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Determinants of customer satisfaction in a B2B IT context – A structural equation modeling approach

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ABSTRACT

Customer satisfaction studies in a business-to-business (B2B) information technology (IT) industry have primarily focused on assessing satisfaction at the project level. However, software organizations are unique due to the complex nature of the supplier-customer relationships; therefore, the requirements of customers at the project and engagement levels are quite different and convoluted. This research identifies the determinants of customer satisfaction in an IT scenario, at an engagement level, and proposes a measurement instrument for the same. Furthermore, the relationships among the various determinants of customer satisfaction and their effect on overall customer satisfaction are investigated using the structural equation modeling (SEM) approach. The SEM model was tested for model fit and adequacy through various indices and measures, thereby confirming the theory behind the proposed model. The present research will help practitioners better understand the relationships among the various elements in customer satisfaction measurement and management in software organizations. This study is perhaps the first of its kind in applying the SEM approach for evaluating customer satisfaction in the B2B IT industry.

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customer satisfaction; IT industry; SEM; software organizations; structural equation modeling; survey instrument

Introduction

It is widely acknowledged among researchers and practitioners that high customer satisfaction is a strong predictor of behavioral variables such as repurchase intentions, cross-selling, and loyalty apart from generating positive word of the mouth and bringing in new customers to the firm, thereby increasing market share (Oliver and DeSarbo 1988; Bolton and Drew 1991; Anderson and Sullivan 1993; Heskett et al. 1994; Rust, Zahorik, and Keiningham 1995; Zeithaml et al. 1996; Bolton 1998; Mittal, Kumar, and Tsiros 1999; Mittal and Kamakura 2001; Timothy et al. 2014). Both marketing theory and practice also contend that firms can improve their business performance by satisfying customers, as superior customer satisfaction results in greater financial gains, higher price-willingness, a greater share of wallet, and increased sales.

In their efforts to ameliorate satisfaction levels, many organizations have realized that creating an advantage along the traditional marketing mix dimensions is temporary at best, and they have started to seek more innovative ways to create value for their customers along relational dimensions. Such an approach helps suppliers acquire a unique competitive edge, as it is even more difficult to duplicate such relational aspects by competitors due to the inherent intangible nature of relationship building (Barry, Dion, and Johnson 2008). Mutual value creation, trust, and commitment are the rudiments on which relationship marketing is based. The higher the level of customer satisfaction with the entire engagement (not just the product or service), the greater the likelihood that the customer will be loyal to the seller company (Caceres and Paproidamis 2007). Therefore, customer satisfaction measurement is considered to be the most reliable feedback mechanism, as it provides an effective, meaningful, direct, and objective way of understanding customers' preferences and proclivities (Johannes et al. 2016; Zhao, Xu, and Wang 2019).

Numerous research works have investigated the importance of customer satisfaction for a firm's success and how customer satisfaction can be measured (Oliver 1980; Youjae 1993; Keaveney 1995; Zeithaml et al. 1996), but most of these works are limited to the area of business-to-consumer (B2C) marketing (Chakraborty, Srivastava, and Marshall 2007). It is not prudent to make broad-based generalizations from B2C studies to business-to-business (B2B) contexts

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due to the inherent differences between consumer buying (B2C) and organizational buying (B2B) behavior. Organizational buying is much more complex than consumer buying, as it involves many stakeholders across different functions and levels, multiple priorities, and seemingly conflicting decision criteria (Webster and Wind 1972; Anderson, Chu, and Weitz 1987).

Traditionally, the contrasts between consumer and B2B marketing are well documented (Simkin 2000). These differences revolve around market structure and demand, the nature of the buying unit, and the types of decisions and the decision process involved (Kotler et al. 2001). B2B organizations are typified as having many customers that must be handled individually (Hakansson, Johanson, and Wootz 1976) and also require relationship development, frequently long term, between the selling and the buying organizations.

A major shift has occurred in the ways B2B companies deal with their customers and suppliers. Organizations have started to recognize that sustainable competitive advantage in the global economy increasingly requires companies to become trusted partners in various networks or sets of strategic alliances.

Significance of customer satisfaction measurement in the IT industry

In view of the complexity of organizational buying situations in B2B contexts, it is likely that the various roles involved in the buying process in a customer organization would have a different set of factors on which they make their decisions (Chakraborty, Srivastava, and Marshall 2007). In a typical industrial marketing setting, the relationship between buyer and seller is frequently long term, close, and involves a complex pattern of interaction between and within each company (Hakonsson 1982). In essence, customer satisfaction in B2B marketing is highly relationship specific (Homburg and Rudolph 2001).

Despite several research works establishing links between customer satisfaction and other behavioral variables such as customer loyalty, purchase intentions, word of the mouth, and others, there is not enough conformity on the determinants of customer satisfaction in a B2B context (Patterson, Johnson, and Spreng 1997; Jap 1999; Abdul-Muhmin 2002; Ulaga and Eggert 2006; Spiteri and Dion 2004; Russell-Bennett, Janet, and Coote 2007). This lacuna has been well documented in marketing management research (see Sheth and Sharma 2006) wherein the authors argue that there is not a clear understanding of customer satisfaction in B2B marketing (Cater and Cater 2009).

This hiatus is even more pronounced in an information technology (IT) setting. The criticality of the software industry is growing at a remarkable pace, as internet and e-business applications are becoming widely used. Consequently, a significant amount of research on software evaluation is being conducted actively in academia and industry. However, most of the software process assessment models are based on the developer or the development process point of view (Leem and Yoon 2004). Research works on software quality, traditionally focused on improving the quality of the final product/software, have failed to address the concept of quality from a holistic total quality management (TQM) perspective, which places emphasis on customer satisfaction (McManus and Harper 2007). Efforts to improve the effectiveness of the process were more concerned with reducing the time and costs of producing the software (Hevner 1997; Rai, Song, and Troutt 1998; Lewis 1999; Harter, Krishnan, and Slaughter 2000). The emergence of various versions of quality-related certifications such as the Capability Maturity Model (CMM), People Capability Maturity Model (PCMM), Capability Maturity Model Integration (CMMi), and ISO stand exemplary proof of such efforts.

It must be noted that such software evaluation models focus mainly on software process improvement, organizational maturity, and capability of the software processes rather than the evaluation of overall customer-oriented quality and satisfaction at the engagement level. Many software companies fail in their efforts to measure and improve customer satisfaction, as the IT industry is primarily knowledge intensive, and the general belief among software practitioners is that customer satisfaction can be improved by providing high-quality, defect-free software. While this is true to some extent, limiting the multifaceted construct of customer satisfaction to just product (software) quality trivializes the understanding of the complex nature of buyer-seller relationships involved in IT scenarios.

The B2B IT environment can be thought to differ in a plenitude of ways thanks to the unique nature of IT services (even among B2B services) and the projectized structure of all IT organizations. Therefore, there is a need to identify the factors of customer satisfaction in a complex B2B IT setting and explore ways of measuring customer satisfaction in such industrial environments. The relationships among the various dimensions of customer satisfaction should also be established.

Objectives of the research

In light of the previous discussions, the objectives of the present research are formulated as below:

1. Identify the determinants of customer satisfaction in a B2B IT setting
2. Develop a measurement instrument and a measurement strategy to measure customer satisfaction
3. Establish the relationships among the determinants of customer satisfaction and overall customer satisfaction (CSAT) using the structural equation modeling (SEM) approach

Dimensions of customer satisfaction and the measurement approach

Critical dimensions of customer satisfaction in a B2B IT setting

Most of the existing works on customer satisfaction in industrial markets are too simplistic and are largely focused on replicating the measurement approaches (both identification of dimensions and operationalization of the same) used in B2C settings to the B2B contexts (Tikkanen and Alajoutsijarvi 2002). They have failed to fully comprehend the nuances of different industries in the B2B scenario and, consequently, have failed to unearth research studies that would effectively address the peculiarities of a specific industry, such as the IT industry. As discussed earlier, software organizations are distinct in that the complexity of the supplier-customer relationships obligate the effective management of the interactions of individuals involved in the relationships across the various functions and levels of hierarchy. The presence of multiple stakeholders from the customer organization in the buying and service acquisition process implies the existence of conflicting goals and priorities that are to be effectively addressed by the seller organization.

While it is possible via literature review to identify broad generic aspects that customers may consider important in B2B contexts, because of the diversity and complexity of products/services in B2B contexts, such issues need to be validated by conducting empirical research with domain experts from the specific industry (Chakraborty, Srivastava, and Marshall 2007). Drawing on the extensive research and practitioner literature on customer satisfaction and B2B markets, and keeping in view the dynamics and structure of the IT industry, the following eight determinants, as depicted in Figure 1, have been identified as critical for customer satisfaction measurement. These dimensions fall under different categories/phases in the software management process. The dimensions focus on different aspects, starting from prepurchase through relationship management, project management, service delivery and recovery, the service product (core service), measurement and analytics, and value creation. A brief description, accentuating the criticality of these dimensions in a typical IT scenario, is presented in Table 1.

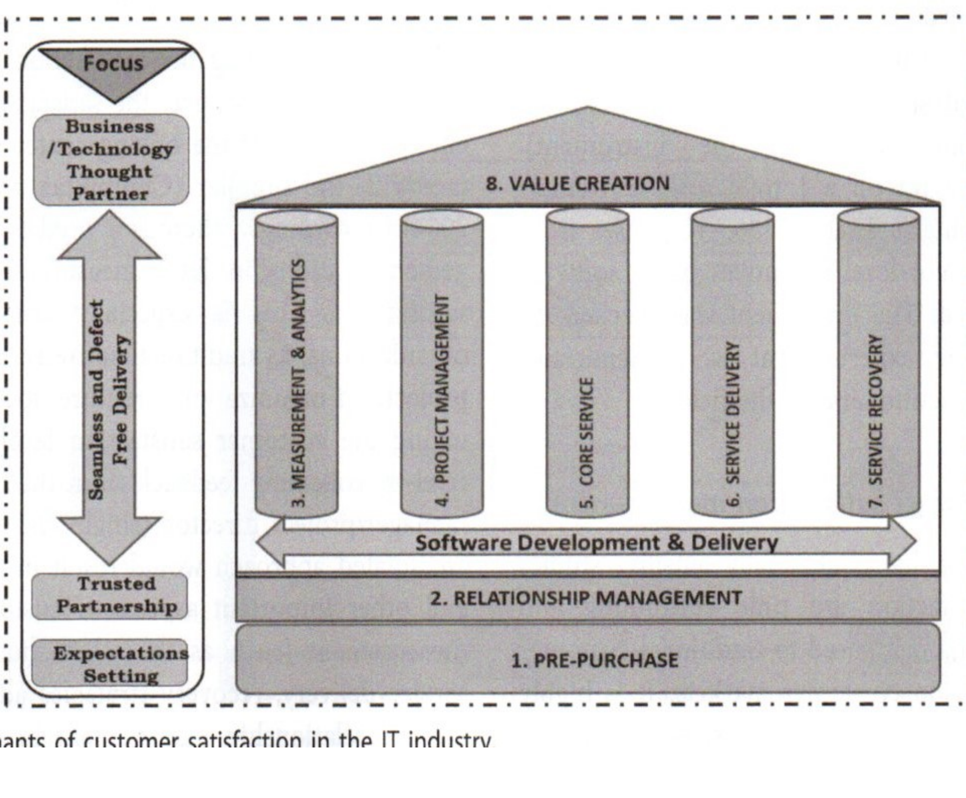

Figure 1. Determinants of customer satisfaction in the IT industry.

Table 1. The criticality of the dimensions of customer satisfaction.

Sl No	Dimension	Description
1	Prepurchase	Prepurchase satisfaction is extremely important, as it creates the expectations setting for the customers. Customers get to know the expertise on offer during this phase, which they then use to make their decision of whether to offer the contract. Any negative disconfirmation with these expectations surfacing during the project life cycle would adversely affect the satisfaction levels of the customers.
2	Relationship management	In most B2B situations, where the situation warrants goal congruence between the vendor and the customer, "the organization and the customer realize that the potential gains from acting cooperatively will exceed the gains from acting opportunistically" (Bowen, Sieh, and Schneider 1989), it is natural to maintain a long-serving, healthy relationship by both parties. Apart from helping the service providers, in terms of opportunities for cross selling, positive word of mouth, and so on, such a relationship also helps the customers, as it helps prevent costs related to switching, retraining, reorganization, and so on (Cann 1998).
3	Measurement and analytics	Driven by the metrics culture, most software customers insist on adopting several basic and derived metrics for project monitoring and control. Development of customer portals, engagement dashboards, and scorecards are mandatory requirements as part of status reporting and tracking. Moreover, emphasis has been laid on the use of models for prediction purposes, as they will provide confidence to the customers on the ability of the supplier organization to adhere to delivery schedules and timelines, delivery of defect-free software, and so on. Customers of late have started viewing the robustness of the measurement and analytics function as an indicator of project management supremacy and ability to quantitatively manage the projects.
4	Project management	A projectized structure is at the core of all IT organizations. Several programs could consist of multiple projects spread across different geographical locations and solution centers. Therefore, the ability to manage projects by the seamless integration of different stakeholders involved is critical for timely and defect-free delivery of customer deliverables.
5	Core service	The core service portrays the "content" of a service. It portrays the "what" of a service; that is, the service product is whatever features that are offered in a service/product (Sureshchandar, Rajendran, and Anantharaman 2002). The quality of this core service largely influences and sometimes may be the ultimate determinant of the overall service quality from the viewpoint of the customers (Schneider and Bowen 1995). In an IT context, this refers to the extent to which the releases/software meet the specifications (both stated and unstated), defect-free software, reliability, ease of use, technical competencies of the offerings, and so on.
6	Service delivery	This factor refers to all aspects (reliability, responsiveness, assurance, empathy, and so on) that will fall under the domain of the seamless service delivery. Compliance of actual and agreed deliverables, timeliness of deliverables, effectiveness of knowledge transfer, quality of transition planning, and training effectiveness are some of the critical measures of this dimension.
7	Service recovery	Although a service failure has the potential to destroy customers' loyalty, the successful implementation of service recovery strategies may prevent the defection of customers who experience a service failure (Schoefer and Ennew 2005). Consequently, it is important to understand what factors make customer recovery programs successful. In a service failure context, service recovery can be considered a second service encounter. The effectiveness and timeliness of issue management and the establishment of an early warning mechanism to identify problems upfront to devise preventive and corrective strategies are fundamental for the sustenance of healthy relationships with the customers and for espousing customer satisfaction and loyalty.
8	Value creation	In a software context, much importance is given to effectively managing the perceptions of the customers, by providing more value-added services and products that would in turn augment the competitiveness of the customers, than simply trying to maximize customer retention rates. Value is perceived to be created if the offerings by the software organizations result in increased productivity, improved operational efficiency, reduced costs, and development of innovative and leading practices that result in the offerings/services tuned to address the customers' emerging business needs.

To exhaustively capture the different facets of customer satisfaction with respect to the eight dimensions, a detailed survey instrument consisting of 53 items was developed. Customers' overall satisfaction (CSAT) was also solicited exclusively to gain an inkling of the total satisfaction level of the customers (see the Appendix for details of the instrument). Responses were sought on a 1 to 9 scale (extremely low to extremely high). In total, 305 responses from to middle- and senior-level executives of 52 software firms were collected. The instrument was checked for content validity by experts (that is, academicians, researchers, and practitioners) in the field.

Approach to customer satisfaction measurement

It must be accepted that contextually sensitive studies on customer satisfaction are time consuming and resource demanding compared to traditional customer satisfaction surveys in consumer markets. It is highly mandatory that researchers familiarizes themselves with the primary features of each customer relationship so the responses can be comprehended in-depth from the perspective of understanding the latent needs of the customers.

When considering the satisfaction of a B2B client, it is necessary to evaluate the satisfaction of the different constituents of the buying center who are in contact with the supplier (Chumpitaz and Paparoidamis 2004). Accordingly, there is a need to devise an engagement/relationship level measurement of customer satisfaction. This is especially critical in software organizations, as traditional software firms, due to the projectized organization structure, focus only on evaluating the customer satisfaction levels at the project level by collecting feedback from the customer project manager/project director (single client contact). Such an isolated approach would result in overlooking several other important aspects of customer satisfaction measurement (such as the satisfaction level with the service delivery, recovery strategies adopted, effectiveness of relationship management in developing trust and commitment, value creation in terms of helping customers' business priorities, and so on) that are highly significant in customers continuing the relationship with the service providers.

Consequently, the measurement approach should be so designed that feedback is obtained from multiple stakeholders in the customer organization who are involved during the various stages of the buying cycle. Such an alignment is portrayed in Figure 2, which helps in getting relevant feedback from each client contact of significance. This approach is based on the need to move from a single key informant approach to a "higher order of network structure such as an inter-organizational dyad" (Rossomme 2003).

The customer satisfaction measurement approach presented previously would help in acquiring vital information on the needs and expectations of the complete range of customer relationships – from purely transactional exchanges to operational relations and strategic partnerships. In the present study, each survey form solicited responses from different stakeholders (based on their role and the dimension they are involved in, as depicted in Figure 2), and the collated feedback for each survey form was treated as a single response.

Relationships among the determinants of customer satisfaction – a structural equation modeling (SEM) approach

While the instrument developed to measure customer satisfaction would help to understand the level of customer satisfaction along various dimensions, the dimensions themselves could be influencing each other in different ways. Based on a thorough review of the literature on software engineering, intrinsic dynamic relationships among various activities of software project life management, the determinants of customer satisfaction have been conceptualized to have a relationship, as shown in Figure 3.

The proposed model of relationships is theoretical, based on the literature and expert views, and an attempt is being made to validate the same using the SEM approach. This will make it possible to identify the relationships among the different constructs of customer satisfaction as well as help to ascertain the influence of each of these dimensions on overall customer satisfaction.

Structural equation modeling (SEM)

SEM refers to a family of statistical models that seeks to explain the relationships among multiple variables. In other words, SEM can be understood as a method for examining a structure of interrelationships expressed in a series of equations, that is, a series of multiple regression equations. These equations or structure depict all relationships among constructs and variables involved in the complete analysis. Constructs are unobservable, latent factors represented by many variables. In SEM, a theoretical structure is specified that describes the relationships between the variables and constructs as well as the relationships among the constructs (Hair et al. 2018). Just like other

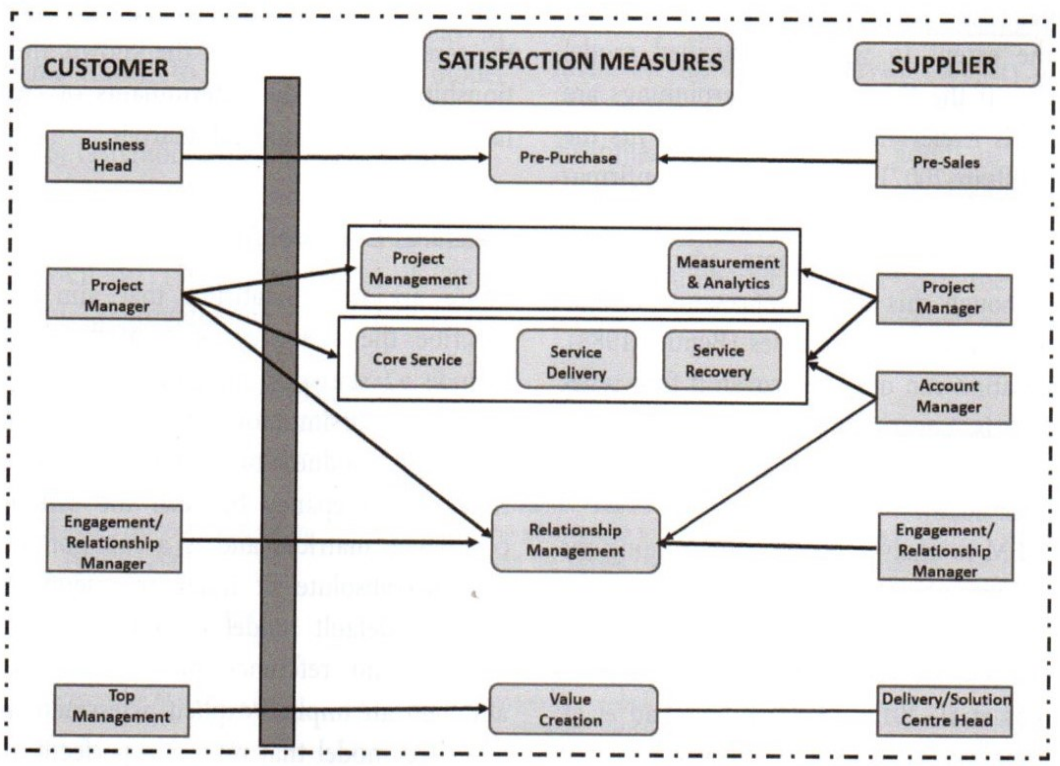

Figure 2. Customer satisfaction measurement approach.

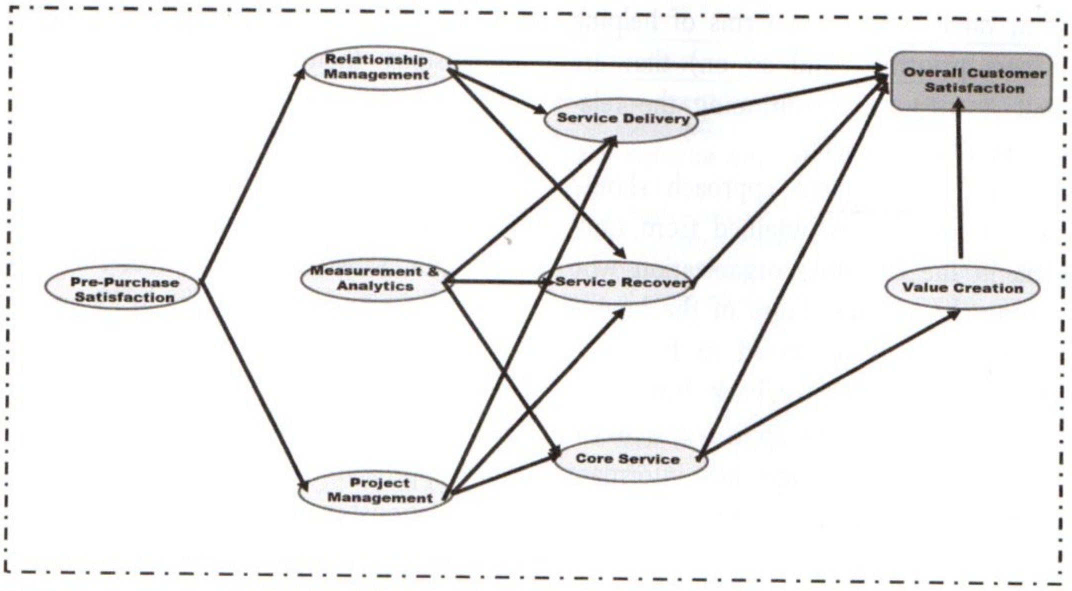

Figure 3. Relationships among the customer satisfaction dimensions.

linear models such as ANOVA, multiple regression, principal factor analysis, and others, SEM also accounts for relationships among variables. In other words, these analyses can also be done with SEM, which would provide identical results. Therefore, SEM can be described as a generalization, integration, and extension of the models used in the analysis of linear relationships (Hoyle 2012).

Like in other models, the quality of the outputs of SEM depends on the inputs provided by the researcher based on theory (Hayduk et al. 2007). Many of the naïve users of SEM believe that the purpose of SEM is to find a model that fits the data. However, this is not true, especially given the fact that any model can be made to fit the data well by making it more complicated, that is, by adding more parameters. Therefore, the success of any SEM model depends on the extent to which a specified model relates to theory. If the theoretical underpinnings are not espoused, it is irrelevant whether a model fits the data or not. (Millsap 2007). SEM adopts a confirmatory, hypothesis testing approach to the analysis of a structural theory bearing on some phenomenon (Byrne 2016). Though this theory represents "causal" relationships among multiple variables (Bentler 1988), establishing causation can only be proven if four types of evidence, that is, covariation, sequence, nonspurious covariation, and theory, are reflected in the SEM model (Hair et al. 2018).

The use of SEM to analyze relationships among the various dimensions of customer satisfaction across multiple industrial settings has been well documented in the literature (Faizan and Rosmini 2014; Chayuth et al. 2015; Akos et al. 2017; 2018; Muhammad et al. 2018). Traditionally, SEM uses a covariance-based approach (CB-SEM) to evaluate the measurement of latent variables, while also examining the relationships among latent variables. Of late, the variance-based partial least squares technique (PLS-SEM) for evaluating models in SEM is gaining prominence. There are several schools of thought on which technique is better between the two in terms of fitting the model well. The consensus is that if the context is data rich and theory-skeletal, the PLS technique is better suited. Per contra, if the context is such that the theory behind the subject of interest is well established and the researcher is interested in the confirmation of the theory through data, the CB approach is well suited. Also, unlike PLS, the CB approach provides various measures of model fit that help to describe the adequacy of the model. The current research chose to use the CB-based SEM approach, as customer satisfaction is a well-researched subject and the objective of the research is to establish the known, theoretical relationships among the determinants of customer satisfaction through empirical analysis.

Measures of model fit

There are many statistics that aim to assess and describe the adequacy of a model in SEM. These include $\chi 2$ statistics, incremental fit indices, absolute fit indices, parsimonious fit indices, and so on.

The $\chi 2$ goodness-of-fit statistic assesses the magnitude of discrepancy between the sample and fitted covariance matrices and is a function of the sample size. An absolute fit index represents the extent to which a default model reproduces the sample data. There is no reference model used in this index, although an implicit/explicit assessment is made to a saturated model that reflects a perfectly fitting model. Absolute fit indexes include the goodness-of-fit index

(GFI), adjusted goodness-of-fit index (AGFI), root mean squared residual (SRMR), and the root mean square error of approximation (RMSEA). The incremental fit indices are a measure of the comparable improvement in fit by comparing a default model with a baseline, null model, where no items covary (Bentler and Bonett 1980). Normally used incremental fit indexes are normed fit index (NFI), Tucker-Lewis index (TLI), relative noncentrality index (RNI), and comparative fit index (CFI) (Hu and Bentler 1999). Parsimony-based indices such as PCFI and PGFI focus on punishing the model for complexity and hence will have lesser values than the corresponding CFI, GFI, and others.

There are several theories on how many indices and/or statistics must be reported and what combination of these indices adequately describe a SEM model. Certain statistics/indices are swayed by sample sizes or the ratio of indicators/factor and thus may not provide an acceptable depiction of the model fit (Xenophon A. Koufteros 1999). To cite an example, the chi square statistic is expected to be nonsignificant ($p > 0.05$) for an acceptable model. However, research has shown that the chi square statistic is largely influenced by sample size, and if the sample size is big, which is typically required for SEM models, the chi square statistic and its corresponding p-value will turn out to be significant ($p < 0.05$). To address this problem, researchers have suggested the chi-square/df measure as an alternative to chi square. Likewise, GFI is also greatly influenced by sample size. Consequently, researchers have advocated the use of manifold fit indices/statistics to provide a more comprehensive view of the model, which will help to address problems linked to sample size and model complexity (Schermelleh-Engel et al. 2003; Vandenberg 2006; Gatignon 2014). There is much evidence in the literature on the key indices that must be reported in research findings (Hu and Bentler 1999; Xenophon A. Koufteros 1999; Schreiber et al. 2006; Kline 2016). Table 2 provides the list of indices for model adequacy along with their descriptions and acceptable values.

Results and discussions of SEM analysis

In order to empirically test the relationships among the eight identified determinants of customer satisfaction and their influence on overall customer satisfaction (CSAT), an SEM was developed, as shown in Figure 4.

The analysis was done using the IBM SPSS Amos v26 software. The results of the SEM analysis are shown in Tables 3, 4, 5, and 6.

Model fit - results and discussions

The model fit indices such as chi square/df, CFI, SRMR, and RMSEA, shown in Table 3, indicate that all the mandatory indices, except SRMR, fall under the excellent category showing strong evidence of model fit. The SRMR value is at 0.095, which corresponds to a "good" level.

Table 4 provides the regression coefficients and the significance levels of the various paths specified in the model. As can be seen from this table, all the paths are highly significant at the 0.001 level except CSAT <-- VC, which is significant at the 0.1 level (with a p-value of 0.068). Also, the regression weight of CSAT <-- VC is only 0.116. This can be attributed to the fact that although value creation is a very important influencing variable to CSAT, it does not per se contribute much to the CSAT score. Customers look at other basic determinants such as relationship management, service delivery, service recovery, and core service while forming perceptions on the levels of customer satisfaction. In addition, the regression weight of CSAT <-- SR is only 0.167, thereby implying that customers, in a B2B IT context, always look for "first time right" rather than the effectiveness of service recovery when compared to other variables

Table 2. Cut-off criteria for select indices to determine model fit in SEM.

Purpose	Measure	Description	Acceptable values
Absolute fit	Chi Square/df	The chi square tests if the covariance matrix for both the sample and the population is the same.	1 to 3
	Standardized root mean square residual (SRMR)	This is the standardized square root of the difference between the sample covariance matrix and the implied model covariance matrix.	<0.08 - Excellent 0.08 to 0.10 - Good
	Root means square error of approximation (RMSEA)	This is the amount of error while using the proposed model to predict the sample. It also adjusts for model complexity as compared to SRMR.	<0.06 – Excellent 0.06 to 0.08 – Good
Incremental fit	Comparative fit index (CFI)	This compares the proposed model (default model) with the baseline null model and says whether the proposed model is better or not.	>0.95 – Excellent 0.9 to 0.95 - Good

Source: Hu and Bentler 1999; Kline 2016

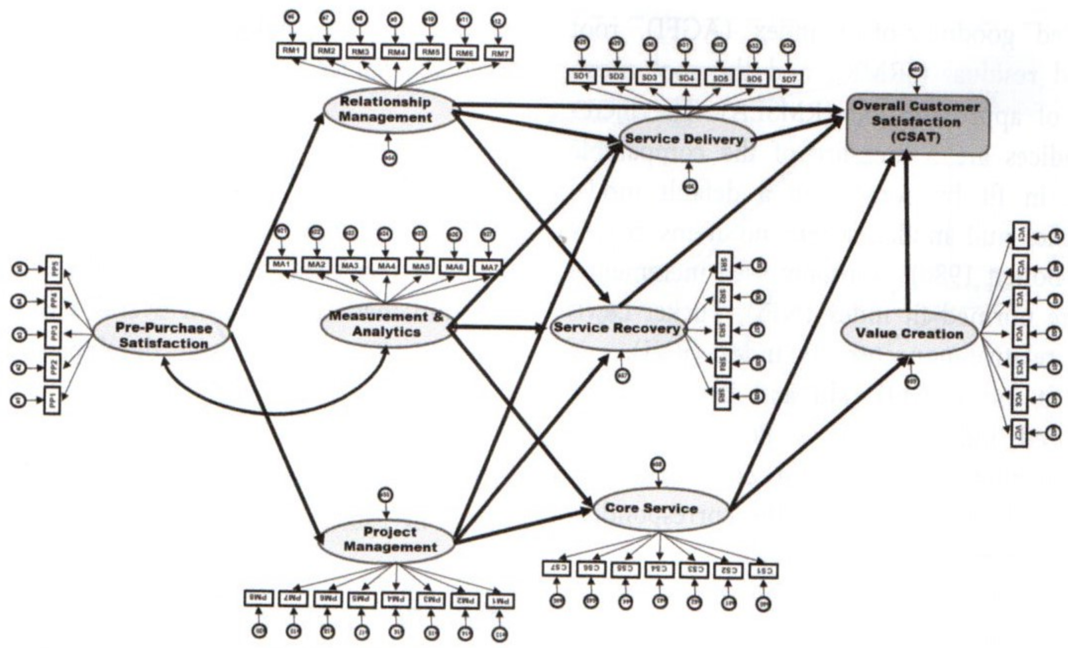

Figure 4. A graphical display of an SEM model showing the relationships among the various determinants of customer satisfaction.

Table 3. Results of SEM - model fit indices.

Purpose	Measure	Value	Criteria
Absolute fit	Chi square/df	1.527	1 to 3
	Standardized root mean square residual (SRMR)	0.095	<0.08 - Excellent 0.08 to 0.10 - Good
	Root means square error of approximation (RMSEA)	0.042	<0.06 – Excellent 0.06 to 0.08 – Good
Incremental fit	Comparative fit index (CFI)	0.952	>0.95 – Excellent 0.9 to 0.95 - Good

Table 4. Regression weights and p-values for the various paths.

Path	Regression weight	p-value
PM <—PP	0.614	<0.001
RM <—PP	0.791	<0.001
CS <—PM	0.779	<0.001
CS <—MA	0.674	<0.001
SD <—RM	1.135	<0.001
SR <—RM	1.399	<0.001
SD <—PM	0.775	<0.001
SR <—PM	0.624	<0.001
VC <—CS	1.156	<0.001
SD <—MA	0.697	<0.001
SR <—MA	0.824	<0.001
CSAT <—RM	0.333	<0.001
CSAT <—SD	0.431	<0.001
CSAT <—SR	0.167	<0.001
CSAT <—CS	0.340	<0.001
CSAT <—VC	0.116	<0.068

such as relationship management, service delivery, and core service.

The square multiple correlations (R^2) for each of the endogenous variables (a variable that is caused by one or more variables) is tabulated in Table 5. As can be inferred from Table 5, the R^2 value for the overall customer satisfaction (CSAT) is at 0.80, implying that 80 percent of variation in CSAT is explained by the determinants of customer satisfaction. A value of 80 percent is considered as substantial in SEM. Except for project management (PM), the R^2 values for the other endogenous variables are quite good. The low R^2 for PM can be attributed to the fact that being a projectized organization, the software industry needs to practice project management from the start of the software life cycle and, therefore, except pre-purchase, other variables do not contribute to the variation in PM.

The adequacy of the model fit and the high R^2 values for the endogenous variables in the model, especially for CSAT, imply that the proposed theoretical model is proven to be sufficient to explain the relationships among the determinants of customer satisfaction and how they contribute to overall customer satisfaction (CSAT) in a B2B IT setup.

Customers' perceptions of satisfaction happen very early in the interaction between the service provider and the customer. Even before a contract is finalized, there are various instances of engagement between the different stakeholders in the customer organization and the supplier. In fact, in an IT scenario, this sets the stage for expectations, as only during the presales

Table 5. R^2 values of the endogenous variables.

Endogenous variable	Influencing variables	R^2
Relationship management (RM)	Prepurchase satisfaction (PP)	0.503
Project management (PM)	Prepurchase satisfaction (PP)	0.254
Service delivery (SD)	Relationship management (RM) Measurement and analytics (MA) Project management (PM)	0.799
Service recovery (SR)	Relationship management (RM) Measurement and analytics (MA) Project management (PM)	0.742
Core service (CS)	Measurement and analytics (MA) Project management (PM)	0.506
Value creation (VC)	Core service (CS)	0.754
Overall customer satisfaction (CSAT)	Relationship management (RM) Service delivery (SD) Service recovery (SR) Core service (CS) Value creation (VC)	0.800

Table 6. Indirect effects of various dimensions on overall CSAT.

Path	Indirect effect	Lower	Upper	p-value
PP-CF-CSAT	0.264	0.11	0.437	0.006
MA-SD-CSAT	0.3	0.218	0.404	0.001
MA-SR-CSAT	0.137	0.073	0.21	0.001
MA-CS-CSAT	0.229	0.123	0.344	0.002
CF-SD-CSAT	0.489	0.367	0.637	0.001
CF-SR-CSAT	0.233	0.125	0.347	0.001
PM-SD-CSAT	0.334	0.24	0.458	0.001
PM-SR-CSAT	0.104	0.052	0.172	0.001
PM-CS-CSAT	0.265	0.135	0.401	0.003

and negotiations can the supplier showcase their ability to meet or exceed the expectations of customers. Therefore, it is extremely important to note that even during prepurchase, a lot of effort must go into addressing the ever-changing requirements of the customers; otherwise, the gap in expectations would continue to influence the satisfaction levels during subsequent stages of the software development and delivery.

As soon as an engagement/relationship is live and active, various stakeholders from both the supplier and customer organizations are involved in different capacities and throughout the design, development, and delivery of the software projects. The key is to understand and manage relationships. Also, when a relationship (wherein high customer focus is warranted) is established, the structure in which the relationship is made operational is through a projectized alignment. With the increasing insistence on quantitative management and the stipulation of most software customers on metrics-based tracking of project/program performance, measuring and managing metrics becomes a vital cog in the flawless execution of a software project.

In other words, the three dimensions, that is, relationship management, measurement and analytics, and project management, act as influencing variables that determine the effective execution of other dimensions such as service delivery and service recovery. Also, core service is influenced by measurement and analytics and project management, as the IT industry fundamentally operates in a projectized structure and hence both project management and measurement and analytics play a significant role in delivering the features of the software product. Detection of issues in the early stages of the software project life cycle can be accomplished if project management activities are effectively managed and the metrics related to software development are monitored, controlled, and managed using data-driven approaches. Needless to say, measurement and analytics and project management influence core service. A defect-free software with all the functionalities is expected to add value to the customer; hence, core service influences value creation. Aside from core service and value creation, relationship dimensions such as relationship management and delivery aspects such service delivery and service recovery contribute to overall customer satisfaction.

Mediation – indirect effects

While the aforementioned results provide clear indications on the significance of the impact of different dimensions on customer satisfaction, it must be noted that these dimensions, apart from contributing to overall CSAT independently, also operate indirectly in influencing customer satisfaction. To test such mediating (indirect) effects, SEM analysis was also parallelly run for indirect effects of the dimensions on CSAT, with a user-defined estimand in Amos v26. The result of such analysis is tabulated in Table 6.

It can be seen from Table 6 that all the indirect effects are statistically significant at a significance level of 0.05. This can be attributed to the fact that in a B2B IT scenario, these dimensions need to operate in unison. Success or failure in effective implementation of the individual dimensions has a cascading effect, and apart from their direct influence on CSAT, they also contribute indirectly through other dimensions. Such a confirmation accentuates the need to have a holistic approach in managing the various dimensions that contribute to CSAT.

Common method variance (CMV) – issues and resolution

Malhotra, Kim, and Patil (2006) state that "surveys are the most common method of data collection in diverse domains including social sciences, psychology (Feldman and Lynch 1988), organizational research (Crampton and Wagner 1994), marketing (Malhotra 2004), information systems (IS) (Hufnagel and Conca 1994), etc." In such cross-sectional studies wherein the same method is used to ask respondents to rate all the items in a single survey instrument at the same point of time, a bias called a common method variance (CMV) may creep into the collected data (Lindell and Whitney 2001).

CMV refers to the "spurious variance that is attributable to the measurement method rather than to the constructs the measures are assumed to represent" (Podsakoff et al. 2003). Richardson et al. (2009) describe CMV as the "systematic error variance shared among variables that are measured with the same method and/or source." There is a lot of agreement among researchers that measurement error is contributed using common methods to collect data. Measurement error comprises a random component and a systematic component (Bagozzi and Yi 1991; Nunnally 1978). The challenge among researchers is to primarily focus on the systematic component, because it is a depiction of an alternative explanation of relationships among the variables that are different from the relationships hypothesized in the model specified by the researcher (Podsakoff et al. 2003; Podsakoff, MacKenzie, and Podsakoff 2012).

There are ex-ante and ex-post approaches to address CMV. The ex-ante category, which is used in the research design stage, includes approaches such as collecting information for various variables from various sources, randomizing the items in the instrument, and using different scale types. Per contra, the ex-post approaches that are used after the research has been conducted include approaches such as "complex specification of the hypothesized model to eliminate the bias that may otherwise" (that would make it difficult for the respondents to visualize the interaction and nonlinear effects) and "statistical methods of detecting and controlling CMV, and so on" (Chang, van Witteloostuijn, and Eden 2010).

Though, CMV is widely regarded as present in any single method study, there are multiple views on the detrimental effect of such method variances in explaining the exact relationships among the variables (Malhotra, Kim, and Patil 2006). There are also many statistical approaches, such as Harman's single factor test using exploratory factor analysis (EFA) or confirmatory factor analysis (CFA), common latent factor method, marker variable techniques, CFA marker technique, and so on, which are commonly used by researchers to address CMV (Malhotra, Kim, and Patil 2006; Podsakoff et al. 2003, Podsakoff, MacKenzie, and Podsakoff 2012).

On the other hand, ex-ante approaches that were used to address CMV include having different respondents for different aspects of the survey instrument, listing the questions in a random order, using different scales for measuring different items, and so on. It should be noted that a combination of ex-ante and ex-post approaches are mandatory to address the issues due to CMV.

As discussed previously, the design ensured that the responses for the various determinants were solicited from different role players in the customer organization. Questions in the survey were also randomized to minimize any bias that may arise during administration. Respondents were also told that the responses would be kept strictly confidential to elicit honest responses. In addition, the SEM model is quite complex with many mediating effects; hence, the likelihood of CMV affecting the direct and indirect relationships among variables is much less (see Archimi et al. 2018). These methods guaranteed that CMV is eradicated/minimalized at the research design stage. Also, statistical methods were used to check whether CMV is insignificant. The Harman's one-factor EFA was carried out without rotation (using SPSS) that yielded an explained variance of 32.9 percent, which is much less than the threshold of 50 percent. In addition, CFA was run using a single factor using Amos, which resulted in a very poor model fit (chi square/df = 7.288; CFI = 0.427; RMSEA = 0.144; SRMR =0.193). A common latent factor (CLF) test was also carried out, and the chi square difference test indicated that there is no statistically significant difference between the model with CLF and the model without CLF ($p = 0.126$). These results suggest that the presence of CMV is insignificant and whatever relationships that would be observed using SEM are purely because of the inherent relationships among the dimensions.

Implications for further research

As the software industry is predominantly driven by the metrics mindset, and with the focus given by quality models and methodologies such as CMMI and ISO on quantitative management and use of prediction models, there is a need from a software organization perspective to investigate the relationships among several internal project/organization-level metrics and the various dimensions of customer satisfaction.

Therefore, some of the possible approaches that can be explored are listed below

- Software organizations typically spend a lot of effort, time, and money in the maximum conversion of leads and opportunities into deals. Consequently, they track various metrics during the presales stage, such as "probability of winning," "probability of successful execution," or "release verification rating." These measures could be correlated with the satisfaction level given by the customer on "prepurchase," so they would provide valuable insights on the effectiveness of the proposal and contracting processes.
- The effect of project metrics such as effort and schedule variance, requirements stability, productivity, and cost of quality on project management satisfaction could be explored to improve the effectiveness of project management.
- The influence of product metrics such as defect density, residual defect density, and reliability on core service satisfaction would help in reinventing practices and methodologies that aid in developing error-free software.
- Measures such as percent of SLA commitment, problem turnaround time, problem closing effort, issue age, and NC closure rate could be correlated with satisfaction levels with respect to service recovery to assess the effectiveness of issue handling and closing.
- With development and implementation of prediction models to predict issues, defects are prerequisites as part of certifications such as CMMI. The reliability of such prediction models and the use of other scorecards, dashboards, and portals could be evaluated based on the feedback from customers on the measurement and analytics dimension.

All these analyses would provide valuable insights on the efficacy of the various metrics. Most organizations have a metrics system in place wherein a plethora of base and derived metrics are collected and analyzed. However, the overabundance of such metrics has complicated the measurement approach, as practitioners often express difficulties with measurement because they feel overwhelmed with data as they get quantitative feedback on a variety of attributes; hence, it is hazy as to which attributes should be dealt with to enhance quality or business performance (Sureshchandar and Leisten 2006). From a management perspective, ascertaining the criticality of these metrics with respect to customer satisfaction is vital for understanding the factors contributing to customer satisfaction. Such analyses also help in providing crucial inputs on the project-, process-, and resource-related requirements that are fundamental for customer satisfaction in the ever-changing software environment.

Summary

The body of literature in B2B marketing has grown exponentially in the last few decades as evidenced by the multitude of journals, books, and industry-specific magazines that have mushroomed in this period. This can be attributed to the fact that B2B marketing as a discipline has spectacularly borrowed concepts and ideas from the behavioral and quantitative sciences, thereby broadening its horizons from traditional industrial product marketing to marketing of business services (Sheth and Sharma 2006). As the research domain of B2B marketing expands, it is imperative that the discipline aspires to address the emerging requirements of effectively managing customer satisfaction in other B2B industries such as IT.

The current study highlights the complexity of factors of customer satisfaction in B2B IT transactions and identifies the critical determinants of customer satisfaction in the software industry. It also proposes a measurement instrument and a measurement approach that forms the basis for further analyses of the relationships among the determinants of customer satisfaction. The results of the research work provide ample proof on the adequacy of the model and the nature of relationships among the various constructs in the model, which in turn helps in the better understanding of the factors contributing to improved customer satisfaction. Approaches for linking several