory in nature and aimed at uncovering common themes and generic elements in the cost of serving customers. In order to assess the drivers of cost associated with maintaining customer relationships, we conducted in-depth interviews with sales and marketing managers from the selling firm. These interviews inquired about activities, tasks and services provided at different levels for different customers. In-depth interviews have been used in the marketing literature in order to understand the beliefs and outcomes of marketing managers (e.g. Frankwick, Walker, &

Ward, 1994) to develop an understanding and create themes within an under-researched marketing phenomena (e.g. Price, Arnould, & Curasi, 2000), and to obtain exploratory perspectives that might not emerge from surveys (e.g. Maltz, Carter, & Maltz, 2011; Stremersch, Wuyts, & Frambach, 2001).

Since participants acted as key informants, it was critical to interview influential decision makers involved in managing customer relationships. 11 managers from the selling firm participated in this phase of the research: the Vice-president of Marketing, Marketing Directors for each of the six market segments and four Regional Sales Managers. The interviewees received a short pre-designed questionnaire previous to the interview. A face-to-face interview followed. The interviews were unstructured, allowing respondents to share their experience as much as possible. However, the interviewer focused questions about the different activities, services and resources dedicated to serve particular customers. The 11 interviews were audio recorded and later transcribed to a written format. All interviews were utilized for coding and integrating into themes.

Content analysis of existing documents about activities and services consumed by customers complemented the interviews. Among the reviewed documents were sales calls reports, R&D project time reports, order and delivery records and customer service reports.

The extant literature on customer costs served as the base for developing a-priori categories for coding and organizing into themes. The following a-priori categories were used:

- *Pre-sales support*: includes marketing and sales personnel time, technical pre-sale support, samples, communications, demand for customized products and solutions previous to the completion of a sale.
- *Order management and fulfillment*: includes supply chain activities and resources dedicated to customers in particular to process and deliver orders. The main driver in this category is number of orders, but other factors can increase or decrease cost-to-

serve. Customization and changes in delivery requirements, small and unpredictable orders and demand for expedited delivery (rush orders) can significantly impact the cost of order processing and fulfillment.

- *Post-sales support*: refers to activities such installation, training, warranties, returns and technical support after the sale has been completed.
- *Ongoing relationship support*: includes activities performed to maintain the ongoing relationship and not related to an exchange in particular. Examples in this category include: ongoing communication, applied R&D and joint collaboration projects.

Drivers were also categorized according to their net effect on cost, into efficiency and complexity drivers. Efficiency drivers result from better communication and coordination between buyer and seller and reduce cost-to-serve. Those are activities that make the exchange more efficient such as coordinated order planning, order automation and faster conflict resolution. Complexity drivers capture variables that represent a deviation from the norm when serving customers: customization of products, orders or services, more technical, marketing or sales personnel attention.

For analysis, we followed the approach suggested by Strauss and Corbin (1998). We first prepared detailed memos for each interview. Next, we reviewed interview notes extensively, using open-coding methods to identify concepts with common properties and dimensions. We then clustered sentences and phrases pertaining to the same categories together and identified recurring themes in the data. As the analysis progressed, a-priori categories were confirmed and emerging themes were generated. Using a grounded theory approach, the themes discovered in this research emerged directly from the data (Strauss and Corbin 1998).

4.2.2 Cost-to-serve Calculation

Once the qualitative study uncovered drivers of customer cost, the information was used to calculate cost-to-serve for all individual customers in the sample. As suggested in

the extant literature, we adopted an activity-based costing (ABC) approach to measure cost-to-serve (Guerreiro et al., 2008; Kaplan & Narayanan, 2001; Niraj et al., 2008). In such approach, activities and drivers of cost are identified, and consumption of such activities is then measured. Costs are linked to activities using a key driver for each activity (Braithwaite & Samakh, 1998a). Actual consumption of cost drivers by individual customers was available in the company's systems. Consumption was translated to monetary terms using a cost rate provided by accounting. For instance, the time marketing and sales managers spend solving individual customers problems is a driver of cost-to-serve. Such time was measured over a period of time and then converted into monetary cost multiplying by the appropriate average hourly cost of marketing and sales personnel.

4.3. Study 2: Testing the proposed model

Study 2 tested the proposed research model with relationship data from the selling firm's customer database.

4.3.1 Sampling Frame

The unit of analysis for the present research was individual buyer-seller relationships. A sample of relationships was drawn from the customer base of the focal selling firm. The firm sells to a large variety of customers, all of them organizational customers. The firm's customer database holds enough variance of customer size, buyer's industry, purchasing quantity, share of wallet, average order size and frequency of purchase to yield a representative sample.

The top 90% (based on sales volume) active customers were selected from the selling firm's customer database as potential participants. Active customers were defined as those purchasing from the selling firm in the last three years. A total of 557 firms were invited to participate in the study via email. Of the 557 potential respondents a total of 173 initiated the survey but 38 failed to complete the entire questionnaire. A total of 135

respondents answered the entire survey. However, 19 cases were removed due to inconsistencies in the responses, too short amount of time responding the questionnaire or excess missing data within the questionnaire. A total of 116 cases were included in the final analysis. The effective response rate was 20.8 %.

The majority of customers participating in the study (83.6 %) had relationships with the selling firm for longer than 5 years. Average share of wallet captured by the selling firm was 46.7%. Size of the firms offered significant variability both in terms of number of employees and annual revenue. Table 3 provides a summary of sample firms' profile.

Table 3
Summary of Sample Profile

Variable	Categories	Frequency	%
Length of Relationship with selling firm	1. Under 1 year	8	6.9%
	2. 1 - 5 years	11	9.5%
	3. 5 - 10 years	22	19.0%
	4. 10 - 20 years	38	32.8%
	5. Over 20 years	36	31.0%
Share or Wallet (SOW)	1. 0 - 20%	19	16.4%
	2. 20% - 40%	35	30.2%
	3. 40% - 60%	26	22.4%
	4. 60% - 80%	22	19.0%
	5. 80% - 100%	11	9.5%
Number of Employees	1. 1-9 employees	0	0.0%
	2. 10-19 employees	5	4.3%
	3. 20-99 employees	16	13.8%
	4. 100-249 employees	18	15.5%
	5. 250-999 employees	22	19.0%
	6. 1000-4999 employees	17	14.7%
	7. More than 5000 employees	36	31.0%
Annual Revenue	1. Less than \$1 million	0	0.0%
	2. \$1million - \$20 million	3	2.6%
	3. \$20 million - \$100 million	16	13.8%
	4. \$100 million - \$200 million	26	22.4%
	5. \$200 million - \$1 billion	28	24.1%
	6. More than \$1 billion	42	36.2%

Respondents were employees of the customer firm involved in purchasing materials for their organization (85% agreed when asked if about such involvement). They also confirmed that their views on the relationship of your company with the selling firm were consistent with those of other members of the buying team.

4.3.2 Measures

Constructs in the model were measured using different methodologies, drawing data from different sources. A survey provided subjective measures of relationship quality and efficiency drivers as reported by the customer; while objective measures for other constructs were gathered from the selling firm’s data warehouse. Using a multi-method, multi-source approach solves the problem of common method bias, which may occur when both antecedents and consequences are simultaneously measured by the same instrument (Podsakoff, MacKenzie, Jeong-Yeon, & Podsakoff, 2003). Table 4 provides a summary of the measurement of constructs used in this study.

Table 4
Measurement of Constructs

Construct	Source	Type	Measure
Relationship Quality	Customer Survey	Second order formative	Trust, Commitment, Relationship Satisfaction
Trust	Customer Survey	Reflective	5 items (seven point Likert scale)
Commitment	Customer Survey	Reflective	3 items (seven point Likert scale)
Relationship Satisfaction	Customer Survey	Reflective	4 items (seven point Likert scale)
Customer Contribution Margin (CMi)	Selling firm data warehouse	Objective – single item	Sum of all revenue generated by sales to the customer minus cost of goods sold.
Price Discount	Selling firm data warehouse	Objective – single item	% discount over list price paid by the customer.

Share of Wallet	Customer Survey	Single item	% of customer's purchases of (specific product) from the selling firm.
Product Mix Profitability	Selling firm data warehouse	Objective - Single item	% sales volume to the customer of premium grade products.
Cost to Serve (CTSi)	Study 1	Single item	Estimated cost incurred to maintain the relationship with the customer.
Efficiency Drivers	Customer Survey	Formative	Communication, Information sharing, Coordination and Problem Solving.
Complexity Drivers	Selling firm data warehouse	Objective	Number of orders per period of time, Number of rush orders, Number of changed orders, Customized R&D projects
Customer Profit (CPi)	Calculated value		$CPi = CMi - CTSi$
Customer Lifetime Value	Modeled		NPV of future customer profit over the lifetime of the relationship.

Relationship quality (RQ)

This study measured relationship quality as perceived by the customer. One could argue that when evaluating buyer-seller relationships, a researcher could either assess the supplier's or the customer's perspective. However, from the point of view of marketing, the customer view's is fundamental since it is usually the customer who selects the supplier (Cannon & Perreault Jr, 1999).

Relationship quality has been previously measured in the literature as a second order construct, which captures the overall evaluation of the relational ties (De Wulf, Odekerken-Schröder, & Iacobucci, 2001; Palmatier et al., 2006; Ulaga & Eggert, 2006). This study adopts a similar methodology, using trust, commitment and satisfaction as first-order indicators of RQ. Using relationship quality as a multidimensional construct is more appropriate than using its different dimensions separately, because customers tend to lump the different facets of relationship quality together in an overall assessment (Crosby et al., 1990).

We assume RQ to be a composite of its dimension, modeling trust, commitment and relationship satisfaction as formative indicators of the more complex construct. According to a study on the use of formative measurement models in marketing:

“A construct should be modeled as having formative indicators if the following conditions prevail: (a) the indicators are viewed as defining characteristics of the construct, (b) changes in the indicators are expected to cause changes in the construct, (c) changes in the construct are not expected to cause changes in the indicators, (d) the indicators do not necessarily share a common theme, (e) eliminating an indicator may alter the conceptual domain of the construct, (f) a change in the value of one of the indicators is not necessarily expected to be associated with a change in all of the other indicators, and (g) the indicators are not expected to have the same antecedents and consequences (Jarvis, Mackenzie, Podsakoff, Mick, & Bearden, 2003, p. 203).”

Trust, commitment and satisfaction are all independent characteristics of high-quality relationships, each representing a different facet of the quality assessment. The three facets need to be evaluated to have a complete measurement of the overall strength of the relationship. If any of those dimensions changes, the overall assessment varies but not necessarily the other dimensions. Moreover, there is evidence of the three aforementioned characteristics having different antecedents and consequences (Palmatier et al., 2006). In consequence, it is safe to model relationship quality as a formative latent variable.

Each of the first-level indicators was measured by using existing scales already applied in published studies. The scale items reflecting trust are based on Morgan and Hunt's (1994) trust scale and Doney and Cannon's (1997) trust scale. The scale items reflecting commitment are based on Morgan and Hunt's (1994) relationship commitment scale. The scale items measuring relationship satisfaction are based on Cannon and Perreault's (1999) satisfaction with supplier scale. All measures use seven point Likert scales. Data was collected by administering a survey instrument (Appendix A) to the most knowledgeable contact person at the customer firm, who reported on the perceived quality of the relationship. Table 5 presents the items used to measure the dimensions of Relationship Quality.

Table 5
Relationship Quality Items

Constructs	Items
Trust	<ol style="list-style-type: none"> 1. This supplier keeps promises it makes to our firm. 2. We trust this vendor keeps our best interests in mind. 3. This supplier is trustworthy. 4. This supplier cannot be trusted at times. (R) 5. This supplier can be counted on to do what is right.
Commitment	<ol style="list-style-type: none"> 1. The relationship my firm has with this supplier is something we are very committed to. 2. My firm intends to maintain the relationship with this supplier indefinitely. 3. The relationship my firm has with this supplier deserves our firm's maximum effort to maintain.
Relationship Satisfaction	<ol style="list-style-type: none"> 1. Our firm regrets the decision to do business with this supplier. (R) 2. Overall, we are very satisfied with this supplier. 3. We are very pleased with what this supplier has done for us over time. 4. If we had to do it all over again, we would still choose to use this supplier.

Contribution Margin

Customer contribution margin for any period of time is calculated based on the following formula:

$$CM_i = \sum_{s=1}^n (P_s - C_s) \times Q_s$$

Where

CM_i = Contribution Margin for customer i

P_s = unit price paid for product s by customer i

C_s = unit manufacturing cost of product s

Q_s = volume of product s purchased by customer i

Objective measures of past contribution margin per customers were available in the selling focal company's data warehouse. The firm collects and stores revenue and cost data by products and customer. More than 10 years of sales history is available in the company's data warehouse. The selling firm provided three years of customer specific monthly sales volume and contribution margin.

Customer Profit

The present study adopts Weir's approach (2008), which considers the assessment of customer value to the selling firm as a multi-stage process that starts with customer profitability analysis. The calculation of customer profitability is a pre-requisite for the next stage in which the customer lifetime value is estimated (Niraj, 2001). Thus, retrospective profits by customer were calculated as the difference between customer contribution margin and cost-to-serve per period of time, as express in the following formula:

$$CP_i = CM_i - CTS_i$$

where

CP_i = Profit generated by customer i

CM_i = contribution margin from customer i

CTS_i = cost-to-serve customer i

Customer Lifetime Value

Given the nature of the focal company's business, an always-a-share approach was adopted to predict future customer activity. Thus, the probability of a customer purchasing in the future was the focus of the calculation. Kumar and colleagues (V. Kumar, 2007b; V. Kumar & Shah, 2009; Reinartz & Kumar, 2003) suggest the use of a 3-year horizon when calculating CLV. We adopted the same assumption in this study.

The uncertain nature of customer behavior requires stochastic modeling to estimate the forward-looking customer lifetime value. CLV is a function of future contribution margin, the probability that the customer will purchase in the period of analysis, and the marketing resources allocated to the customer (V. Kumar, 2007b). Prediction of those three aspects is required to calculate CLV. Hence, this study formulates CLV as:

$$CLV_i = \frac{[p(Buy_{ij} = 1) \times CM_{ij} - CTS_{ij}]}{(1 + r)^j}$$

Where:

CLV_i = Lifetime value for customer i

$P(\text{Buy}_{ij})$ = Predicted probability that customer i will purchase in time period j

CM_{ij} = Contribution Margin provided by customer i in time period j

CTS_{ij} = Cost-to-serve allocated to customer i in period j

j = time index (months)

r = corporate cost of capital (monthly)

Adopting the approach from previous CLV research (V. Kumar & Shah, 2009; V. Kumar, Venkatesan, Bohling, & Beckmann, 2008), this study models Customer Lifetime Value as a function of exchange characteristics and customer heterogeneity. We followed the methodology applied by Kumar and Shah (2009) to calculate CLV for individual customers by jointly modeling a system of regression equations and estimating parameters through a Bayesian approach. Contribution margin, cost-to-serve and probability of purchase were estimated jointly to allow for the correlation among the three elements for being associated to the same customer. However, intercepts and coefficients were allowed to vary by individual customers to reflect customer heterogeneity.

We model the log of cost-to-serve for a customer I in time j as follows:

$$\log(1 + \text{CTS}_{ij}) = \alpha_{i1} + x_{1ij} \beta_{1i} + \mu_{1ij}$$

where x_{1ij} , β_{1i} , α_{i1} and μ_{1ij} are a vector of predictor variables, a vector of customer-level coefficients, a vector of customer-level intercepts and an error term. The use of a logarithmic form allows to model the diminishing returns of marketing efforts (Venkatesan & Kumar, 2004).

Probability of purchase is modeled as follows:

$$\text{Buy}_{ij} = \alpha_{2i} + x_{2ij} \beta_{2i} + \mu_{2ij}$$

where x_{2ij} , β_{2i} , α_{2i} and μ_{2ij} are a vector of predictor variables, a vector of customer-level coefficients, a vector of customer-level intercepts and an error term.

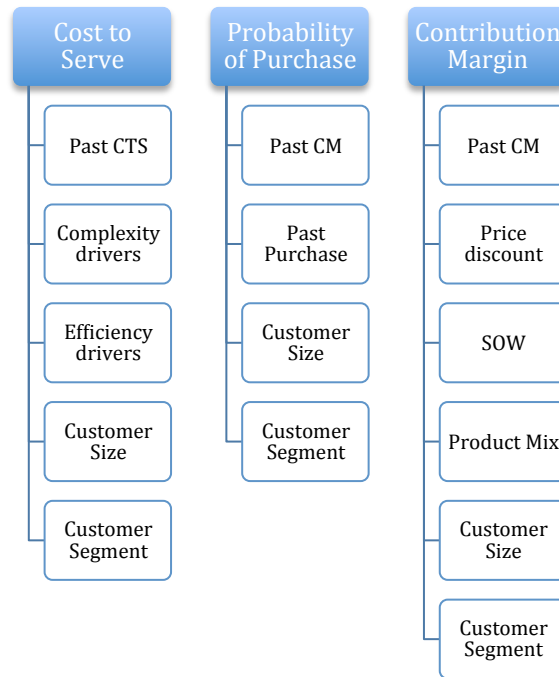
Contribution margin is also modeled as a linear function of predictor variables as follows:

$$\text{CM}_{ij} = \alpha_{3i} + x_{3ij} \beta_{3i} + \mu_{3ij}$$

where x_{3ij} , β_{3i} , α_{3i} and μ_{3ij} are a vector of predictor variables, a vector of customer-level coefficients, a vector of customer-level intercepts and an error term.

Figure 2 shows the set of predictor variables for each of the predicted elements in the proposed CLV model.

Figure 2
CLV Model



4.3.3 Testing the Hypothesis

The hypotheses were tested in two different time dimensions: retrospective (effect of proposed variables on past customer profit) and prospective (effect of proposed variables on customer lifetime value).

Testing the effect of relationship quality on past customer profitability

A partial least squares structural equation modeling (PLS-SEM) approach was used to test hypothesis using retrospective data. Relationship quality is modeled as a formative

second order construct. PLS is more suitable for the analysis when formative constructs are present. PLS-SEM, which only requires the constructs to be structurally linked, provides more flexibility when formative measures are involved (Hair et al. 2011). PLS-SEM also provides the ability to model latent constructs even under conditions of non-normality and small- to medium-size samples. Recently, Reinartz and colleagues (2009) showed that PLS-SEM achieves high levels of statistical power in comparison to covariance-based SEM, even if the sample size is relatively small (i.e., 100 observations).

Testing the effect of relationship quality on customer lifetime value

The proposed CLV model was used to make estimations of customer lifetime value for all relationships in the sample. Then, simple linear regression analysis was used to test the effect of relationship quality on CLV.

CHAPTER 5

DATA ANALYSIS AND RESULTS

5.1. Study 1: Qualitative analysis findings

The objective of this phase of the study was to identify drivers of customer specific cost. Through in-depth interviews we asked marketing and sales managers at the selling firm to mention activities performed for customers, focusing on those that are provided at different levels for different customers. Using axial coding, we fit the data into an explanatory framework based on the four categories of cost-to-serve drivers identified in the literature: pre-sales support, post-sales support, order management and fulfillment, and ongoing relationship support. We looked for interview passages not fitting into those categories to ensure that the framework fit the data. Then, we generated subcategories based on the themes identified in the data. The following sections discussed the findings from the analysis of interview content.

5.1.1 Pre-sales support

Pre-sales support includes activities and resources dedicated to customers previous to the completion of a sale. This research focuses on established customers and the cost of maintaining relationships, purposely disregarding customer acquisition cost. Sales and marketing managers from the selling firm indicated that salespeople split their time between calling on prospects and serving specific existing customers in their sales districts. When asked about the type of pre-sales support was provided to existing customers, some respondents indicated that salespeople and customer service reps call on customers to ask about their future order plans and to check if they need any assistance in ordering. It varies across segments and type of customers. Larger customers in segments where the product represents a critical raw material integrate their forecasting and ordering system and don't require much support.

According to most respondents, an endeavor that consumes a significant amount of sales and marketing personnel's time is contract negotiation. Most customers sign contracts with the selling firm either on an annual basis or every two or three years. The contract stipulates price discount over list price and the minimum volume requirements to achieve the discount. It was noted that at times sole source supplier contracts are signed, but more often contracts warrant the selling firm a preferred supplier role. From the discussion it was clear that contract negotiation is a lengthy process requiring the participation of many players from the selling firm. When asked if contract negotiation length and intensity varied among customers, the answer was categorically affirmative. Some customers are very easy to negotiate with or don't require a contract at all, while others engage in intense discussions until an agreement is reached. The following comments illustrate how time consuming contract negotiation can be:

We prepare very well each year for contract negotiations. This process may take weeks. A good amount of people participate in these negotiations. For a large customer such as [name of customer] we put together a team made up of sales reps, sales managers, marketing analysts, market segment directors and finance staff. We analyze the conditions, the requests, the financials until we have a winning proposition. It may take up to six weeks (Marketing Segment Director).

Some of the respondents mentioned samples and promotional materials sent to customers as another driver for customer specific cost.

5.1.2 Post-sales support

Post-sales support refers to activities and resources dedicated to customers after a sale has been completed. The literature mentions installation, training, warranties, returns and technical support as some of the post-sales actions. In this respect interviewed managers could not think of many activities performed at varied levels for different customers. Some respondents mentioned post-sales calls or visits to check that delivery was correct. Half of the respondents recalled installation of feeding equipment required for

certain grades of product that were required by customers after starting to purchase such grade.

5.1.3 Order management and fulfillment

This category of cost drivers includes supply chain activities associated to order taking, order management and delivery. This is an area where variability among customer is particularly noticeable. Most managers talked about differences in order size and frequency, noticing that some customers demand small quantities often while others order in bulk just few times a month.

One area that received great attention during discussion was the demand for expedite or rush orders. Most respondents showed concern with the amount of rush orders some customers placed, explaining that when a large customer places a rush order, the selling firm's production and logistic plan is disrupted, incurring in significant cost increments at the plant and warehouse levels. Disruptions and extra cost also occurred in the case of change in orders that had been already placed and incorporated in the forecast.

Rush orders are a nightmare from the point of view of logistics. When a customer places a large order to be delivered in a short period of time, orders in the pipeline have to be bumped and the planning for the day and even the week is ruined. We may have to stop a run to change grades in the unit, creating downtime and a suboptimal situation. Rush orders are costly (Supply Chain Manager).

Customers don't have an idea of how complex is to send an order of [product] in a short period of time. When you handle tones of product, flexibility is not easy. Usually delivering a rush order means sending an incomplete or late shipment to other customers (Marketing Segment Director).

Another factor discussed during the interviews was complex deliveries requested by customers such as breaking bulks, partial deliveries to more than one site in the same order or customized packaging. Non-standard credit terms were also mentioned as something provided to only a handful of customers.

5.1.4 Ongoing relationship support

When inquired about activities performed to maintain the ongoing relationship without a specific exchange in mind, respondents found plenty of instances to discuss. All respondents indicated that sales and marketing managers dedicate a great deal of time to nurture relationships with customers, recognizing that some customers take up a disproportionate share of their time. This is especially valid for strategic customers deemed “key accounts” for which a key account management approach is employed. Multidisciplinary team of people from sales, marketing, supply chain and finance are formed to serve those strategic accounts. Sales and Marketing time was the type of resource mentioned most often across the interviews. Management is aware of the importance of this element and keeps records of the time dedicated to specific customers on a regular basis.

Another type of activity mentioned during the discussions was technical problem solving. Some respondents recalled instances where a technical service representative had to dedicate time or even travel to a customer’s site to assist solving a technical issue.

Research and development joint projects were also profusely discussed. Respondents explained how scientists from the selling firm often work exclusively on projects to generate solutions tailored to specific customers. The projects objectives vary: from developing customized grades of product, to finding formulations to use existing grades in the customer’s product, to enhancing quality by improving processes. It was also pointed out that if a customized grade is successfully developed, the firm produces and supplies uniquely to the customer. In the words of a sales manager:

For example, we make [name of product] uniquely for [name of customer]. That grade was developed few years ago to meet the quality requirements of one of their premium products. It’s not sold to any other customer. We hold inventory only for them (Sales Manager).

Responses referenced inventory holding for customers also when no customized grade is involved. Under certain circumstances the selling firm holds inventory for individual customers for several weeks at a time.

Finally, interview participants pointed out that occasionally special events were planned for customers, either individual or groups. Such event may take place at industry conferences, conventions and trade shows, or they may occur when customers are invited to the selling firm's sites.

5.1.5 Summary

In total, 16 subcategories of customer specific activities emerged from the qualitative analysis and were grouped into four broad categories. The frequency of mentions of subcategories across interviews was computed. Table 6 presents a summary of customer specific activities categories and subcategories identified in the study with their corresponding frequencies.

Table 6
Customer Specific Activities Categories

Categories	Subcategories	Frequency
Pre-sales Support	Pre-sales visits and calls	18
	Contract negotiation	23
	Samples and promotional materials	6
Post-sales Support	Post-sales visits and calls	7
	Installation of feeding equipment	4
Order management and fulfillment	Number of orders	11
	Rush orders	16
	Change in already placed orders	14
	Complex deliveries	5
	Non-standard credit agreements	8
Ongoing relationship support	Key account management	27
	Joint R&D projects	20
	Development of customized grades	10
	Inventory holding	5
	Problem solving support	9
	Customer specific special events	3

5.2. Study 1: Cost-to-Serve Calculation

To calculate cost-to-serve for individual customers an ABC approach was adopted. We selected a subset of the activities identified in the qualitative analysis. The activities were chosen based on an assessment of significance and availability of data, for which managers of the selling firm provided guidance. Costs were linked to activities using a key driver for each activity. Table 7 presents the activities and cost drivers used in the calculations.

Table 7
Activities and Cost Drivers used in the Calculation of Cost-to-serve

Activities	Department	Cost drivers	Source
Pre-sales visits and calls	Sales & Marketing	# man-hours S&M	Sales & Marketing time tracking system
Contract negotiation			
Post-sales visits and calls			
Key account management			
Problem solving support	Technical Support	# man-hours techs	Tech support time tracking system
Key account management			
Joint R&D projects	R&D	# man-hours scientist	R&D project tracking system
Placed Orders	Logistics	# of orders placed	Data warehouse
Rush orders		# of rush orders	Data Warehouse
Changed orders		# of changed orders	Data Warehouse

The selling firm tracks and maintains history data on the consumptions of the selected cost drivers, facilitating the process. Average cost rates were requested to accounting and combined with the consumption information to estimate cost-to-serve for each customer in the sample. For instance, the time marketing and sales managers spend on contract negotiation is a driver of cost-to-serve. Such time was tracked over the period of analysis and then converted into monetary cost multiplying by the appropriate average hourly cost of marketing and sales personnel.

The accounting department provided cost rates for the calculation. For the cost rate of man-hours and average personnel hourly rate by department was used. For the cost of standard, expedited and changed orders, we used rates previously calculated by the supply chain organization to evaluate the impact of order variations on operations cost.

As expected, the customers in the sample varied significantly in the amount of cost drivers consumption. Some customers were big consumers of time and services from the selling organization. The top 15 customers, ranked by cost-to-serve, account for 50% of the total estimated cost. The organization dedicates a disproportionate amount of time and resources to large customer, which may or may not be the most profitable. Table 8 presents a summary of the descriptive statistics for cost drivers and cost-to-serve for the customers in the study sample.

Table 8
Summary of Cost-to-Serve Drivers Statistics for the sample

Cost Drivers	Mean	Median	S.E.	Range
Sales & Marketing time (man-hours/year)	201.72	72.5	333.7	12 - 1456
R&D time (man-hours/year)	44.76	0	75.1	0 - 250
Technical Support time (man-hours/year)	21.30	6	35.9	0 - 150
Number of orders placer	98.56	63.5	126.2	10 - 974
Number of rush orders placed	5.65	3	10.8	3 - 97
Number of changed orders	2.07	1	2.5	0 - 15
Annual Cost-to-Serve	\$87,027	\$50,744	\$112,565	\$7K - \$826K

Based on the calculations explained above, customers can be classified as high-cost-to-serve or low-cost-to-serve depending on how the allocated cost compares to that of other customers in the sample. Table 9 shows an illustration of the different levels of customer service cost using two real cases from the data set.

Table 9
Cost-to-Serve Examples

Cost Drivers	High Cost-to-Serve Customer	Low Cost-to-Serve Customer
Sales & Marketing time (man-hours/year)	733	19
R&D time (man-hours/year)	219	0
Technical Support time (man-hours/year)	64	0
Number of orders placer	472	33
Number of rush orders placed	33	2
Number of changed orders	2	1
Annual Cost-to-Serve	\$416,748	\$24,229

Most high-cost-to-serve customers were also large accounts that purchase high volume of product on a regular basis. Sales volume is an important driver of the treatment certain customers get from the selling firm. However, depending on the product margin generated by such volume, the customer may or may not be generating profits for the firm. Cost-to-serve in itself does not have meaning, although it is analyzed as part of a measure of customer profitability.

5.3. Customer Profitably Calculation

Once the cost of serving customer was estimated, the next step in the study involved the calculation of retrospective profit for individual customers in the sample. Customer profit was calculated as the difference between customer contribution margin and cost-to-serve per period of time, as express in the following formula:

$$CP_i = CM_i - CTS_i$$

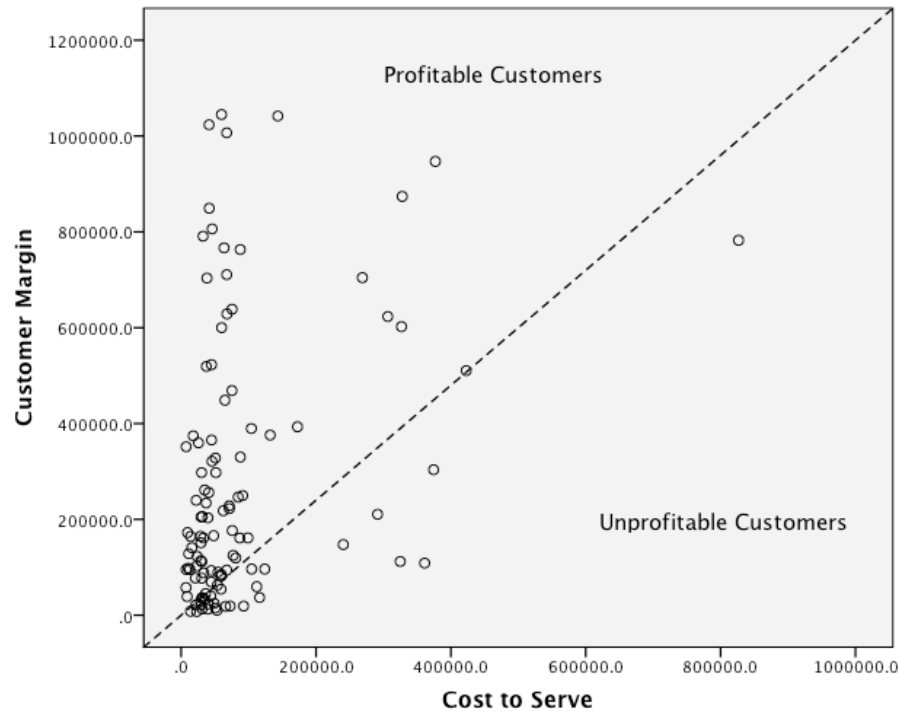
The results showed different levels of profitability at any level of customer size and sales volume. To avoid the effect of sales volume and size when comparing customer profitability, we compared measures as percentage of sales.

Table 10
Customer Profitability Summary

	Mean	Median	Std. Deviation	Minimum	Maximum
Sales Volume (units/year)	3,871,944	1,409,410	7,255,614	2,268	32,679,795
Sales Revenue (\$/year)	\$1,196,451	\$592,811	\$1,666,086	\$15,261	\$7,273,575
Manufacturing Margin (\$/year)	\$347,977	\$174,504	\$411,842	\$7,494	\$2,142,643
Cost-to-Serve (\$/year)	\$87,027	\$50,744	\$112,565	\$7,133	\$826,634
Customer Profit (\$/year)	\$260,950	\$123,430	\$398,393	-\$252,262	\$2,049,717
Customer Margin (% of Revenue)	42%	45%	20%	1%	87%
Customer Profit (% of Revenue)	15%	24%	49%	-267%	75%

From a sample of 116 customers, 26 were not profitable when the analysis incorporated cost-to-serve and another 10 had profits of less than 5% of sales. Customers can be profitable incurring in high cost of service, as long as they pay enough to cover for it. From our analysis it was evident that some high volume customers demand a high level of service but have also negotiated high price discounts. Several of those customers are marginally profitable due to the high volume they purchase, while others do not generate enough margin to cover the high cost-to-serve. However, most unprofitable customers are small to mid-size type of customers demanding high level of service but not generating enough volume or paying premium prices to cover for the cost of service. As suggested by Kaplan (Kaplan & Narayanan, 2001), we plotted the customers according to the margin and cost to serve. Figure 3 shows a matrix where the vertical axis represents the customer margin contribution (i.e. net revenue minus cost of goods sold) and the horizontal axis represents customer's cost-to-serve. Customers above the diagonal line are profitable while the ones under the diagonal line are not.

Figure 3
Customer Profitability: Cost to Serve vs. Customer Margin



5.4. Main Study: Hypothesis Testing

Since the purpose of this study was to simultaneously test the proposed causal relationships among constructs, the method of analysis is partial least squares (PLS) structural equation modeling using SmartPLS 2.0 M3 software (Christian Marc Ringle, Wende, & Will, 2005). PLS is appropriate in this case because it allows simultaneous testing of multiple hypotheses while allowing the use formative second order constructs. Using PLS is also preferred when the sample size is smaller than 200 cases. Like other structural equation modeling (SEM) techniques, PLS combines principal component analysis, path analysis, and a set of regressions to generate estimates of standardized regression coefficients for the model's paths and factor loadings. However, unlike other SEM techniques, PLS relaxes the assumptions about the data distribution to estimate model

parameters and the independence of observations. Previous research studying measures of quality have employed PLS in the past (Hair, Sarstedt, Ringle, & Mena, 2012).

5.4.1. Pre-test

Before sending the survey to customers, we conducted a pre-test. The main objectives of the pre-test were to further refine our measures and to validate the data collection process. We targeted 30-40 employees of the selling firm who had purchased any type of product or service for the company. They were asked to evaluate the relationship with the supplier of such product or service. Participants were mid level managers involved in purchases ranging from raw material to office supplies. The results of the pre-test suggested that our measures would be appropriate for our main study.

5.4.2. Measurement Model Evaluation

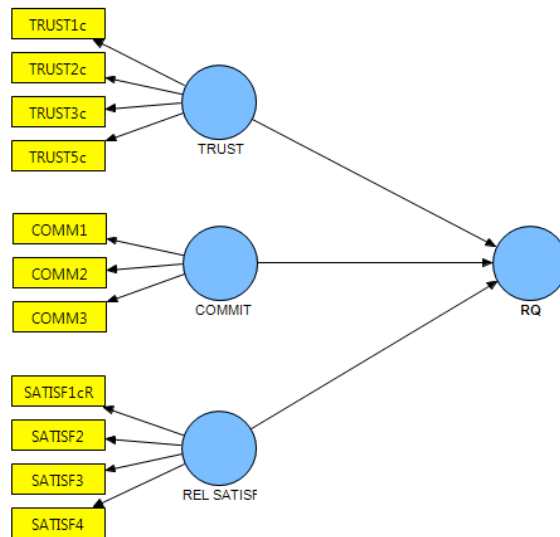
The first step in data analysis should be the assessment of the properties of the measurement model. Measurement model assessment involves examining indicators reliabilities, constructs reliabilities as well as the measures' convergent and discriminant validities. The analysis varies between reflective and formative measurements (Hair et al., 2012). For formative constructs, reliability becomes an irrelevant criterion to assess. For the reflective constructs we assessed indicator reliability by looking at squared standardized outer loadings, internal consistent reliability by evaluating Cronbach's alpha and composite reliability, convergent validity by AVE and discriminant validity by evaluating cross-loadings and comparing AVE to inter-item correlation values for each construct.

Relationship Quality as a second order construct

This research models Relationship Quality as a multidimensional, second-order, composite latent variable. We assume that the measures (trust, commitment, relationship satisfaction) all have an impact on the RQ construct. That is, the direction of causality flows

from the indicators to the latent construct. However, based on previous research, the first-order constructs are modeled as having reflective indicators themselves (see figure 4).

Figure 4
Modeling Relationship Quality as a second-order construct



According to Jarvis et al (2003) the combination of reflective first-order, formative second-order measure is classified as a Type II model. In this type of situation, a two-stage approach is recommended to estimate the model. In the first stage, the higher order component uses all indicators of the lower order components (which is called a repeated indicators approach) to obtain the latent variable scores for the lower order components. In the second stage, the previously obtained latent variable scores serve as manifest variables in the measurement model of the higher order component (Christian M. Ringle, Sarstedt, & Straub, 2012). We adopted the recommended two-stage approach.

Validation of Reflective Constructs

To validate the reflective measures a confirmatory factor analysis (CFA) was performed. All reflective latent variables were connected in the model and the PLS

algorithm was run with the “factor weighting scheme” so the relations between latent variables would be computed as correlations. Appendix B shows a drawing of the measurement model and output statistics.

The CFA revealed evidence of sound reflective measures. Table 11 presents the mean, standard deviation, and factor loadings for all the constructs. We found reflective indicators to be reliable as individual scale items’ loadings exceeded the 0.7 minimum recommended value except for the reverse item measuring trust. We decided to drop the unreliable item measuring trust. Since five indicators were being used, dropping one should not generate concern. Both composite reliability and Cronbach’s alphas were above the 0.8 thresholds for all constructs, indicating internal consistency of the constructs.

Convergent validity was assessed and confirmed by examining the constructs’ average variance extracted (AVE). A value higher than .50 is recommended for AVE as it indicates that the variance due to measurement error is not greater than the variance explained by the construct. All constructs in this analysis present AVE ranging between 0.7 and 0.9.

For discriminant validity we evaluated cross loadings and found that each indicator loaded on the intended construct and not other constructs. We also found that the square root of the AVE exceeded the inter-item correlation values for each construct in all cases, indicating discriminant validity has been achieved.

Table 11
Reflective Constructs Statistics

Construct	Mean	S.E.	Loading
<i>Trust (Reliability =0.94 , AVE =0.82, Alpha =0.92)</i>			
This supplier keeps promises it makes to our firm.	4.85	1.48	0.9207
We trust this vendor keeps our best interests in mind.	4.65	1.60	0.8828
This supplier is trustworthy.	4.89	1.49	0.9285
This supplier can be counted on to do what is right.	4.89	1.40	0.9014
<i>Commitment (Reliability=0.94, AVE = 0.84 , Alpha =0.91)</i>			
The relationship my firm has with this supplier is something we are very committed to.	4.49	1.67	0.9542
My firm intends to maintain the relationship with this supplier indefinitely.	4.75	1.59	0.9329
The relationship my firm has with this supplier deserves our firm's maximum effort to maintain.	4.61	1.60	0.8767
<i>Relationship Satisfaction (Reliability= 0.93, AVE =0,79 , Alpha =0.91)</i>			
Our firm regrets the decision to do business with this supplier. (R)		1.47	0.8914
Overall, we are very satisfied with this supplier.	4.98	1.52	0.9022
We are very pleased with what this supplier has done for us over time.	5.03	1.59	0.8881
If we had to do it all over again, we would still choose to use this supplier.	5.07	1.60	0.8835
<i>Efficiency Drivers (Reliability= 0.93 , AVE =0.77 , Alpha =0.91)</i>			
There is an open communication process established with the selling firm.	4.49	1.87	0.8111
Our firm shares critical information with the selling firm	4.47	1.62	0.9374
Our firm coordinates order planning with the selling firm	4.05	1.84	0.9071
	3.75	1.93	0.8521

Validation of Formative Constructs

Two formative constructs were included in the model: relationship quality and efficiency factors. To assess the reliability of the formative measurements, recent literature suggests examining significance of indicators' weights via resampling procedures (Hair et al., 2012). We applied bootstrapping and found that the weights of the indicators of formative scales were all significant.

5.4.3. Structural Model Evaluation and Hypothesis Testing

Original Theoretical Model

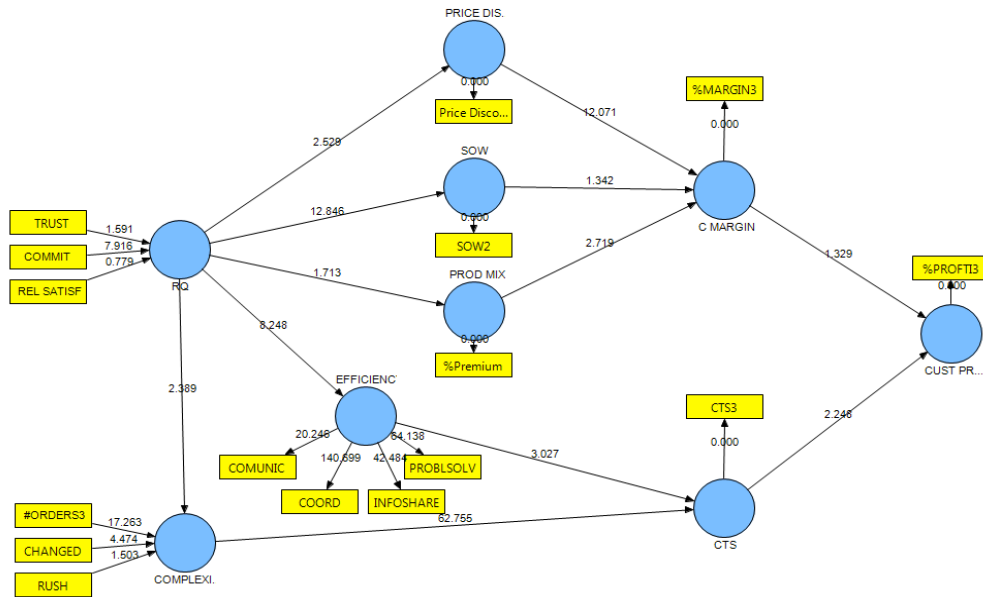
We estimated the hypothesized structural models using SmartPLS 2.0 M3 {Ringle, 2005 #176}. We first tested the original theoretical model to determine the effect of relationship quality (RQ) on customer profitability, considering the moderating effect of cost-to-serve drivers, price discounts, share-of-wallet, and product mixed profitability.

Calculating the PLS algorithm we obtained the path coefficients and construct variance explained by the model. Overall, the data supports the theoretical framework reflected in the hypothesized model, although not all propositions were supported. The structural model explains 96.7% of cost-to-serve variance and 62.8% of the variance in customer margin. However it only explains 3.1% of the variance in customer profitability, as suggested by the constructs R^2 .

More important was to determine the statistical significance of the model paths. Being distribution-free, PLS uses a bootstrapping resampling methodology to determine path significance. 500 resamples were taken to perform the bootstrap. The t-values were computed based on the bootstrapping procedure, and their significance levels were determined using a two-tailed distribution with 499 degrees of freedom (Christian Marc Ringle et al., 2005).

Results of the bootstrapping analysis, showing path significance for the original model, are shown in Figure 5. Results suggest evidence of an effect of relationship quality on several of the antecedents of customer margin and cost-to-serve, which determine the level of profitability at the customer level. However, some of the proposed connections between constructs are not statistically significant.

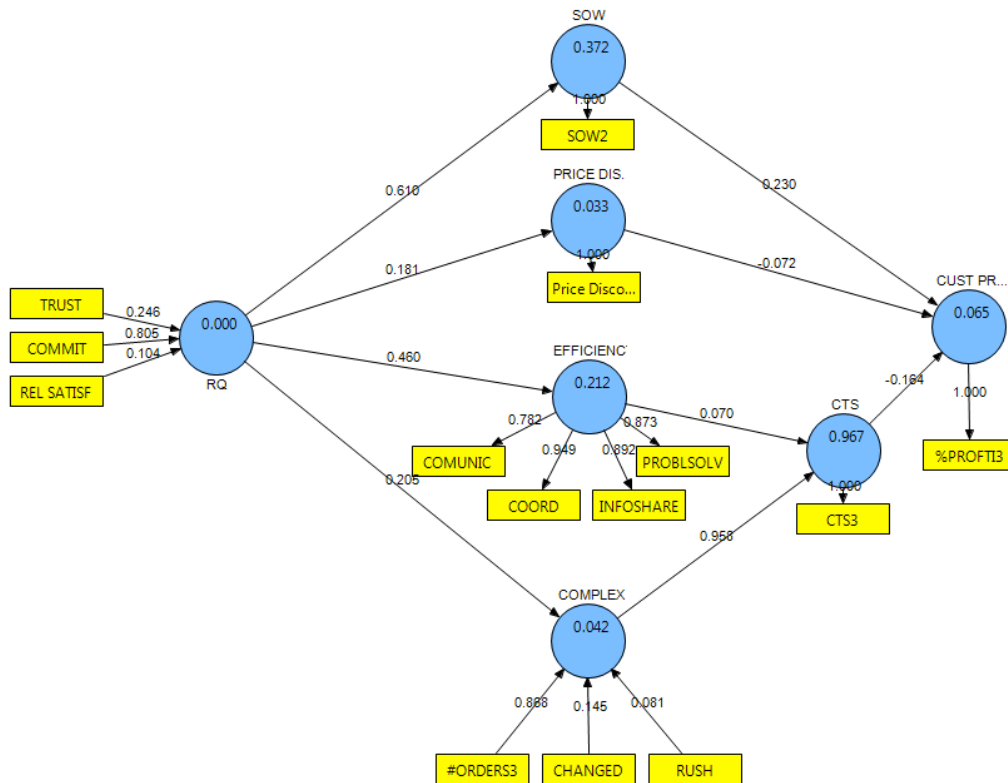
Figure 5
Path significance (t-values) of Original Model



Alternative Model

An alternative model was tested after removing customer margin and product mix. Customer margin seems to be redundant in some aspects, but at the same time, having the effect of large volume discounts, it may not reflect a clear effect on profitability. The explanatory power of the model increased marginally as it explains 6.5% of the variance in customer profitability, as suggested by the constructs R^2 (see Figure 6).

Figure 6
Alternative Structural Model showing path coefficients and R²



Although relationship quality doesn't seem to explain a large proportion of variance in the mediators, paths coefficient and their significance suggest that RQ have a positive effect on price discounts (H1 - although the direction is opposite to the original hypothesized effect), share of wallet (H2), efficiency (H5) and complexity factors (H6). Table 12 presents a summary of the model paths coefficients, standard deviation and t-values.

Table 12
Model Path Coefficients

Construct Paths	Original Sample (O)	Sample Mean (M)	Standard Deviation	T-value
COMPLEXITY -> CTS	0.958	0.955	0.015	62.141
CTS -> CUST PROFIT	(0.164)	(0.174)	0.044	3.692
EFFICIENCY -> CTS	(0.070)	(0.071)	0.023	3.117
PRICE DISCOUNT -> CUST PROFIT	(0.072)	(0.072)	0.072	1.001
RQ -> COMPLEXITY	0.205	0.224	0.085	2.410
RQ -> EFFICIENCY	0.460	0.465	0.057	8.141
RQ -> PRICE DISCOUNT	0.181	0.187	0.071	2.540
RQ -> SOW	0.610	0.609	0.048	12.704
SOW -> CUST PROFIT	0.230	0.228	0.061	3.761

5.4.4. Customer Lifetime Value Estimates

For Customer Lifetime Value estimation actual monthly measurements of the proposed CLV drivers for a period of three years was used. Based on the monthly data and employing Bayesian analysis, predictions on three main elements of the proposed CLV model: (a) cost-to-serve, (b) the probability that a customer would purchase in each time period, and (c) the contribution margin provided by the customer in each time period.

Table 13 shows the coefficient estimates of the drivers of CLV. The reported values are the posterior means and variances.

Table 13
CLV Model Coefficient Estimates

Independent Variables	Coefficients	
	Mean	Variance
Cost to Serve		
Past CTS	0.789	0.022
Complexity	0.406	0.022
Efficiency	-0.548	0.049
Customer Size	0.628	0.055

Customer Segment	0.218	0.001
Probability of Purchase		
Past CM	0.570	0.001
Past Purchase	2.103	0.007
Customer Size	0.023	0.000
Customer Segment	0.295	0.035
Contribution Margin		
Past CM	0.892	0.003
Price discount	0.088	0.047
SOW	0.546	0.057
Product Mix	0.002	0.021
Customer Size	0.258	0.002
Customer Segment	0.672	0.038

Cost of Capital:

Since CLV is the net present value of all cash flows generated by the customer, the future contribution and costs were discounted by the reported weighted average cost of capital used by the focal firm. Such cost of capital was 9.53% at the time of analysis.

CLV for each customer was computed using predictions of cost-to-serve, purchase probability, and contribution margin obtained from the proposed model. Thirty six months of historical data were available for model development.

5.3.5. Findings

Our analyses reveal several key findings. First, results of the PLS structural equations modeling analysis indicate sound measures and significant proportions of explained variance of the components of customer profitability, although the model does not fully explain customer profitability itself. Table 14 presents a summary of the hypothesis testing results.

Table 14
Summary of Hypothesis Testing

Hypothesis	p-value	Supported/ Not Supported
<i>H1: The quality of the relationship between customer and supplier is positively related to the price that the customer pays for purchased products.</i>	NA	Not supported
<i>H2: The higher the quality of the relationship between customer and supplier, the higher the percentage that the supplier represents of the customer's total category purchases.</i>	< .05	Supported
<i>H3: The quality of the relationship between customer and supplier is positively related to the proportion of high margin products that the customer purchases.</i>	NA	Not supported
<i>H5: The quality of the relationship between and customer and supplier is positively related to the existence of efficiency drivers in the relationship.</i>	< .001	Supported
<i>H6: The quality of the relationship between and customer and supplier is positively related to the existence of complexity drivers in the relationship.</i>	< .01	Supported
<i>H7: The presence of efficiency drivers in a customer relationship reduces the cost-to-serve such customer.</i>	< .001	Supported
<i>H8: The presence of complexity drivers in a customer relationship increases the cost-to-serve such customer.</i>	< .001	Supported
<i>H9: The higher the quality of the relationship between and customer and supplier, the higher the customer lifetime value of such relationship.</i>	NA	Not Supported

The effect of Relationship Quality on Customer Margin Components

It was hypothesized that the quality of a relationship between buyer and seller had a positive effect on price. An oversimplified notion assumes that relationship attributes such as trust, commitment and satisfaction increase customer loyalty, reducing price sensitivity. Scant evidence of the effect of RQ on price was found in previous research, so we decided to test the overall general belief.

Our results indicated that although there was statistically significant evidence of the effect of relationship quality on price discounts, the direction of the effect was opposite of what was originally hypothesized. The data shows evidence of larger price discounts for higher levels of relationship quality ($b = 0.18$; $p < 0.05$), which contradicts general. H1 was

not supported. One possible explanation is that in business markets, where prices are often negotiated with the customer, volume discounts are common. Customers in high quality relationships tend to buy larger volumes and most likely pay lower prices.

Our second hypothesis posited that higher levels of relationship quality make customers more willing to repurchase from supplier, increasing the portion of total purchases that the customer obtains from the supplier, in other words its share-of-wallet. As expected, the effect of RQ on share of wallet was positive and significant ($\beta = 0.61$; $p < 0.01$), hence supporting H2. Findings were consistent with intuition and previous literature, suggesting that customers will allocate a larger share of their spending to buying from suppliers they feel better about their relationship.

H3 was not statistically supported by the data ($t = 1.2$). We hypothesized that customers in higher-quality relationships would demand premium products from the supplier, leading to a more profitable mix of purchased products. However, there was no evidence of a significant relationship between RQ quality and the proportion of premium products procured by the customer. Demand for premium products seems to be independent of the strength of the relational ties between buyer and seller.

The effect of Relationship Quality on Components of Cost-to-Serve

Our theoretical model explains the relationship quality effect on cost-to-serve as mediated by two types of drivers behaving contradictorily. It was hypothesized that closer relationships with customers lead to better coordination and collaboration, increasing efficiency and thus creating cost savings for suppliers. At the same time, higher quality relationships demand more services, time and customization from suppliers, increasing complexity, leading to increased cost. Indeed, support for hypotheses 5 and 6 was found. There was strong support for the effect of RQ on efficiency drivers ($\beta = 0.46$; $p < 0.001$). There was also a statistically significant positive effect of RQ on complexity drivers ($\beta =$

0.2; $p < 0.01$). Interesting enough, the data support the fact that increased relationship quality increases the efficiency and the complexity in buyer-seller relationships.

The direct effect of RQ on cost-to-serve was also estimated to test the mediating effect of efficiency and complexity drivers. When both constructs were eliminated, the explanatory power of the model diminished substantially. R^2 of CTS went from 0.96 in the mediated model to 0.058 for the direct effect. Also the direct effect of RQ on CTS is reduced considerably when compared to the effect of the mediators. The effect of relationship quality on the cost of serve customers is better explained by the mediating effect of the two different types of drivers.

The effect of cost drivers on cost-to-serve

Hypotheses 7 and 8 attempted to explain the opposing effect of complexity drivers and efficiency driver on cost-to-serve. As expected, the negative effect of efficiency drivers on cost-to-serve was supported ($\beta = -0.07$; $p < 0.001$). Furthermore, there is evidence of a significant positive relationship between complexity drivers and cost-to-serve ($\beta = 0.92$; $p < 0.001$).

The effect of relationship quality on customer lifetime value

After estimating customer lifetime value for individual customers, we tested the effect of RQ on CLV. The composite values for RQ were used as well as the components of RQ (trust, commitment and satisfaction). The results of the regression analysis showed no significant relationship between RQ and CLV, suggesting that the ultimate impact of relationships on profitability and value creation depends on the tradeoff of the different drivers of cost and profit.

CHAPTER 6

DISCUSSION, IMPLICATIONS AND LIMITATIONS

6.1. Discussion

In this study we examine the drivers of customer profitability in an industrial market context for a large manufacturer with a heterogeneous customer base. This study is one of the first to examine cost-to-serve from a relationship marketing perspective. A qualitative analysis provided insight into the activities of sales and marketing managers that may improve relationships but generate cost. The analysis showed that higher quality relationships foster the achievement of efficiency by generating opportunities to share information, joint problem solving and coordinated planning. However, closer relationships also add complexity that eventually increase the cost and reduce profitability. Thus customer relationship may have an opposing effect on cost and profitability, which lead us to conclude that just focusing on sales volume and customer margin to achieve profitability is misleading.

At the same time the effect of relationship quality on the margin generated by product purchases is harder to isolate due to the effect of volume. Large customers get significant price discounts, but very often are the ones with the highest quality relationship.

The study found evidence that investing in relationship does have an effect on the drivers of customer cost and profitability. However, it did not find evidence supporting one of the most repeated themes in relationship marketing: that customers in closer relationships pay higher prices. The findings of this research confirm previous research conclusions suggesting that higher-quality relationships do have a positive effect on share of wallet. Customers will buy more from suppliers with whom they feel have a closer relationship.

The fundamental learning is that customer profitability is a very complex function where the drivers may have opposing effects, but understanding and measuring such drivers lead to more informed decisions and greater awareness of the trade-offs involved.

6.2. Managerial Implications

From a managerial perspective, results from the current research study indicate that an investment in customer relationships must be strategically planned to avoid excessive costs that reduce profitability. Managers focused on building and maintaining strong customer relationships should note that choosing the right customer to provide extra resources and services is critical as not all customers value them or pay for them equally. The ability to make customer relationship management decisions based on understanding on customer cost and profitability provides managers with an invaluable strategic tool.

Understanding the drivers of cost and profitability at the customer level can also help managers to eliminate activities that may not add value to customers or the firm. However, the area where this type of knowledge and understanding can create the most value is in the pricing function. Managers can price their products and services to capture value and generate profit for the firm when they know the impact of those on cost. In many situations, the best way to deal with an unprofitable customer is to offer a menu-based service pricing so customers pay for what they consume. Such pricing policy cannot be implemented without a proper estimation of customer cost and profitability.

In summary, the findings from this research allow marketing and sales managers to improve their strategy, to improve customer relationships while wisely allocating resources to boost the profitability of customers and the firm as a whole.

6.3. Limitations

As any other research in social science, this study has several limitations. First, since we drew our data from the customer base of only one supplier and all customers were located in the United States we cannot generalize results to consumer markets, other industries, or other cultures without additional testing. Second, data collection efforts in terms of customer perception of relationship quality were cross-sectional, where a longitudinal study may be able to provide an extended perspective, which could facilitate the modeling of future profitability. Third, the participants in the study self-selected themselves when they responded to the questionnaire, which may cause some bias in the sample. Finally, given data availability limitations, certain cost and profitability drivers were excluded from the analysis while they could have added insight into the intricate behavior of customer profit and value.

6.4. Future Research

New opportunities for research emerge from the findings of this study. One opportunity arises in the modeling of future customer value incorporating the behavior of cost to serve drivers. Also in the future, this research could be tested in a variety of industries so differences and similarities between and within industries may be discovered. Next, if one of the studies looked at this topic in a product setting and another looked at the topic in a service setting, differences in products and services cost and profitability drivers may be discovered.

APPENDIX A
SURVEY INSTRUMENT
Relationship Quality Measurement

OPENING SCREEN

Welcome!

Thank you for taking the time to participate in this study.

You are invited to participate in a research study. The purpose of the study is to investigate the relationships quality between your firm and the selling firm. You are invited to participate because of your procurement position and your involvement in purchasing from the selling firm. Participation will require 15 to 20 minutes of your time.

In this study, you will not have any more risks than you would in a normal day of life. Participation in this study may or may not benefit you personally. However, it will allow us to gain important information about the

Participation in research is voluntary. You have the right not to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time.

Keep in mind that your responses and all data from this research will be reported only in the aggregate. All information will be coded and will remain confidential. If you have questions at anytime about the survey or its procedures, you may contact Gabriela Piscopo at mpiscopo@ggc.edu.

Please start the survey now by clicking on the Continue button below.

To begin, please enter your email account so we can record your participation.

Email: _____

Please be sure to enter the email account where you received the invitation.

Now enter the name of the organization you work for and for which you are filling this questionnaire: _____

CURRENT RELATIONSHIP QUALITY EVALUATION

- I. The following statements refer to the relationship of your company with the selling firm **currently**. Please, indicate the extent to which you agree with the following statements, with "1" being strongly disagree and "7" being strongly agree.
- 1) The selling firm keeps promises it makes to our firm.
 - 2) We trust the selling firm keeps our best interests in mind.
 - 3) The selling firm is trustworthy.
 - 4) The selling firm cannot be trusted at times.
 - 5) The selling firm can be counted on to do what is right.
 - 6) The relationship our firm has with the selling firm is something we are very committed to.
 - 7) Our firm intends to maintain the relationship with the selling firm indefinitely.
 - 8) The relationship our firm has with the selling firm deserves our firm's maximum effort to maintain.
 - 9) Our firm regrets the decision to do business with the selling firm.
 - 10) Overall, we are very satisfied with the selling firm.
 - 11) We are very pleased with what the selling firm has done for us over time.
 - 12) If we had to do it all over again, we would still choose to use the selling firm.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

PAST RELATIONSHIP QUALITY EVALUATION

II. The following statements refer to the relationship of your company with the selling firm **1 year ago**. Please, indicate the extent to which you agree with the following statements, with "1" being strongly disagree and "7" being strongly agree.

- 13) A year ago, the selling firm kept promises it makes to our firm.
- 14) A year ago, we trusted the selling firm keeps our best interests in mind.
- 15) A year ago, the selling firm is trustworthy.
- 16) A year ago, the selling firm cannot be trusted at times.
- 17) A year ago, the selling firm can be counted on to do what is right.
- 18) A year ago, the relationship our firm had with the selling firm is something we are very committed to.
- 19) A year ago, our firm intended to maintain the relationship with the selling firm indefinitely.
- 20) A year ago, the relationship our firm had with the selling firm deserved our firm's maximum effort to maintain.
- 21) A year ago, our firm regretted the decision to do business with the selling firm.
- 22) A year ago, overall, we were very satisfied with the selling firm.
- 23) A year ago, we were very pleased with what the selling firm had done for us over time.
- 24) A year ago, if we had to do it all over again, we would have still chosen to use the selling firm.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

EFFICIENCY DRIVERS EVALUATION

III. The following statements refer to the extent to which your company engages in coordinated planning and problem solving with the selling firm. Please, indicate the extent to which you agree with the following statements, with "1" being strongly disagree and "7" being strongly agree.

- 1) There is an open communication process established with the selling firm.
- 2) Our firm shares critical information with the selling firm.
- 3) Our firm coordinates order planning with the selling firm.
- 4) If there are problems with the selling firm my firm works jointly with them to help improve the situation.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

- 5) To what extent do you think your views on the relationship of your company with the selling firm are consistent with those of other members of the buying team?

1	2	3	4	5	6	7
Not consistent at all						Extremely consistent

COMPANY PROFILE

Now we would like to get some additional information about your company:

- 1) How many years has your firm done business with the selling firm?
 - 1. Under 1 year
 - 2. 1 - 5 years
 - 3. 5 - 10 years
 - 4. 10 - 20 years

5. Over 20 years
- 2) What % of your firm's total purchases does *the selling firm* represent? _____
- 3) What % of your firm's purchases of (specific product) does *the selling firm* supply? _____
- 4) What's the estimated size of your company?
 1. 1-9 employees
 2. 10-19 employees
 3. 20-99 employees
 4. 100-249 employees
 5. 250-999 employees
 6. 1000-4999 employees
 7. More than 5000 employees
- 5) What are your company's estimated dollar sales?
 1. Less than \$1 million
 2. \$1million - \$20 million
 3. \$20 million - \$100 million
 4. \$100 million - \$200 million
 5. \$200 million - \$1 billion
 6. More than \$1 billion

RESPONDENT PROFILE

Please answer the following classification questions about yourself:

- 1) What is your gender?
 1. Male
 2. Female

- 2) What is your age range?
 1. Less than 25 years old
 2. 25 - 34
 3. 35 - 44
 4. 45 - 54
 5. 54 or older

- 3) What is your highest level of education?
 1. Some high school
 2. High school graduate
 3. Some college/university
 4. College/university graduate
 5. Post-graduate degree
 6. Doctoral level degree

- 4) What is your job title? _____

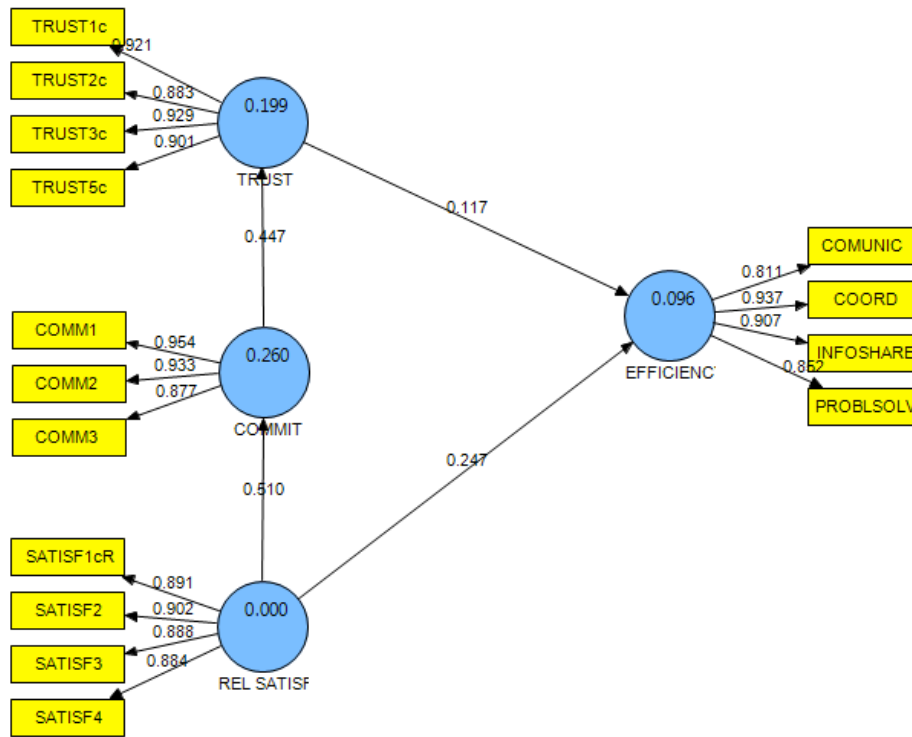
- 5) How long have you worked in your present position?
 1. Under 1 year
 2. 1 - 2 years
 3. 3 - 4 years
 4. 5 - 6 years
 5. Over 6 years

- 6) How long have you worked for this company?
 1. Under 1 year
 2. 1 - 2 years
 3. 3 - 4 years
 4. 5 - 6 years
 5. Over 6 years

APPENDIX B

MEASUREMENT MODEL

SmartPLS Output



Measurement Model Overview (Smart PLS Output)

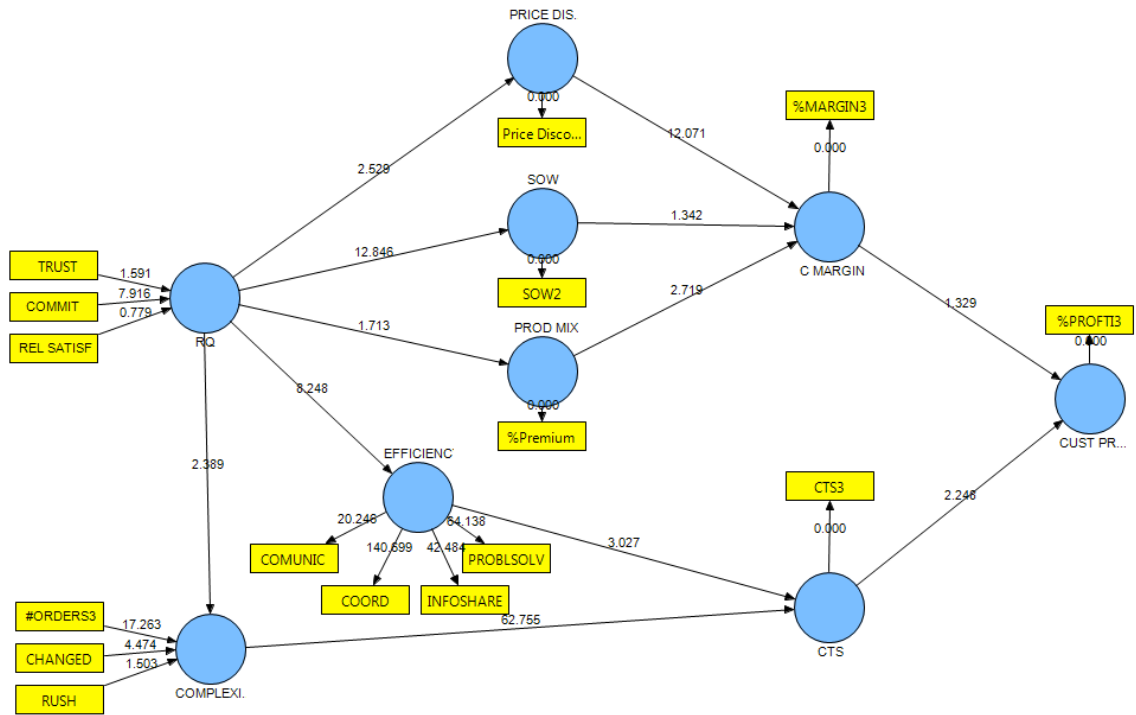
	AVE	Composite Reliability	Cronbachs Alpha	Communality	Redundancy
COMMIT	0.8497	0.9443	0.9109	0.8497	0.2208
EFFICIENCY	0.7714	0.9308	0.9007	0.7714	0.0636
REL SATISF	0.7945	0.9393	0.9147	0.7945	0
TRUST	0.8254	0.9498	0.9294	0.8254	0.1638

Crossloadings

	COMMIT	EFFICIENCY	REL SATISF	TRUST
COMM1	0.9542	0.4589	0.4585	0.4372
COMM2	0.9329	0.4504	0.4611	0.4378
COMM3	0.8767	0.3668	0.4926	0.3576
COMUNIC	0.3034	0.8111	0.2781	0.0699
COORD	0.5068	0.9374	0.2547	0.2681
INFOSHARE	0.3578	0.9071	0.2474	0.1535
PROBLSOLV	0.4264	0.8521	0.2439	0.2063
SATISF1cR	0.5485	0.2758	0.8914	0.3813
SATISF2	0.4554	0.2692	0.9022	0.3181
SATISF3	0.3927	0.2216	0.8881	0.2928
SATISF4	0.3922	0.2583	0.8835	0.2984
TRUST1c	0.4438	0.2073	0.3179	0.9207
TRUST2c	0.3847	0.2032	0.3348	0.8828
TRUST3c	0.3973	0.1779	0.3357	0.9285
TRUST5c	0.3921	0.1622	0.3465	0.9014

APPENDIX C

STRUCTURAL MODEL SMARTPLS OUTPUT



R Square

	R Square
COMPLEXITY	0.041982
CTS	0.966756
CUST PROFIT	0.064600
EFFICIENCY	0.211956
PRICE DISCOUNT	0.032816
RQ	
SOW	0.371886

Cross Loadings

	COMPLEXITY	CTS	CUST PROFIT	EFFICIENCY
TRUST	0.151708	0.156017	0.023385	0.215244
COMMIT	0.185539	0.230807	0.236808	0.469180
#ORDERS3	0.990952	0.970349	-0.164412	0.333007
%PROFTI3	-0.158909	-0.133744	1.000000	0.022691
CHANGED	0.514543	0.501806	-0.037208	0.206652
COMUNIC	0.162140	0.204214	0.044740	0.781799
COORD	0.358388	0.411653	0.017532	0.948763
CTS3	0.981006	1.000000	-0.133744	0.387045
INFOSHARE	0.229775	0.278556	0.027961	0.891521
PROBLSOLV	0.348706	0.399989	0.001794	0.873453
Price Discount	0.327007	0.395486	-0.064121	0.463052
REL SATISF	0.175737	0.188534	-0.060208	0.286923
RUSH	0.809451	0.818546	-0.134303	0.146981
SOW2	0.212074	0.253264	0.165836	0.440383

	PRICE DISCOUNT	RQ	SOW
TRUST	-0.048820	0.643428	0.495959
COMMIT	0.228543	0.967749	0.560781
#ORDERS3	0.302814	0.211571	0.204570
%PROFTI3	-0.064121	0.190146	0.165836
CHANGED	0.331937	0.119619	0.174937
COMUNIC	0.280028	0.290310	0.267579
COORD	0.502519	0.500308	0.449180
CTS3	0.395486	0.243724	0.253264
INFOSHARE	0.345232	0.351474	0.385762
PROBLSOLV	0.436187	0.419259	0.401739
Price Discount	1.000000	0.181153	0.314831
REL SATISF	0.088549	0.604628	0.351066
RUSH	0.198054	0.048697	0.113148
SOW2	0.314831	0.609824	1.000000

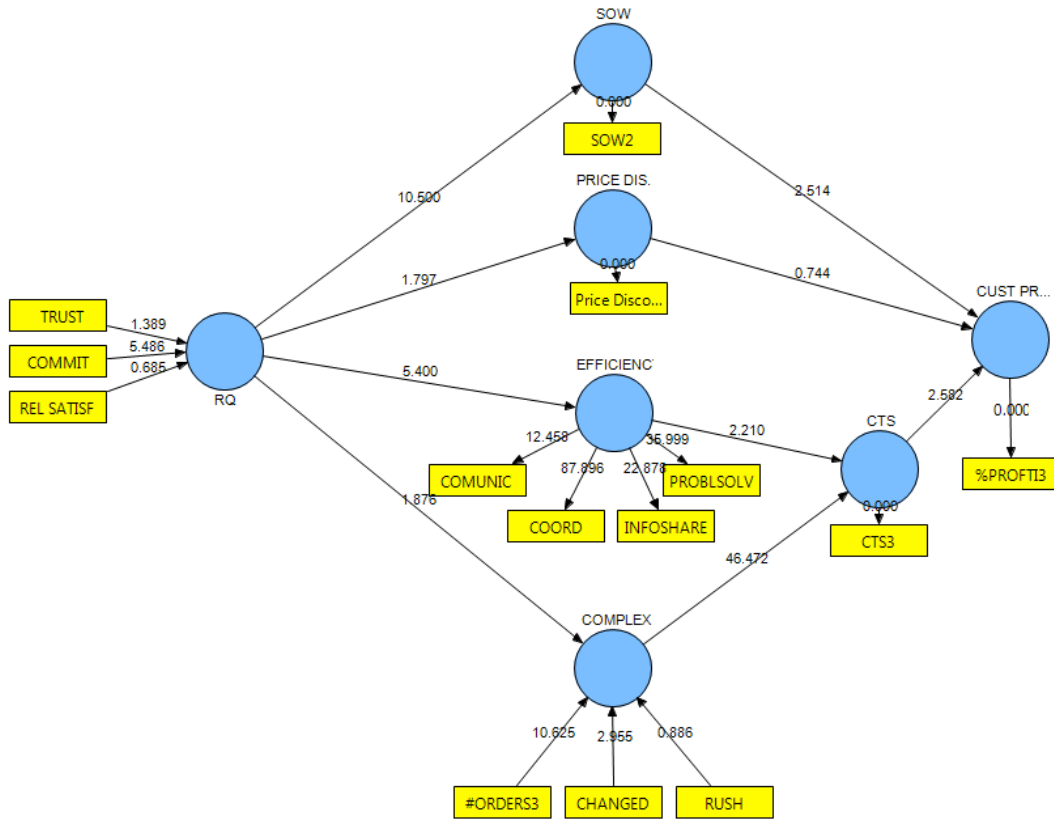
Total Effects (Mean, STDEV, T-Values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)
C MARGIN -> CUST PROFIT	0.132325	0.142032	0.101518	0.101518
COMPLEX -> CTS	0.833809	0.818240	0.061348	0.061348
COMPLEX -> CUST PROFIT	-0.059074	-0.059248	0.024332	0.024332
CTS -> CUST PROFIT	-0.070849	-0.072437	0.029555	0.029555
EFFICIENCY -> CTS	0.218600	0.222124	0.051492	0.051492
EFFICIENCY -> CUST PROFIT	-0.015488	-0.016032	0.007791	0.007791
PRICE DISCOUNT -> C MARGIN	-0.686298	-0.684936	0.055308	0.055308
PRICE DISCOUNT -> CUST PROFIT	-0.090814	-0.099120	0.072617	0.072617
PROD MIX -> C MARGIN	0.166098	0.164975	0.062180	0.062180
PROD MIX -> CUST PROFIT	0.021979	0.020877	0.016879	0.016879
RQ -> C MARGIN	-0.113766	-0.118213	0.071589	0.071589
RQ -> COMPLEX	0.082114	0.108051	0.074473	0.074473
RQ -> CTS	0.169660	0.189691	0.070517	0.070517
RQ -> CUST PROFIT	-0.027074	-0.029483	0.016436	0.016436
RQ -> EFFICIENCY	0.462913	0.465552	0.058822	0.058822
RQ -> PRICE DISCOUNT	0.188085	0.192118	0.077402	0.077402
RQ -> PROD MIX	-0.131569	-0.137524	0.080278	0.080278
RQ -> SOW	0.605961	0.608514	0.046229	0.046229
SOW -> C MARGIN	0.061340	0.061153	0.044675	0.044675
SOW -> CUST PROFIT	0.008117	0.009462	0.009864	0.009864

	T Statistics (O/STERR)
C MARGIN -> CUST PROFIT	1.303465
COMPLEX -> CTS	13.591556
COMPLEX -> CUST PROFIT	2.427861
CTS -> CUST PROFIT	2.397212
EFFICIENCY -> CTS	4.245357
EFFICIENCY -> CUST PROFIT	1.987860
PRICE DISCOUNT -> C MARGIN	12.408582
PRICE DISCOUNT -> CUST PROFIT	1.250597
PROD MIX -> C MARGIN	2.671226
PROD MIX -> CUST PROFIT	1.302167
RQ -> C MARGIN	1.589161
RQ -> COMPLEX	1.102596
RQ -> CTS	2.405937
RQ -> CUST PROFIT	1.647302
RQ -> EFFICIENCY	7.869780
RQ -> PRICE DISCOUNT	2.429960
RQ -> PROD MIX	1.638919
RQ -> SOW	13.107703
SOW -> C MARGIN	1.373012
SOW -> CUST PROFIT	0.822908

APPENDIX C

ALTERNATIVE MODEL



Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
COMPLEX			0.041982	
CTS	1.000000	1.000000	0.966756	1.000000
CUST PROFIT	1.000000	1.000000	0.064600	1.000000
EFFICIENCY	0.767272	0.929207	0.211956	0.900708
PRICE DISCOUNT	1.000000	1.000000	0.032816	1.000000
RQ				

SOW 1.000000 1.000000 0.371886 1.000000

Communality Redundancy

COMPLEX	0.633983	0.015814
CTS	1.000000	0.961835
CUST PROFIT	1.000000	0.016998
EFFICIENCY	0.767273	0.155312
PRICE DISCOUNT	1.000000	0.032816
RQ	0.572036	
SOW	1.000000	0.371886
SOW	1.000000	

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Latent Variable Correlations

	COMPLEX	CTS	CUST PROFIT	EFFICIENCY	PRICE DISCOUNT	RQ	SOW
COMPLEX	1.000000						
CTS	0.981006	1.000000					
CUST PROFIT	-0.158909	-0.133744	1.000000				
EFFICIENCY	0.330856	0.387045	0.022691	1.000000			
PRICE DISC	0.327007	0.395486	-0.064121	0.463052	1.000000		
RQ	0.204896	0.243724	0.190146	0.460387	0.181153	1.000000	
SOW	0.212074	0.253264	0.165836	0.440383	0.314831	0.60982	1.000000

R Square

	R Square
COMPLEX	0.041982
CTS	0.966756
CUST PROFIT	0.064600
EFFICIENCY	0.211956
PRICE DISCOUNT	0.032816
RQ	

SOW 0.371886

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Cross Loadings

	COMPLEX	CTS	CUST PROFIT	EFFICIENCY
TRUST	0.151708	0.156017	0.023385	0.215244
COMMIT	0.185539	0.230807	0.236808	0.469180
#ORDERS3	0.990952	0.970349	-0.164412	0.333007
%PROFTI3	-0.158909	-0.133744	1.000000	0.022691
CHANGED	0.514543	0.501806	-0.037208	0.206652
COMUNIC	0.162140	0.204214	0.044740	0.781799
COORD	0.358388	0.411653	0.017532	0.948763
CTS3	0.981006	1.000000	-0.133744	0.387045
INFOSHARE	0.229775	0.278556	0.027961	0.891521
PROBLSOLV	0.348706	0.399989	0.001794	0.873453
Price Discount	0.327007	0.395486	-0.064121	0.463052
REL SATISF	0.175737	0.188534	-0.060208	0.286923
RUSH	0.809451	0.818546	-0.134303	0.146981
SOW2	0.212074	0.253264	0.165836	0.440383

	PRICE DISCOUNT	RQ	SOW
TRUST	-0.048820	0.643428	0.495959
COMMIT	0.228543	0.967749	0.560781
#ORDERS3	0.302814	0.211571	0.204570
%PROFTI3	-0.064121	0.190146	0.165836
CHANGED	0.331937	0.119619	0.174937
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RUSH	0.198054	0.048697	0.113148
SOW2	0.314831	0.609824	1.000000

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AVE

	AVE
COMPLEX	
CTS	1.000000
CUST PROFIT	1.000000
EFFICIENCY	0.767272
PRICE DISCOUNT	1.000000
RQ	
SOW	1.000000

Quality Criteria

Overview

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RQ				
SOW	1.000000	1.000000	0.371886	1.000000

Latent Variable Correlations

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COMPLEX	1.000000						
CTS	0.981006	1.000000					
CUST PROFIT	-0.158909	-0.133744	1.000000				
EFFICIENCY	0.330856	0.387045	0.022691	1.000000			
PRICE DISCOUNT	0.327007	0.395486	-0.064121	0.463052	1.000000		
RQ	0.204896	0.243724	0.190146	0.460387	0.181153	1.000000	
SOW	0.212074	0.253264	0.165836	0.440383	0.314831	0.609824	1.000000

R Square

COMPLEX	0.041982
CTS	0.966756
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EFFICIENCY	0.211956
PRICE DISCOUNT	0.032816
RQ	
SOW	0.371886

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	COMPLEX	CTS	CUST PROFIT	EFFICIENCY
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CHANGED	0.514543	0.501806	-0.037208	0.206652
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COORD	0.358388	0.411653	0.017532	0.948763
CTS3	0.981006	1.000000	-0.133744	0.387045
INFOSHARE	0.229775	0.278556	0.027961	0.891521
PROBLSOLV	0.348706	0.399989	0.001794	0.873453
Price Discount	0.327007	0.395486	-0.064121	0.463052
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RUSH	0.809451	0.818546	-0.134303	0.146981
SOW2	0.212074	0.253264	0.165836	0.440383

	PRICE DISCOUNT	RQ	SOW
TRUST	-0.048820	0.643428	0.495959
COMMIT	0.228543	0.967749	0.560781
#ORDERS3	0.302814	0.211571	0.204570
%PROFTI3	-0.064121	0.190146	0.165836
CHANGED	0.331937	0.119619	0.174937
COMUNIC	0.280028	0.290310	0.267579
COORD	0.502519	0.500308	0.449180
CTS3	0.395486	0.243724	0.253264
INFOSHARE	0.345232	0.351474	0.385762
PROBLSOLV	0.436187	0.419259	0.401739
Price Discount	1.000000	0.181153	0.314831
REL SATISF	0.088549	0.604628	0.351066
RUSH	0.198054	0.048697	0.113148
SOW2	0.314831	0.609824	1.000000

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AVE

AVE

COMPLEX

CTS 1.000000

CUST PROFIT	1.000000
EFFICIENCY	0.767272
PRICE DISCOUNT	1.000000
RQ	
SOW	1.000000

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Communality

	communality
COMPLEX	0.633983
CTS	1.000000
CUST PROFIT	1.000000
EFFICIENCY	0.767273
PRICE DISCOUNT	1.000000
RQ	0.572036
SOW	1.000000

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Total Effects

	COMPLEX	CTS	CUST PROFIT	EFFICIENCY
COMPLEX		0.957796	-0.156661	
CTS			-0.163564	
CUST PROFIT				
EFFICIENCY		0.070153	-0.011475	
PRICE DISCOUNT			-0.071803	
RQ	0.204896	0.228546	0.089789	0.460387
SOW			0.229866	

	PRICE DISCOUNT	RQ	SOW
COMPLEX			
CTS			

CUST PROFIT
 EFFICIENCY
 PRICE DISCOUNT
 RQ 0.181153 0.609824
 SOW

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Composite Reliability

	Composite Reliability
COMPLEX	
CTS	1.000000
CUST PROFIT	1.000000
EFFICIENCY	0.929207
PRICE DISCOUNT	1.000000
RQ	
SOW	1.000000

Quality Criteria

Overview

	AVE	Composite Reliability	R Square	Cronbachs Alpha
COMPLEX			0.041982	
CTS	1.000000	1.000000	0.966756	1.000000
CUST PROFIT	1.000000	1.000000	0.064600	1.000000
EFFICIENCY	0.767272	0.929207	0.211956	0.900708
PRICE DISCOUNT	1.000000	1.000000	0.032816	1.000000
RQ				
SOW	1.000000	1.000000	0.371886	1.000000

	Communality	Redundancy
COMPLEX	0.633983	0.015814

CTS	1.000000	0.961835
CUST PROFIT	1.000000	0.016998
EFFICIENCY	0.767273	0.155312
PRICE DISCOUNT	1.000000	0.032816
RQ	0.572036	
SOW	1.000000	0.371886

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Redundancy

	redundancy
COMPLEX	0.015814
CTS	0.961835
CUST PROFIT	0.016998
EFFICIENCY	0.155312
PRICE DISCOUNT	0.032816
RQ	
SOW	0.371886

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Cronbachs Alpha

	Cronbachs Alpha
COMPLEX	
CTS	1.000000
CUST PROFIT	1.000000
EFFICIENCY	0.900708
PRICE DISCOUNT	1.000000
RQ	
SOW	1.000000

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Latent Variable Correlations

	COMPLEX	CTS	CUST PROFIT	EFFICIENCY
COMPLEX	1.000000			
CTS	0.981006	1.000000		
CUST PROFIT	-0.158909	-0.133744	1.000000	
EFFICIENCY	0.330856	0.387045	0.022691	1.000000
PRICE DISCOUNT	0.327007	0.395486	-0.064121	0.463052
RQ	0.204896	0.243724	0.190146	0.460387
SOW	0.212074	0.253264	0.165836	0.440383

	PRICE DISCOUNT	RQ	SOW
COMPLEX			
CTS			
CUST PROFIT			
EFFICIENCY			
PRICE DISCOUNT	1.000000		
RQ	0.181153	1.000000	
SOW	0.314831	0.609824	1.000000

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R Square

	R Square
COMPLEX	0.041982
CTS	0.966756
CUST PROFIT	0.064600
EFFICIENCY	0.211956
PRICE DISCOUNT	0.032816
RQ	
SOW	0.371886

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