

Impact of Strategic Sourcing on Customer Satisfaction: An Empirical study

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ABSTRACT : *This paper presents the findings of empirical research to identify the factors which may impact customer satisfaction under the specific choice of sourcing strategy (Single or Multiple sourcing). The study uses a survey instrument to analyze these factors and identify factors that have significant impact on customer satisfaction. The survey focuses on perspective of both sides (customer and vendor) and tries to identify the gaps in the perspective also identifies the factors which provide the significant impact on customer satisfaction. Primary participants are Software development team members (service providers either through single sourcing or multiple sourcing) and the service beneficiary (Customer). ANOVA and Factor analysis, both the techniques are used to understand the significance of the impacting factors and linearity respectively.*

KEYWORDS - *Strategic sourcing; Analysis of Variance (ANOVA); Factor Analysis; IT Outsourcing, Customer Satisfaction*

I. INTRODUCTION

In today's scenario business is driven by customer. Customer requires innovative product or services at competitive cost and delivery on time. Customer satisfaction, quality and retention are global issues that affect all organizations, be it large or small, profit or non-profit, global or local. Most of the companies do analysis, strategies implementation that aim at improving customer retention and maximizing share of customers which in view is beneficial for the financial performance of the firm. Organizations are trying to achieve this by measuring customer satisfaction which is considered to be pre-requisite for customer retention and loyalty, leading to profitability, market share, positive word of mouth and organizations [1].

In present scenario customer demands are having no control on variety and demand for better innovative product or service. Service provider to be in the business, they have to provide such services or product to the customer either by self or involving partners in the business for survival and growth. For example- Nokia's phone business decline [Roger Chang, 2014] [2].

In order to achieve customer demand in a vast scale of multidimensional variety, organization decide to outsource its process such that benefits like increased cost savings, value for money, better service levels, access to best practices, better skill resource is utilized and greater innovation [1]. However from an organization point of view challenge arises in selection of right strategy to outsource is a bit complex issue. Even deploying strategies, achieving through multisourcing, engaging more vendors in order to fulfill customer requirement, increasing the pace of providing the innovative services or products to the customer at appropriate time also predicting the future requirement of the customer. There are so many papers on customer satisfaction, customer retention, buyer supplier relationship also publish about customer switching cost. In the literature review section we able to deduce the gaps and provided an approach on which we narrated briefly and in later sections of this paper, narrated full, hence with the help of this paper we are able to reduce the gap.

In customer point of view, customer need product or service what were be the strategy of the organization to achieve customer requirement. However for organization they need to put an engineering approach to understand customer requirements from different service or product quality dimensions collectively. So that they can align their process and their (vendor(s)/partners process such that their processes dimension should map with the dimensions of customer requirements. So our approach here is to cover maximum aspects under dimensions of service quality, customer satisfaction, strategic sourcing. Hence we designed an approach where we say Voice of Process (VoP), which covers the dimensions of service quality, customer satisfaction and strategic sourcing and under each dimensions there will be maximum coverage of aspects to measure the importance of each dimensions. Similar approach is used to measure Voice of Customer (VoC). We measure the gap between VoP and VoC when organization follows sourcing strategy (single/soul sourcing/multiple sourcing) to execute the service or production. In our case we selected IT industry specifically the Infrastructure management area (Help desk support (First level), Enhancement or major bug fix support (second level),

facilities set up (data center and server management) etc), where project execution is done by organization itself who has won the bid and with help of partners (vendor(s)) either engaged by organization or partner directed by client (who also won the bid) got some portion of work. In this case we design a survey questionnaire which include above to fulfill our objective. Brief description of the survey questionnaire to give an idea about its design, what are the aspects covers under the dimensions of above mentioned. 5 point likert scale is used to measure the perception of the respondent on each aspects cover under dimensions. In the questionnaire we have also tried to indentify in the project what type sourcing strategy is used (single or soul sourcing/multiple sourcing) is used. For example: Quality and Cost effectiveness. Under this dimension with respect to process the aspects were covered are aspects are zero defect delivery, zero rework, CoQ reduction, reduction prevention cost or effort, reduction of appraisal Cost or effort, reduction failure cost or effort, standardization of processes, usage of automations techniques, reduction of inprocess defects, monitoring of defect injection rate throughout the life cycle, UAT defect resolutions, Defect prevention activities, disaster recovey, monitoring frequent negotiations on cost after estimation and quoting to customer, correct estimation, feasibility of providing discounts to customer, six sigma methodology usage during project execution, zero downtime, first call resolution, eradicate repetition of bugs, negotiation with customer regarding the resource increase hence cost, zero waiting for customer, cost competitiveness/cost saving in multiple sourcing, Quality check in the incoming of the product (when buying hardware for example: in setting up data center for client). Question asked to the Project team members (measuring VoP) for this dimension

- Do your project have more than one vendor/partner (Rate: 1-“Yes”, 2-“No”)
- How do you rate the achievement of passing on defect free services to the customer (Rate: 1 to 5)
- How do you rate that there is no rework after the deliverables pass on to the customer (Rate: 1 to 5)
- Cost of Quality is decreasing (Rate: 1 to 5)
- If CoQ is decreasing then prevention cost is also decreasing (Rate: 1 to 5)
- If CoQ is decreasing then Appraisal cost is also decreasing (Rate: 1 to 5)
- If CoQ is decreasing then failure cost is also decreasing (Rate: 1 to 5)
- If prevention cost is decreasing then the training cost is also decreasing (Rate: 1 to 5)
- If prevention cost is decreasing then the usage of automation techniques is increased execution of project (build and Testing stage) (Rate: 1 to 5)
- Is DIR in each phase is monitored if the project follows full life cycle (Rate: 1 to 5)
- Is DIR in each phase have goals for monitoring (Rate: 1 to 5)
- Is internally quality goals were set up and monitored throughout the life cycle of the project (Rate: 1 to 5)
- Is there is any value addition in respect to cost/ business value is transferred to the customer along with the project deliverables (Rate: 1 to 5)
- Is the client retention/more business/renewal of the same business is monitored through the business value transferred to the customer (Rate: 1 to 5)
- Is usage of tools and re-usable component in order to decrease the effort and increase the precision in project aggressively (Rate: 1 to 5)
- How do you rate the competitiveness of the price quoted to customer (Rate: 1 to 5)
- If any CR's raised by the customer during the execution of project, how the cost of that CR's is adjusted in existing cost if customer request (Rate: 1 to 5)
- If any requirement is missed or any bugs still need to be checked and fixed, oftenly negotiate time with customer and hence the cost (Rate: 1 to 5)
- If customer ask for any discounts, oftenly discounts are provided (Rate: 1 to 5)
- Margins were adjusted by changing the role ratio hence without negotiating the cost with customer (Rate: 1 to 5)
- Do you provide the customer a competitive pricing or will find a small chance of opportunism hence have room for negotiate with price (Rate: 1 to 5)
- Do you analyze the feasibility of the scope and then provide a appropriate solution which will create a reliability factor at a competitive price and within customer demanded time (Rate: 1 to 5)
- If customer adds new requirement which may be a CR, how much you agree that you have the capacity to deliver within stipulated time apart from existing delivery (Rate: 1 to 5)
- Is there is any six sigma methodolgy used during the execution of projects such that more savings or reduction of defect happens which decreases effort (Rate: 1 to 5)
- Do you have disaster recovery plan and execution strategy (Rate: 1 to 5)
- Do you perform mock execution for disaster recovery (Rate: 1 to 5)
- Do you perform a maintenance plan and work for the equipment use for disaster recovery (Rate: 1 to 5)

- Do you monitor bugs its type if reported by the customer or testing team or coming from any sources in the process (Rate: 1 to 5)
- Do you per perform classification analysis for the bugs or problems or incident reported (Rate: 1 to 5)
- Do you design and implement prevention plan to eradicate the repetition of bugs (Rate: 1 to 5)
- Is there is any significant difference between the cost savings when project delivered under single/soul sourcing and multiple sourcing (Rate: 1 to 5)
- Is the cost savings in the project execution under multiple sourcing is on the higher side (Rate: 1 to 5)
- Is your cycle time for first response call to the customer is significantly lower side (Rate: 1 to 5)
- Do you perform thorough quality checks, quality audits in the vendor(s) premises regarding the process adherence (Rate: 1 to 5)
- Do you perform thorough quality checks when the components (IT hardware's for data centers) were coming to your premises from the vendor(s) (Rate: 1 to 5)
- Is the rejection of incoming components (IT hardware's for data centers) is on the higher side (Rate: 1 to 5)
- IT outages are very less frequent and planned (Rate: 1 to 5)
- Client dedicated centers, servers, hardware's are always uptime (Rate: 1 to 5)
- Dedicated team and planned maintenance activities are set up to prevent any unplanned outages (Rate: 1 to 5)

The similar type of questionnaire for customer which is not as exhaustive, but significant enough to capture the customer side essence regarding Quality and Cost effectiveness

- How do you rate the quality of the services/product provided by the delivery team (Rate 1 to 5)
- How do you rate for the number of defect not identified in UAT (Rate 1 to 5)
- How do you rate the communication of the team regarding clarification of requirement in one shot (Rate 1 to 5)
- How do you rate regarding the negotiation of days in delivery for project deliverables (Rate 1 to 5)
- How do you rate regarding providing the solution to the CR's raised at a sudden (Rate 1 to 5)
- How do you rate the negotiation in the price if any CR's raised during the execution of the projects (Rate 1 to 5)
- How do you rate the business value transferred through the project delivery team (Rate 1 to 5)
- How do you find the bid or price charged is competitive to the market (Rate 1 to 5)
- How do you find the governance on project during execution (Rate 1 to 5)
- How do you rate the support from project team regarding the resolution of problem raised either planned, sudden, if disaster happened and their strategy to resolve in less time (Rate 1 to 5)
- How do you find the client data centers maintained by the organization (Rate 1 to 5)
- How do you find the follow of processes regarding the execution of project, security, access (Rate 1 to 5)
- How do you rate the response and resolution time of the project team (Rate 1 to 5)
- How do you rate the techniques used to save effort and reduce latent defect in your project when delivered (Rate 1 to 5)
- How do you find the response and treatment given by the project team on call, project representative or organization representative on visit of your representative, strategy for handing the project and provide the solutions in less time (Rate 1 to 5)
- Do you find the solutions provided by the project team or services provided by the organization is cost effective (Rate 1 to 5)
- Do you like to continue the partnership with us in future (Rate 1 to 5)

Similar fashion further questions in the questionnaire were designed and presented to both the respondents (Project Team (Organization) and Customer (VMO representative)). Details of the dimensions and associated aspects for both VoP and VoC mentioned in the subsequent section.

Using the technique of ANOVA and factor analysis, we measured the significancy of the dimensions for measuring satisfaction score for both VoP and VoC and also used factor analysis to reduce the dimension to understand the linearity of the different dimensions of VoP in line with VoC. Since this study is to see the impact of dimensions (its associated aspects) regarding service quality, customer satisfaction and sourcing strategy while designing and execution of projects or providing service on Customer satisfaction, demands, future alignments and switching instinct.

VoP may be defined as the collection of supply chain parameters, service quality parameters/dimensions and other parameters as per the business and process need to measure the maturity of the process in terms of satisfaction score. Voice of customer may defined as the collection of supply chain, service quality and other parameters/dimensions (operations, retention, future partnership, switch cost) as per the supplier buyer relationship in terms of satisfaction score.

II. LITERATURE REVIEW

There are several literatures available with respect service quality, customer satisfaction, sourcing strategy, supplier-buyer relationship. However our selective literature review will talk about the research work related inter-relational impact on customer satisfaction due to service quality, strategic sourcing (single/soul and multiple). We have tried to highlight the gaps, where other researchers have either prompted for future research on similar or extended topics, identified limitations and provided suggestions during research. The Literature review is divided into three section: Section A: Brief Description on Customer satisfaction, Section B: Brief description on Service Quality, Section C: Brief description on Strategic Sourcing

Section A: Customer satisfaction

Customer satisfaction is actually an abstract dimension, which varies from person to person and is manifested differently depending on the type of service. Customer satisfaction would eventually contribute to marketers' success in terms of profitability and market share [4]. The level of customer satisfaction depends on the customers perception and expectations hence the level of satisfaction is believed to be extremely subjective. Therefore, when surveying customer satisfaction, it is important to bear in mind that it cannot be measured by a direct inquiry, because satisfaction is complex and at the same time hidden variable, given that it is about a subjective evaluation of customers [5]. In order to obtain information on customer's response and satisfaction with the company's/organization services, appropriate surveys should be conducted along with the quantification of their results. Surveys of customer satisfaction are carried out with the goal to gain better insight in customer's expectations and experiences when using the services of a given company [6].

Customer satisfaction is one of the key elements in total quality management (TQM), an approach that emphasis overall satisfaction through the continuous improvement of products. For example: In construction business, construction companies are adopting TQM to improve their performance. However companies are lagged behind in implementing TQM because of its inability to accurately determine customer requirements and successfully transform these requirement into complete facility [7]. Relationship between quality and customer satisfaction can be explored suggest by Gronroos [8]. He suggested technical quality of the service process that is another way to measure satisfaction. The customer is also influenced by "how" factor i.e. how customer receives the service and how he experiences the simultaneous production and consumption process. Services have the nature of both quality dimensions (technical and functional). For example, if a defect in the construction process is settled with satisfactory results for the customer, the outcome is process has good technical quality but if defect handling process has been complicated and time consuming, functional quality and overall perceived quality will be lower [9].

There is an another study happened for retail banking industry where researcher have tried to study the linkages among Customer satisfaction, employee satisfaction and business performance by evaluating efficiency of the bank branch network. The study discusses about positive employee perceptions of their workplace lead to strong commitment, higher efficiency and hence productivity growth [10]. The linkage between employee and customer satisfaction is justified by several realworld studies [11], where positive employee experiences in the workplace often establish positive customer experiences. For example, Pugh [12] proved that positive attitudes by bank employees increase customer evaluations of service quality. In general, the service-profit chain theory describes a process in which growth and profitability stem from customer loyalty, which is a direct result of customer satisfaction. Customer satisfaction is in turn largely influenced by the value of services provided, which is created by satisfied, loyal and productive employees. On the other hand, employee satisfaction is stimulated by high internal quality and employee motivation that enables them to provide high quality services. The principle of the service profit chain approach lies in that customer satisfaction acts as a mediator between employee experiences and financial performance of a business unit [13]. To study the cause and effect relationship, survey was conducted. The parameter were considered such as number of employees, Operational cost, employee evaluation report, customer expectation in 5 point likert scale, Deposits, Customer satisfaction under criteria such as service processes, behavioral aspect of employees, tangible of service, accessibility to bank branches; Loans, New accounts, Customer loyalty. Multistage data envelopment technique was used to analyze. Overall finding suggest that overall efficiency is achieved only if the branch is efficient in every level of its service delivery process. This study also justifies the importance of internal and external service quality assessment and incorporation of quality measures in the performance evaluation of business organizations [14].

Section B: Service Quality

Providing high-quality services can enhance customer retention rates, attract new customers through word-of-mouth, increase productivity, lead to higher market share, reduce operating costs and staff turnover, and improve financial performance, profitability, and morale among employees [15] [16].

Although issues related to SQ have attracted increasing attention in management and academia, much of this focus has been on developed countries [17], despite the rapid growth of services in emerging countries [19]. Service qualities may have been overlooked because of the sellers' market conditions that prevail in these emerging economies [18].

The SERVQUAL instrument, developed by Parasuraman [20], relates to the customer's perceived measurement of service quality, where perceived service quality is defined as the degree and direction of the discrepancy between a customer's perceptions and their expectations [20]. The measurement methodology involves determining the customer's expectations of a particular service and then measuring the same customer's perceptions of the service he or she received on the same framework.

The SERVQUAL model is based on measures of the Performance–Expectation (P–E) gap across the following 10 dimensions: access, competence, communication, credibility, courtesy, responsiveness, reliability, tangibles, security, and understanding the customer. PZB consolidated these dimensions into the five following dimensions of service:

- Tangibles: How physical facilities, equipment, personnel, and communication materials appear
- Reliability: The extent to which the promised service can be performed accurately and reliably
- Responsiveness: Willingness to provide a prompt and helpful service to customers
- Assurance: Employees' knowledge, courtesy and ability to convey trust and confidence
- Empathy: A company's caring, individualized attention to its customers

The standard instrument developed to measure what is known as "gap 5" (that is, the difference between the perceived SQ and the SQ expected by the customer) is based on the five dimensions outlined above and is comprised 22 statements. The instrument starts by measuring the respondent's SQ expectation and then his or her perception of the actual SQ. The difference is used as gap 5.

Illustrations related to Service quality:

In Retail Banking

Literature review by Albarq [21] identified that few studies have applied the SERVQUAL model to customer loyalty in developing countries. If managers in the banking industry can understand the impact that the SQ underlying the SERVQUAL model has on customer loyalty, they may be able to focus their efforts on the areas that make the greatest contribution to customer retention.

The insights offered by the present study will help understand the impact of various factors related to e-commerce customer satisfaction in the context of Saudi Arabia. The lack of data about SQ and customer satisfaction in the banking industries of developing countries, most of the SQ-measuring models were created in developed countries [22]. Albarq [23] argued that the outcomes of these studies have also been influenced by culture and questioned the validity of applying findings from developed countries to less-developed ones.

This study has shown that the SERVQUAL model is still the most effective model with which to measure customer satisfaction in retail banking. Generally speaking, the study of service quality is both important and challenging. Future efforts should continue to advance the understanding of the concept and the means to measure and improve service quality [24]

In Software industry

Information Technology (IT) suppliers who can provide services to efficiently and quickly handle demands according to their business needs, respecting the varying volumes and priority of these demands [25]. However, from the point of view of the supplier, restructuring the software development process to meet such customer expectations is not always an easy task, in particular, if it is not clear whether the supplier software organization process is sufficiently mature to drive towards a service delivery format [26].

Although many sectors (like Automobile, Aviation, Construction etc.) have really implemented and institutionalized robust quality processes, but adoption of quality processes within software engineering domain is still a challenge [27]. Software development Projects are very intricate and risky endeavours requiring careful integration of various disciplines, technical activities, project management etc. Managing quality of deliverables from a software project has been an area of concern for quite some-time, but it is, gaining much more interest in recent times due to the various factors economic, social and fierce competition among software vendors [28]. An unprecedented emphasis is being associated these days to the production of high quality software products [29]. Nasib S. Gill described how insecurely tested software system lowers down the system reliability that afterward negatively affects 'Software Quality'.

In [30] M. Agrawal.Et.al elaborated their work pertaining to understand the implication of process maturity on the goals of developing high-quality software on-time and within budget by specifically focusing only CMM Level 5 projects from industry, spanning multiple organizations and projects. The goal was to study the impacts of highly mature processes on effort, quality, and cycle time. Linear regression model based on the data collected from 37 CMM level 5 projects of four organizations. They found that high levels of process maturity, as indicated by CMM level 5 rating, reduce the effects of most factors that were previously believed to impact software development effort, quality, and cycle time. The only factor that they found to be significant was software size. On the average, the developed models predicted effort and cycle time around 12 percent and defects to about 49 percent of the actual, across organizations. Overall, the results of their study indicates that some of the biggest rewards from high levels of Process maturity come from the reduction in variance of software development outcomes that were caused by factors other than software size.

In [31], Wei Li has investigated the problem for component-based software systems from three points of view.

First, the whole umbrella of QoS (Quality of Service) characteristics is defined. Second, the logical and physical requirements for QoS characteristics are analyzed and solutions to achieve are proposed. Third, prior work is classified by QoS characteristics and then realized by abstract reconfiguration strategies. Subsequently, a quantitative evaluation of the QoS assurance abilities is carried out and the results are discussed. The paper concluded that classified QoS characteristics are achievable within the acceptable limits under practical constraints.

In [32] Manar Abu Talib.Et.al provided an overview of quantitative analysis techniques for software quality and their applicability during the software development life cycle (SDLC). The details included the Seven Basic Tools of Quality, Statistical Process Control, and Six Sigma, with special focus on how these techniques can be used for managing and controlling the quality of software during specification, design, implementation, testing, and maintenance. The paper also tried a verification of whether or not these techniques, which are generally accepted for most projects, most of the time, and have value that is recognized by the peer community, have indeed been included in the Guide to Software Engineering Body of Knowledge.

An important conclusion drawn from this study is that understanding of the cost of quality of software products, produced by SDCL-projects is extremely important in establishing a organizational quality management strategy. To arrive at the cost of quality of software products, the key considerations are: We should focus at the cost of quality over the *entire lifecycle of the software release management* – rather than just the *development life cycle*. (i.e. considering overall software development and maintenance cost – not just the development cost alone). Once the organizational data bank of projects is established, we can compare the cost of quality with industry benchmarks and norms and plan for further improvements. No point is measuring against industry benchmarks – if organizational data bank is not in place. Identify the hidden costs related to poor quality on previous projects and document the lessons learnt. Make these documented lessons learnt - visible to all future projects. Final quality model chosen for projects should be based economic trade-offs involved with software quality.

Lessons learnt from this study are articulated offer valuable prescriptive guidance for SMBs who can benefit from this study and apply the lessons learnt for quality improvement programs using CoQ-metric, to improve the capability and maturity of their SDLC-project performance, with cost effective quality of deliverables from SDLC-projects.

This research is a step towards further understanding of the cost of quality components in software development projects. This research has focused on possibility of using CoQ as a metric to measure the effective software quality assurance of SDLC-projects, taking the ideas from manufacturing applications.

Planned extensions of the work from this study could be: (i) Industry oriented Research, Case-study Analysis (from real world projects data), Understanding and Publishing of why many CoQ programs initiated with good intent have failed, got terminated prematurely or did not deliver expected results despite investments in CoQ programs by the industry. (ii) Addressing concerns like quality costs do not readily appear in accounting journals. (iii) Taking-up studies to address industry concerns on CoQ-programs that prevention and appraisal costs have to be stepped-up and sustained for quite a long-time, before any meaningful drop in overall CoQ could be visible on the ground (i.e. empirical research and benchmarking of cycle time between investments in CoQ programs and benefits realization).

Ganguli and Roy [33] determined the dimensions used to judge quality in call center as adaptiveness, assurance, offering of explanations, empathy, authority, educating customers and personalization. A few paper address information asymmetry cases like moral hazard (one side or the other may deliberately shrink or degrade quality to reduce cost) and adverse selection (quality may be an innate characteristic or the level of quality of one vendor may be unknown to the other vendor) [34]. Zheng [35] investigated a firm that maximizes its market share by manipulating the delivery time commitment and delivery quality. Volume allocation is one of the parameter in multisourcing scenario to effectively manage service quality. Differential volume allocation is the strategy used to motivate the suppliers to increase the level of quality [36].

Section C: Strategic Sourcing

There has been focused review work on strategic sourcing. Focused 225 published research contributions over a period of 14 years (1997-2010) were assessed. Five major areas of research emerged based on the analysis of papers selected. These areas include strategic sourcing related issues, supplier selection, evaluation methods and decision tools, purchasing methods, buyer supplier relationships and e-procurement. Contribution from focus area Strategic sourcing issues, Supplier selection, evaluation methods and decision models, purchasing method Buyer-seller relationships are 36.4%, 12%, 21% and 9% respectively. Further classification such as Supply chain strategies, Supplier selection criteria, Decision support tools, Single vs Multiple sourcing, Supply base reduction, Supplier Switching and Structure supplier relationships are 7.6%, 8%, 4%, 3.6%,0.4%,0.9% and 7.1% respectively. Further classified into focus area and type of research was done [37]. Cross-sectional analysis is as follows:

Table 1: Cross-sectional Analysis of Focus area and Type of Research

Focus Area Type	Strategic Sourcing issues	Supplier selection evaluation methods and decisions tools	Purchasing Methods	Buyer supplier relationship	e-procurement	Total in %
Analytical	8.0%	7.1%	8.9%	0.9%	7.6%	32%
Best Practices	0.4%	0.9%	1.8%		2.2%	5%
Conceptual	9.3%	0.4%	3.6%	1.3%	2.7%	17%
Emperical	18.2%	2.2%	6.2%	6.2%	9.3%	42%
Review	0.9%	1.3%	0.4%			3%
Total in %	37%	12%	21%	8%	22%	

However further classification is done on the Strategic sourcing decision making tools. Cross section analysis is as follows:

Table 2: Cross-sectional analysis of Method and Tools for Analysis

Method	Tools for Analysis				Total in %
	Multi criteria Decision Model	Statistical Analysis	Others	AHP/Heuristics	
Case study	0.4%	0.9%	11.1%		19.4%
Model	7.1%	0.4%	12.0%	4.9%	38.2%
Survey and Interviews	0.9%	16.9%	2.2%		31.3%
Analytical Induction	0.4%	0.0%	6.7%		11.1%
Total in %	13.9%	28.5%	50.0%	7.6%	

(Source: Uma Kausik and B Mahadevan, [37])

The tools category analysis includes Markov decision process, simulation, game theory and queuing theory. However in the absence of % bifurcation of others, optimality is considered among the distribution such that 12.5% of contribution of each tools aggregates to represent 'Others'. Thorough the review analysis there is no-where the author has propagated the hybrid approach based on Transactional Cost Analysis using game theory mathematical models to strategic sourcing decisions. However the author suggested more hybrid approach is required to cater solution to strategic sourcing decision issues. Hence Khai Sheang Lee, et.al [38], can be revisited for strategic sourcing decision issues.

Switching cost and Complexity in market place can be relook by Buyer supplier relationship restructuring. It is evident in these cases incumbent supplier were engaged to reduce cost and maintained compromising the quality of product and services provided [39]. However, outsourcing has led to considerable benefits such as cost reduction but also increase attention towards product quality issues when outsourced. For example massive pet food recalls in both US and Canada in 2007 and product recall in China, 2008 (baby formula of Sanlu was found to contain mealmine, originated from contaminated milk supply outsourced to local farmers). A serious hazard of outsourcing is exposed. Hence a negative impact of product quality is observed when outsourced [40]. So outsourcing do reduces cost however quality is also compromised. Although the author later in his study that the gap in product quality can be filled through contract enforcement, however the specifically not mentioned about the governance and monitoring cost arises when multiple suppliers are involved, which is itself is the additional cost. Also is not clearly indicated that whether product quality as a parameter, with economies of scale and learning effect will help the buyer in strategic sourcing decision making.

In case of Sourcing in food supply chain is always is really complex. Consumers are demanding year round availability product in retail outlets. Author highlights the complexities such sourcing from different regions, shelf life of product (decay of quality of product should be less, long sustainability), minimising cost, providing fresh high quality product to the consumers with less waste requires effective sourcing strategy. Despite of optimization in fresh food supply chain, existing strategic sourcing strategy are ineffective. However decision makers have to achieve a trade-off between the logistics cost drivers and product quality cost [41]. Hence product quality is a differentiator in strategic sourcing decisions. Sourcing strategies may also leads to product quality recalls. Product recalls are due to serious quality failure and have significant negative impact on firm performance. Offshore outsourcing has a greater impact on product recalls. Author suggest outsourcing to the smaller supplier base may lead to fewer recalls. However if there is high level of outsourcing then higher is the recalls. It has been also found that there is negative curvilinear relationship between outsourcing and firm performance. Measure were used to developed the relationship are market share and financial performance [42]. However the author relationship between outsourcing and low quality performance. TCE (Transactional Cost Economics) concept, hypothesis are laid, analysed using negative binomial regression techniques. TCE suggests that uncertainty, bounded rationality and opportunistic behaviour creates transaction costs. The prime objective is to minimize such costs [43].

The product quality was always treated as the unobserved factor or uncorrelated with the included variables in the demand function. In many cases this assumption is incorrect, in result the conventional cost function estimated does not provide accurate representations of the structure of production. One of the reason product quality is included, since quality characteristics are the strategic variables which the firm can use to pursue profit maximization [44]. With multiplier supplier procurement strategy there is always a competition between the suppliers which curbs suppliers opportunism [44]. Buyer will have an opportunity to receive lower prices and shipping costs. Supplier will be responsible to maintain the necessary technology, expertise and forecasting abilities, cost , quality and delivery competencies [45]. However dealing with multiple suppliers is likely to require longer time in negotiation which in turn may delays or disturb production schedules [46].

Long term partnership is the strategy taken by many winning companies with suppliers to achieve the same benefits provided through the multiple sourcing strategy, in turn reducing the supplier base. Xerox reduces its supplier base from five thousand in 1981 to several hundred by 1985. Reducing with huge numbers helps them to form effective partnerships with those who are willing to produce high quality, low cost components [47].

Reducing the supplier list has become the priority for many firms; some have even considered single sourcing would be a choice. The concept of single sourcing has evolved with growing popularity of JIT (Just in time) concept [48]. There was a survey study which indicates the benefits of single sourcing. It includes higher quality at lower total cost to the buyer and higher supplier-buyer cooperation [49]. Other benefits such as monitoring cost will be less and more consistency of product can be achieved [50]. Greater reliability, increased machine throughput and reduced number of failures and repairs are further more benefits provided by the single source stated by the Engineers of Machine design [46].

In Multiple sourcing strategy, concept of splitting orders in a context of cost minimization or economics. Researchers have assessed the benefits of order splitting in economic context, total cost for ordering, purchasing prices and inventory holding and stock out penalties are minimized. In this case using numerical search technique researchers claim that dual sourcing is often better than single sourcing [50]. Analyst from Industry suggested firms to adopt multisourcing supplier strategy, pointing out advantages of major cost savings and operational and strategic risk reduction [51], [52]. Multi-sourcing supplier strategy allows firms to tap into unique resources of diverse supplier relationships and gaining complementary competitive advantages [53], [54].

The concept of few strategic partner may prevent the firm from discovering new business opportunities and new markets to deliver product or service. Such misses have the potential to lose large service offerings [55]. Organization should employ a relatively small number of suppliers (atleast two) which may reduces operational risk and increase completion [56]. Multi-sourcing suppliers' selection is particularly interesting when candidate suppliers provide similar services [52].

Some Researchers said when a market has been segmented, a marketer may choose to serve one or more of the segments. Thus, if the market was divided between those firms more likely to use single sourcing, some marketers would choose the latter because they view the division of business among numerous suppliers to be detrimental to enduring buyer-seller relationships, while other marketers would choose former because to be as profitable as being the single source. Uncertainty of a specific buying and selling situation might explain when multiple sourcing might be preferred over single sourcing [57].

However the main argument that supports a multiple sourcing strategy lies in the need to maintain control over supplier's opportunism. Constant monitoring of supplier's production prevent supplier's opportunistic behaviour [58]. This knowledge would ensure the sharing of production efficiency gains. However this assumption may not always true. Monitoring is more costly. Splitting of demand among the supplier's have its own disadvantage for buyer. Buyer may able to leverage less efficiency gains due to economies of scale unlike in single sourcing strategy. It is also not evident that reduction in efficiency gains is justifiable in terms of benefits that are derived from controlling supplier opportunism. However, it is concluded that neither of the strategies was equivocally the best [3][59]. To understand the opportunistic behaviours by parties interactions, Khai Sheang lee, et al, [38], uses the game theoretic approach, which is also proposed by Moorthy, [60] as most suitable approach. Khai Sheang lee, et al, [38] recognizes the importance of specific assets in buyer-seller relationship as emphasizes in TCA, they incorporated the concept of economies of scale and impact of acquiring specific knowledge, explicitly examine the opportunistic behaviours of the interacting parties uses all in game theoretic analysis of sourcing strategies. The author did not include product quality, put as limitation in the analysis, however he propagated that product quality is the important factor and may bring some different results. This is taken care in our study along with other factors included in the equation.

III. GAPS AND OBJECTIVE

From the above literature review what we can deduce that traditional way of measuring into the service quality and customer satisfaction is no more significant. Servqual model is successful however other parameters need to be considered [61].

Following potential gap can be deduce from the above mentioned literature

- a) In Gronroos [8], suggested that services has both quality dimensions (technical and functional). Both aspects need to be fulfilled else overall perception of quality is lower, hence less satisfied customer. In retail banking which is financial service industry, used the parameter such as number of employees, operational cost, employee appraisal report, deposits, number of loans, number of new accounts, customer satisfaction along with service quality dimensions such as behavioral aspects of customer (courtesy), tangible services, accessibility to bank branches. Results suggested that overall efficiency is achieved by branch is due to overall service delivery process is efficient. Also justifies the internal service quality assessment is as important as external quality measurement. The internal measurement should be in line with external quality measurement. Another researchers said the study of service quality is challenging. Future efforts should continue to advance the concepts and also improve the means to measure service quality. Although many sectors (like Automobile, Aviation, Construction etc.) have really implemented and institutionalized robust quality processes, but adoption of quality processes within software engineering domain is still a challenge. Managing quality of deliverables from a software project has been an area of concern for quite some-time, but it is, gaining much more interest in recent times due to the various factors economic, social and fierce competition among software vendors [62]. In IT industry, in software development process more than one supplier involved. We have varying volumes, priority, demands, meeting customer expectations is challenging. There is no clarity whether the supplier software organizations process is sufficiently mature to drive towards a service delivery format. There is another study [62] pertaining to understand the implication of process maturity on the goals of high quality software on-time and within budget. The goal was to study the impact of high mature process on effort, quality and cycle time. Software size was the important factor. There is another research which is on CoQ (cost of quality) in software development process. The researches happened where many CoQ programs initiative with good intent failed, got terminated prematurely or did not expect desired result despite investments in CoQ programs by the industry. CoQ

do not even readily appear in accounting journals. Suggested need of some empirical researches and benchmarking of cycle time between investments in CoQ programs and benefits realization. In case of strategic sourcing negative impact of quality is observed when outsourced. So outsourcing do reduces cost however quality is compromised. However ever the author have not also mentioned about the impact on governance and monitoring cost [40]. Also the cost to curb supplier opportunism

. For example: In case of Sourcing in food supply chain is always is really complex. Consumers are demanding year round availability product in retail outlets. Author highlights the complexities such sourcing from different regions, shelf life of product (decay of quality of product should be less, long sustainability), minimising cost, providing fresh high quality product to the consumers with less waste requires effective sourcing strategy. Despite of optimization in fresh food supply chain, existing strategic sourcing strategy are ineffective. However decision makers have to achieve a trade-off between the logistics cost drivers and product quality cost [41]. Product recalls are due to serious quality failure and have significant negative impact on firm performance. So from the above studies we can conclude that pure service quality dimensions are not enough. We have to look for the various aspects associated with service quality dimensions along with other parameters (operational, strategic, related to market, stakeholders). So alone measuring customer satisfactions doesn't give the complete picture regarding the satisfaction. Requirement is to engineer the customer satisfaction, customer expectations, internal expectations (process, person, procedure, policy) all need to be satisfied and dimensions should be in line customer satisfactions measuring dimensions. Hence there is a need to develop such concept specifically for IT industry as said by other researchers that there very few studies available and bit challenging, also there is no clarity on the maturity of the service delivery process hence there is a gap can be observed between the customer expectations and process expectations. So there is a requirement IT industry which measures the gap related to satisfaction between the Voice of Process (combination of process centric parameters, service centric parameters, strategic sourcing parameters, customer centric parameters) and Voice of Customer (Customer centric parameters) under strategic sourcing (single and multiple sourcing) scenario

- b) For IT industry, also there is no clarity which are the specific service quality dimensions (associated with multidimensional aspects) are aligned with service quality dimension measured for Voice of customer and Voice of Process respectively under strategic sourcing (single and multiple sourcing) scenario.

Our objective to measure the gap between the Voice of Process and Voice of Customer under the similar service quality dimensions and deduce the important service quality dimensions and their alignment which is in sync with service quality dimensions of customer sourcing strategy scenario (single/soul or multiple (dual)).

IV. PROBLEM FORMULATION

Definitions:

Voice of Process: Measuring satisfaction level by using service quality and other parameters (operational, customer centric, cost centric, process, policy and procedure) under single sourcing and multiple sourcing scenario.

VoP covers two broad aspects. One process performance measurement and anticipated customer oriented performance measurement which will help in anticipating increased customer satisfaction and retention, also results in better financial realization.

Process performances or organization performances are marked as a condition in which a process or an organization is or a state they want to achieve [63]. Measuring the process performances is the tool which enables managers to control the process success and represents the basis for continual improvement [64]. The meaning of measurement lies in the influence upon the relations between the results of the process and investing into the realization of these results, in order to accomplish as highest quality as possible, i.e. the system of measuring performances represents the process of quantifying effectiveness and efficiency [65].

Dimensions for measuring process performance should fulfill aspects or combination of the following aspects such Quality, Cost effectiveness, technical competence, reliability, security and access, communication and feedback, knowing your customer and responsiveness, tangibility, credibility, courtesy, training and skill development, time and resource optimization, effort reduction, early warning mechanisms (prediction models), measurement and monitoring, risk reduction, customer loyalty, customer retention, business value transfer, supplier opportunism, cost opportunity, requirement stability, uniqueness of the solution, compliances and certifications.

Voice of Customer: Measuring satisfaction level by using service quality parameter under single and multiple sourcing scenario. Customer satisfaction having multidimensional aspect. Capturing all the aspect is a very difficult task. However for our research objective we have reduced the aspect under one umbrella. One aspect is operational performance. Dimensions for measuring customer satisfaction under operation performance are Quality, Cost effectiveness, technical competence, requirement stability, security and access, communication and feedback, reliability, credibility, business value transfer, responsiveness, loyalty and future partnership, opportunity for new business, solution uniqueness and competitive cost, goodwill, brandvalue and recommendations, compliances and certifications.

The product or services need to deliver to the customer as per the requirement on time, defect free and should be cost effective. As mentioned above in the literature review in order to be in the business and to retain customer, the level of satisfaction of customer need to be measured. However in today's scenario organization are strategic sourcing in order to fulfill customer varying demands on time and cost effective. In order to maintain the profitability and demand in the market, organization are using single sourcing approach and multiple (dual) sourcing approach accordingly. Hence it is important for the organization should have standard procedures for both the approaches and also have sound measurement system in order the process efficiency and manage risks associated with the process. As mentioned above we have concept of VoP and VoC. The gap between VoP and VoC will give the organization about the process health and also let the organization know whether they will able to deliver the product or services to the customer as per the requirement or not. Another problem statement is to look into the dimensions under VoP are in line with VoC and also let you know which are the dimensions are weakly behaving air behaving negative against the customer dimensions which may be as a potential area where an organization can improve.

VoP and VoC (trimmed dimension and collective aspects) dimensions description

- a) Quality and Cost effectiveness: Under this dimensions the aspects are zero defect delivery, zero rework, CoQ reduction, reduction prevention cost or effort, reduction of appraisal Cost or effort, reduction failure cost or effort, standardization of processes, usage of automations techniques, reduction of inprocess defects, monitoring of defect injection rate (Rate) throughout the life cycle, UAT defect resolutions, Defect prevention activities, disaster recovery, monitoring frequent negotiations on cost after estimation and quoting to customer, correct estimation, feasibility of providing discounts to customer, six sigma methodology usage during project execution, zero downtime, first call resolution, eradicate repetition of bugs, negotiation with customer regarding the resource increase hence cost, zero waiting for customer, cost is less in multiple sourcing
- b) Communication and Documentation: Under this dimension the aspects are- Make aware customer regarding the progress of your work, prior information regarding any breach which may delay your scheduled deliveries, completeness of deliverables, SPMP of the projects should be maintained, SLA's and penalty clauses should be documented, process documentations, minutes of meeting and action plan with responsibilities of each one should be shared with client or vendors. OLA's with penalties clauses when vendors (s) are involved in the project executions, release notes and documentations of customer assets should be maintained, Sign off should be taken from both sides for the bug free releases, SOW's, SLA's, OLA's, Audit report and audit schedules should be maintained and properly communicated between customer, beneficiary organizations and vendor (s), any CR's raised during the current project execution which lead to check feasibility of scope and cost association and freezing the same shall be shared with customer in properly, any resource increase or decrease or releasing resource from project or deploying more or any role ratio change would lead to inform customer formally
- c) Effort reduction/optimization: Under this dimension the aspects are Usage of reusable components, standard coding practices, outsourcing the process, first time right, role ratio change of resource (experience resource is engaged) and present less experience resource is engaged in other project with less risk, anticipation of risk, risk mitigation plan, prediction models usage for prediction of actual effort, monitor of review effectiveness, effective MPP for projects, help desk support table is trained and have proper manual for dealing with errors and can solved in first call, second level support should have proper technical support and can be transferred at a switch, mostly automated testing is performed, new coding tools were used
- d) Technical Competence and Business solution uniqueness: Under this dimension the aspects are Measurement of productivity of the resource, competency matrix of the resource, building a team for project management with a mix of highly experienced and less experienced person with subject and technology familiarity, providing a solution within the committed time, solution should be unique and cost-effective, understanding the requirement of the customer and very less turn back to customer for clarification, publishing research papers in external forum and patents, appropriate skilled resource

- e) **Knowing the customer and Responsiveness to customer:** Under this dimension the aspects are Understand customer requirement and converting them into technical terms for production or service, what exactly the customer want and what we are giving have zero gap, knowing customer business and what type of problem customer is facing and designing solution according to it, Customer query raised and response to the call at once and proving initial solution, if solution is not appropriate then immediately escalating to second level which are usually vendor (s) to resolve with in SLA, Regarding new query or CR raised proper clarified response with proper scope definition and its feasibility with current delivery or in the next updated, proper estimates and schedules is communicated within committed time, Providing proactive consultancy for other business of the customer, communicating the progress of the work to the customer
- f) **Competitiveness:** Under this dimension the aspects are regarding cost competitiveness, provide best competitive price to the customer, decent saving in margins using the strategic sourcing approach, if customer ask for discount, provide discounts, compare internal benchmarking reports with external benchmark regarding operational parameters such DIR per 100phrs, Productivity related to technology or practice, delivered defect per 1000 projects/tickets, Internal process capability measurement and used before bidding to customer, internal goals and project goals are mapped with organization and customer goals, cost is competitiveness when outsourced to multiple vendor
- g) **Credibility:** Under this dimension the aspects are urgent CR's raised by customer has to be implemented immediately within the current project execution, SLA agreement are not breached, commitment towards the customer deliverables on time, providing offline help to customer, considering customer request on discount on CR's and enhancements, providing solutions within stipulated time, work as partner for customer help in reaching defect free product or services in the market, provide business value to the customer with every contract, Resource are technically sound and customer can bank upon the suggestion and solution produce are affordable and unique, helping customer is creating brand-value to the customer
- h) **Security Access:** Under this dimension the aspects are customer centers in the partner premises (data centers and virtual networks)(in case here the IT companies) are secured and restricted access, Associated vendor(s) have the restricted access to the customer centers in the partners premises (data centers and virtual networks), disaster recovery plans are available with the partner organizations and associated vendor(s), Non disclosure agreements are signed from each employee and vendor(s), Customer assets such as hardware (servers) and softwares, in the data centers or in other machine are secured, Security breaches are monitored , fixed and reported to the customer if happens, systems are always uplinked and uptime
- i) **Reliability:** Under this dimension the aspects are deliverables are always on time, Completeness of the deliverables are maintained as per the agreed SLA, Committed to delivery, Urgent changes or CR's are fixed and implemented, Committed to zero UAT defects, bugs fixed are err-revocable, solutions or patches delivered are compatible to the system, provide unique and easy solutions, deliveries are on schedules, cycle time for response and resolution of problem or bug fixing is minimum, deliveries are in sink with customer stipulated time for example the deliverables from partner (vendor(s) in case of strategic sourcing) are delivered on time such that customer (Partner in case of strategic sourcing)) is ready with its server for UAT, Committed to quality and ontime and at competitive cost, always approachable and available, feedback of customer are analyzed and appropriate suggestion are implemented in the project delivery system, Usage of process performance model and predicting the schedules, effort and cycle time
- j) **Training and Awareness:** Under this dimension the aspects are resource and customer both are trained on different technology and usage of technology respectively. Resources are motivated to go through online training modules and participate in sponsored class room trainings related to IT infrastructure, technology related to it, latest tools for testing and automation, Before onboarding the new features in the existing tools customers were made aware to regarding the features and any extra functionality can be communicated properly and help them in getting familiar, Special consulting projects or domain knowledge training programs were available in the organization and also encourage to the vendor(s) to participate and learn, Case studies training and discussion were organized with the vendor(s), Annual discussion forum are introduced for collective listening on the gaps raised by customer and its improvement. Positive training environment and motivated skilled resource help in delivering defect delivery hence raise customer confidence and helps in customer retention.
- k) **Certification and Compliances:** Under this dimension the aspects are service partner (organization) are certified and follow models, standards and guidelines, good practices such ISO 9001:2008, CMMI, ISO 20K, ITIL etc. Associated vendors are also quality standard certified. Vendor(s) go through the vendor life cycle management.

On the above mention dimensions an elaborative questionnaire is designed. Under each dimension there were questions on the aspects associated. An illustrative example of the questionnaire is below below. The questionnaire has the ability to capture the Voice of Process (Project Team from 03 companies) and Voice of Customer (VMO representatives of the account (s)).

V. DATA COLLECTION METHODOLOGY

The sourcing is done in two way. Beneficiary organization takes services from Single vendor and also multiple (dual) vendor. The vendors are aligned to the projects which is further associated with the customer accounts. Every organization has Vendor management office (VMO) either separate or integrated within the project team (Project Manager). These vendor management office have representatives who are associated with customer account (s). They are link between the customer and beneficiary organization. The VMO representative frequently have meetings with the customer account representative (s), discuss the present and future business strategies and take feedback regarding the present project work with respect to the VoC and VoP. However the feedbacks are also given in the calls or in client meeting happens with the project team on calls or on VC's or on mails regarding requirement clarifications, urgent CR's, discounts, processes, defects, scheduled delivery, documentations, cost negotiations and other feedbacks which are inline with VoC and VoP. The VMO representative pass on the feedbacks collected from the customer to the project teams.

The VMO representative will act as a voice for customer percolate the feedback and recommendations to the beneficiary organizations. The Project team will acts as operation team of the beneficiary organization which is either linked with the single vendor and multiple (dual) vendor regarding the project operations and its deliverables. Beneficiary organization project teams who are associated with the strategic sourcing (single or multiple) will provide the feedback and recommendations which in line with VoP and VoC.

In order to fulfill the objective we have designed two questionnaires. One questionnaire is designed for capturing VoP which will be given to the project teams who are associated with strategic sourcing, outsourced few processes. Another questionnaire is designed for capturing VoC, which will be provided to the customer. Here in case of customer, VMO team representative of customer account (s) will provide the inputs.

The data is collected from 03 Indian IT companies, two are Noida based having size (300-500 person) and one is bangalore based IT company (larger size). All the three companies are having sales offices across the world. Noida based companies having more than 100 account and more than 1000 projects whereas bangalore based company is having more than 150 account and more than 1000 projects provide Infrastructure management services such as help desk and support services. All the three companies practice strategic sourcing (single and multiple) depending upon project requirement. So all are beneficiary organization taking services from other small vendor (s) in the following scenario discussed subsequently. In the first scenario where single vendor is providing both help desk (first level support) and also bug fixing support (second level) to the beneficiary organization. In second scenario where multiple vendor, in our case dual vendor where vendor 1 is providing the help desk support (first level resolution) and vendor 2 is providing the technical support such development, enhancements and bug fixes support (second level resolution).

All the three Indian IT organization compliant with ITIL processes, follows ISO 20K process, ISO 9001:2008 and CMMI practices. The small Indian IT companies are compliant with ITIL processes, follow ISO 9001:2008, CMMI practices processes. Due to confidentiality the organization names cannot be shared. For customer survey three organization were involved in which total 80 accounts randomly were taken for study. Under this study 80 questionnaire were shared with Client Management representative /Vendor management office representative and requested to fill the questionnaire. Out of which only for 30 account, which is 37.50% filled questionnaire were only shared. For same accounts respective project teams of the respective 3 companies another set of questionnaire is shared. Project managers, Team leaders, developers were requested to fill the questionnaire. In total 390 questionnaire were shared, out of that 52.05% filled questionnaire were shared. The distribution of projects who are associated with single sourcing is 68% and multiple (dual) sourcing is 32%.

Demographic data of the survey participant	Demographic factor	% Sample size	Sample Size
Job Position	Project Manager	25%	40
	Project Lead/Team Lead/Test Lead	35%	56
	Sr.Developer/Developer	25%	40
	Others (System Engineer, System admin, Business analyst and others involved in project)	15%	24

Figure 1: Demographic data of the survey participant

Designation	No. of years of Work Experience
Project Manager	12+ years
Project Lead/Team Lead/Test Lead	8 to 10 years
Sr.Developer/Developer	6 to 8 years
Others (System Engineer, System admin, Business analyst and others involved in project)	less than 5 years
VMO/Client Management representative	10+ years

Figure 2: Designation and No. of years of work experience of survey participant

VI. DATA ANALYSIS AND NUMERICAL EXAMPLE DEMONSTRATION

Reliability test for the survey questionnaire were done in bangalore based company. Randomly 10 respondent (VMO representative) were requested to fill the questionnaire (Customer questionnaire (VoC)). Similarly randomly 20 questionnaire were sent to the project team and requested to fill the questionnaire (Project Team (VoP)). The data collected and analysed with help of SPSS. The reliability score are as follows:

Customer (VMO representative (VoC)) reliability score is

Reliability Statistics	
Cronbach's Alpha	N of Items
.799	9

Figure 3: Reliability Score of the VoC questionnaire

Case Processing Summary			
		N	%
Cases	Valid	10	100.0
	Excluded ^a	0	0.0
	Total	10	100.0

a. Listwise deletion based on all variables in the procedure.

Figure 4: Summary of the Respondent analysis for VoC questionnaire

Project Team to understand VoP, reliability score is

Reliability Statistics

Cronbach's Alpha	N of Items
.728	11

Figure 5: Reliability score for VoP questionnaire

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded ^a	0	0.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Figure 5: Summary of the Respondent analysis for VoP questionnaire

Later the data is collected for from all the three IT companies and the dimensions were analyzed with the help of one way ANOVA in order to see the dimensions are significant or not.

For Project Team (Single Vendor) to understand the VoP,

$$H_0: \mu_1 = \mu_2 = \dots = \mu_{11}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3,4 \dots$$

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Quality & Cost effectiveness	138	573	4.152173913	0.129958743
Effort Reduction/Optimization	138	592	4.289855072	0.207341585
Business Solution Uniqueness	138	599	4.34057971	0.31381572
Knowing the customer & Responsiveness to customer	138	423	3.065217391	0.878927325
Competitiveness (Benchmarking, etc)	138	442	3.202898551	1.316195917
Credibility (Trustworthiness, belief, honest, etc)	138	520	3.768115942	0.383793505
Security access (Data access, physical access, etc)	138	556	4.028985507	0.26192743
Communication and Documentation	138	610	4.420289855	0.522796996
Reliability (On time delivery, commitment to delivery, etc)	138	488	3.536231884	2.148312705
Training and Awareness	138	527	3.81884058	2.047233682
Certification and Compliances	138	437	3.166666667	2.694647202

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	339.7404	10	33.9740448	34.27016768	1.45E-60	1.836971
Within Groups	1493.978	1507	0.991359164			
Total	1833.719	1517				

Figure 6: ANOVA Table for VoP dimensions under Single sourcing

For Project Team (Multiple (dual) Vendor) to understand the VoP.

$$H_0: \mu_1 = \mu_2 = \dots = \mu_{11}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3,4 \dots$$

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Quality & Cost effectiveness	65	270	4.153846	0.132212
Effort Reduction/Optimization	65	278	4.276923	0.203365
Business Solution Uniqueness	65	283	4.353846	0.325962
Knowing the customer & Responsiveness to customer	65	198	3.046154	0.888462
Competitiveness (Benchmarking,etc)	65	212	3.261538	1.227404
Credibility (Trustworthiness,belief,honest, etc)	65	243	3.738462	0.383654
Security access (Data access, physical access,etc)	65	264	4.061538	0.214904
Communication and Documentation	65	291	4.476923	0.503365
Reliability (On time delivery,commitment to delivery,etc)	65	235	3.615385	2.084135
Training and Awareness	65	252	3.876923	1.953365
Certification and Compliances	65	214	3.292308	2.522596

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	151.7371	10	15.17371	15.98851	4.19E-26	1.844138
Within Groups	668.1231	704	0.949038			
Total	819.8601	714				

Figure 7: ANOVA Table for VoP dimensions under Multiple sourcing

For Customer (VMO representative) to understand the VoC.

$$H_0: \mu_1 = \mu_2 = \dots = \mu_9$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3,4 \dots$$

SUMMARY

Groups	Count	Sum	Average	Variance
Quality & Cost effectiveness	30	132	4.4	0.248276
Business Solution Uniqueness	30	124	4.133333	0.464368
Knowing the customer & Responsiveness to customer	30	118	3.933333	0.478161
Competitiveness & Credibility (Trustworthiness,belief,honest)	30	109	3.633333	0.24023
Security access (Data access, physical access)	30	118	3.933333	0.478161
Communication and Documentation	30	132	4.4	0.455172
Reliability (On time delivery,commitment to delivery)	30	129	4.3	0.424138
Certification and Compliances	30	130	4.333333	0.505747
Technical Competence	30	122	4.066667	0.547126

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	16.31852	8	2.039815	4.779099	1.7E-05	1.973975
Within Groups	111.4	261	0.42682			
Total	127.7185	269				

Figure 8: ANOVA Table for VoC dimensions

Factor Analysis

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Quality_Costeffectiveness	4.152	.3605	138
Effortreduction_Optimization	4.290	.4553	138
Business_unique_solution	4.341	.5602	138
Knowing_customer_responsiveness	3.065	.9375	138
Competitiveness_Benchmarking	3.203	1.1473	138
Credibility_Trustworthiness_belief	3.768	.6195	138
Security_access	4.029	.5118	138
Communication_Documentation	4.420	.7230	138
Reliability_Ontimedelivery	3.536	1.4657	138
Training_Awareness	3.819	1.4308	138
Certification_Compliances	3.167	1.6415	138

Figure 9: Descriptive analysis of VoP dimensions under Single sourcing

KMO and Bartlett's Test^a

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.528
Bartlett's Test of Sphericity	Approx. Chi-Square	776.930
	df	55
	Sig.	.000

a. Based on correlations

Figure 10: KMO and Bartlett's test Table for VoP dimensions under Single sourcing

Rotated Component Matrix^a

	Component			
	1	2	3	4
Certification_Compliances	.856			
Reliability_Ontimedelivery	.836			
Training_Awareness	.781			
Communication_Documentation	.689			
Effortreduction_Optimization	-.646			
Security_access		.769		
Knowing_customer_responsiveness		-.685		
Credibility_Trustworthiness_belief		.618		
Quality_Costeffectiveness			.889	
Competitiveness_Benchmarking	.573		.576	
Business_unique_solution				.848

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 6 iterations.

Figure 11: Factor table for VoP dimensions under Single sourcing

In this case Certification and compliances, Reliability and ontime delivery, training and awareness, communication and documentation, competitiveness and benchmarking, knowing customer and responsiveness, effort reduction and optimization, security access, Quality and Cost effectiveness, Business unique solution loaded high on factors.

Certification and compliances, reliability and ontime delivery, training and awareness, communication and documentation, Effort reduction and optimization computes Factor 1

If we round off the score then security and access, Knowing Competitiveness computes Factor 2

If we round off the score then Quality and Cost effectiveness and Business unique solution computes Factor 3 and Factor 4 respectively.

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Quality_Competitiveness	4.123	.4149	65
Effortreduction_Optimizati on	4.277	.4510	65
Business_unique_soluti on	4.354	.5709	65
Knowing_customer_resp onsiveness	3.046	.9426	65
Competitiveness_Bench marking	3.277	1.0970	65
Credibility_Trustworthine ss_belief	3.738	.6194	65
Security_access	4.046	.4819	65
Communication_Docum entation	4.477	.7095	65
Reliability_Ontimedelivery	3.615	1.4437	65
Training_Awareness	3.877	1.3976	65
Certification_Compliance s	3.369	1.5769	65

Figure 12: Descriptive Statistics table for VoP dimensions under Multiple sourcing

KMO and Bartlett's Test^a

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.592
Bartlett's Test of Sphericity	Approx. Chi-Square	315.003
	df	55
	Sig.	.000

a. Based on correlations

Figure 13: KMO and Bartlett's table for VoP dimensions under Multiple sourcing

Rotated Component Matrix^a

	Component			
	1	2	3	4
Certification_Compliance	.909			
Reliability_Ontimedelivery	.838			
Training_Awareness	.772			
Communication_Documentation	.640			
Effortreduction_Optimization	-.638			
Security_access		.814		
Knowing_customer_responsiveness		-.732		
Quality_Competitiveness			.806	
Credibility_Trustworthiness_belief			.614	
Competitiveness_Benchmarking	.515		.528	
Business_unique_solution				.847

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 6 iterations.

Figure 14: Factor table for VoP dimensions under Multiple sourcing

In this case 4 Factors were extracted. Certification and Compliances, Reliability and On-time delivery, Training and awareness, Competitiveness and Benchmark, Quality and Competitiveness, Business unique solution, communication and documentation, security and access are loaded high. Credibility and Trustworthiness belief, knowing customer and responsiveness and business unique solution are loaded low on Factor

Certification And Compliances, Reliability and On-time delivery, Training awareness, Competitiveness and Benchmarking, Communication and Documentation computes Factor 1

Security and access compute Factor 2

Quality and competitiveness compute Factor 3

Business Unique solution compute Factor 4

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Quality_Costeffectiveness	4.40	.498	30
Business_solution_uniqueness	4.13	.681	30
Knowing_responsiveness_customer	3.93	.691	30
Competitiveness_Credibility	3.63	.490	30
Security_Access	3.93	.691	30
Communication_Documentation	4.40	.675	30
Reliability_Ontimedelivery	4.30	.651	30
Certification_Compliance	4.33	.711	30
Technical_Competencies	4.07	.740	30

Figure 15: Descriptive statistics for VoC dimensions

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.538
Bartlett's Test of Sphericity	Approx. Chi-Square	168.661
	df	36
	Sig.	.000

Figure 16: KMO and Bartlett's test for VoC dimensions

	Raw				Rescaled			
	Component				Component			
	1	2	3	4	1	2	3	4
Security_Acess	.604				.874			
Competitiveness_Credibility	.418				.854			
Quality_Costeffectiveness	.355	.239			.712	.479		
Certification_Compliance		.660				.927		
Technical_Competencies	.446	.555			.603	.750		
Business_solution_uniqueness			.627				.919	
Reliability_Ontimedelivery	.306		.381		.470		.585	
Knowing_responsiveness_customer	.322		.390		.466		.565	
Communication_Documentation				.658				.975

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 5 iterations.

Figure 17: Factor table for VoC dimensions

As we can see from Fig ...

From the Fig 17 we can see 4 Factors were extracted. Here for our analysis we tool component scores more than .5. Factor loading for dimensions like Security and access, Competitiveness and Credibility, Quality and Cost effectiveness, Certification and Compliances, Technical Competencies, Business Solution uniqueness, Reliability and Ontimedelivery, Knowing responsiveness and Communication and Documentation.

Security and access, Competitiveness and Credibility and Quality and Cost effectiveness computes Factor 1.

Certification and Compliances, Technical Competence computes Factor 2

Business Uniqueness solutions and Communication and Documentation computes Factor 3 and Factor 4 respectively.

On-time delivery and Knowing responsiveness dimensions weakly loaded in Factor 2.

Hypothesis analysis

$$H_0: \mu_{Quality\ Costeffectiveness\ for\ SS} = \mu_{Quality\ Costeffectiveness\ for\ MS}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the VoP dimension *Qualit_Costeffectiveness* for single sourcing (SS) is significantly different from multiple sourcing (MS). Mean satisfaction score for SS is 4.15 and Mean satisfaction score for MS is 4.10. p value (two tail) is 0.047. Sample size for MS is 65 and for SS is 138 respectively.

$$H_0: \mu_{\text{Reliability Overtime delivery for SS}} = \mu_{\text{Reliability Overtime delivery for MS}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the VoP dimension *Reliability_Ontimedelivery* for single sourcing (SS) is significantly different from multiple sourcing (MS). Mean satisfaction score for SS is 3.62 and Mean satisfaction score for MS is 3.54. p value (two tail) is 0.036. Sample size for MS is 65 and for SS is 138 respectively.

$$H_0: \mu_{\text{Certification Compliances for SS}} = \mu_{\text{Certification Compliances for MS}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the VoP dimension *Certification Compliances* for single sourcing (SS) is significantly different from multiple sourcing (MS). Mean satisfaction score for SS is 3.41 and Mean satisfaction score for MS is 3.16. p value (two tail) is 0.031. Sample size for MS is 65 and for SS is 138 respectively.

$$H_0: \mu_{\text{Overall satisfaction for SS}} = \mu_{\text{Overall satisfaction for MS}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the overall satisfaction score for single sourcing (SS) is not significantly different from multiple sourcing (MS). Mean satisfaction score for SS is 3.79 and Mean satisfaction score for MS is 3.83. p value (two tail) is 0.067. Sample size for MS is 65 and for SS is 138 respectively.

$$H_0: \mu_{\text{Overall satisfaction for SS}} = \mu_{\text{Customer satisfaction}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the overall satisfaction score for single sourcing (SS) is significantly different from Customer satisfaction score. Mean satisfaction score for SS is 3.79 and Mean score Customer satisfaction for 4.12. p value (two tail) is 0.0013. Sample size for Customer Satisfaction is 30 and for SS is 138 respectively.

$$H_0: \mu_{\text{Overall satisfaction for MS}} = \mu_{\text{Customer satisfaction}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the overall satisfaction score for multi sourcing (SS) is significantly different from Customer satisfaction score. Mean satisfaction score for SS is 3.83 and Mean score Customer satisfaction for 4.12. p value (two tail) is 0.006. Sample size for Customer Satisfaction is 30 and for MS is 65 respectively.

$$H_0: \mu_{\text{Quality Costeffectiveness for MS}} = \mu_{\text{Quality Costeffectiveness for Customer}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the overall satisfaction score for multi sourcing (MS) is significantly different from Customer satisfaction score. Mean satisfaction score for MS is 4.10 and Mean score for Customer satisfaction for 4.4. p value (two tail) is 0.0047. Sample size for Customer Satisfaction is 30 and for MS is 65 respectively.

$$H_0: \mu_{\text{Quality Costeffectiveness for SS}} = \mu_{\text{Quality Costeffectiveness for Customer}}$$

$$H_a: \mu_i \neq \mu_j; i \neq j; i = 1,2,3, \dots; j = 1,2,3 \dots$$

In this case the overall satisfaction score for single sourcing (SS) is significantly different from Customer satisfaction score. Mean satisfaction score for SS is 4.15 and Mean score for Customer satisfaction for 4.4, p value (two tail) is 0.014. Sample size for Customer Satisfaction is 30 and for MS is 138 respectively.

Table 3: Hypothesis Table 1 for VoP Factors and VoC Factors under Single sourcing and Multiple Sourcing.

Hypothesis	Intraclass Correlation	F test significant (p value)
<i>H₀: Factor 1 of VoC = Factor 1 of VoP Single Sourcing</i>	.609	.007
<i>H₀: Factor 4 of VoC = Factor 1 of VoP Single Sourcing</i>	.549	.018
<i>H₀: Factor 2 of VoC = Factor 1 of VoP Single Sourcing</i>	.470	.046
<i>H₀: Factor 3 of VoC = Factor 4 of VoP Single Sourcing</i>	.675	.02
<i>H₀: Factor 2 of VoC = Factor 3 of VoP Single Sourcing</i>	.614	.06
<i>H₀: Factor 3 of VoC = Factor 4 of VoP Single Sourcing</i>	.466	.048
<i>H₀: Factor 1 of VoC = Factor 3 of VoP Multiple Sourcing</i>	.522	.026
<i>H₀: Factor 3 of VoC = Factor 4 of VoP Multiple Sourcing</i>	.582	.011
<i>H₀: Factor 1 of VoC = Factor 2 of VoP Multiple Sourcing</i>	.582	.011
<i>H₀: Factor 2 of VoC = Factor 3 of VoP Multiple Sourcing</i>	.579	.011
<i>H₀: Factor 4 of VoC = Factor 1 of VoP Multiple Sourcing</i>	.579	.011

VII. CONCLUSION

We can conclude from the survey results that there is a significant difference between the VoP_single sourcing, VoP_multiple sourcing and VoC satisfaction scores. VoC shows the good satisfaction score with respect to VoP single sourcing and multiple sourcing. Interestingly there is no significant difference between the overall satisfaction score of VoP single sourcing and VoP multiple sourcing. However getting deep into the dimensions of VoP multisourcing and VoP single sourcing we found out that dimensions like Quality_Cost effectiveness, reliability_ontime delivery, certification_compliances are significant different. The mean scores for dimension Quality_Cost effectiveness, reliability_ontimedelivery under VoP single sourcing is higher than VoP multiple sourcing, which indicates quality and ontime delivery, schedule met, adhere to SLA agreement, Urgent CR's delivery with stipulated timelines aspects in single sourcing is better. Whereas mean score of dimension Certification_Compliance under VoP multiplesourcing is higher than VoP single sourcing and significantly different. However the overall all satisfaction score under VoP multisourcing is higher than VoP single sourcing.

ANOVA shows that dimensions under VoP single sourcing, VoP multiple sourcing and VoC are significantly different. Later Factor analysis is performed to reduce the dimensions and also to see the behavior of the dimensions under factors. For VoP single sourcing, dimensions reduced to 4 component factors which suggest dimensions such as Certification and Compliances, reliability and ontimedelivery, training and awareness, communication and documentation, Effort reduction and optimization computes Factor 1. Security access, Knowing Customer and responsiveness computes Factor 2, Quality and Cost effectiveness and Business unique solution computes Factor 3 and Factor 4 respectively. Interpretation we can make here is in single/soul sourcing approach the dimensions like quality and cost effectiveness and Business unique solution is more important. Since organization is more focused on quality and cost effectiveness and delivering unique business solutions to their customer. Knowing customer and responsiveness dimensions suggest that organization is more focused on understanding customer requirement in all aspects and committed to provide response and resolution first time right. Also focused about dimension security and access along with customer requirement.

For VoP multi-sourcing, dimensions reduced to 4 component factors which suggest dimensions such as Certification and Compliances, reliability and ontime-delivery, training and awareness, communication and documentation, Competitiveness and Benchmarking computes Factor 1. Security access computes Factor 2, Quality and Cost effectiveness and Business unique solution computes Factor 3 and Factor 4 respectively. Interpretation we can make here is in multi-sourcing approach the dimensions like quality and cost effectiveness

has to be more focused and have to compete with quality and cost delivered by single sourcing approach. The factor loading score is also less than the factor loading score of quality and cost effectiveness dimension in single sourcing. Here business unique solution is a standalone factor shows negative impact, which suggest process is aligned to regular solutions. More focus is on delivering unique and innovative solutions. Factor loading for Knowing customer and responsiveness dimensions suggest that organization need more focus on understanding customer requirement in all aspects and has to be more committed to provide response and resolution first time right.

For VoC dimension reduced to 4 factors. Dimensions such as Security and access, Competitiveness and Credibility, Quality and cost effectiveness computes Factor 1. Certification and Compliances and technical competencies computes Factor 2. Business solution uniqueness computes factor 3 and, Communication and Documentation computes factor 4. So in customer point of view security and access, Certification and compliances, Business unique solutions and, Communication and Documentations are the factors which are most prominent and have highest factor loading score. This suggest that organization operating under strategic sourcing, service dimensions and associated aspects has to be inline with the dimensions above. However in the second important priority is Competitiveness and Credibility and Quality, Cost effectiveness and Technical Competencies. Dimensions with low factor score like Reliability and On-time delivery and Knowing responsiveness and customer. These dimensions along with Business unique solution computes Factor 2 which suggest customer is looking from organization both uniqueness in business solution but on-time and also want the organization should understand their requirement quickly with less negotiations and comeback. Factor 1 of VoC approach suggest that customer satisfaction will be on the higher side if the dimensions and its associated aspects; security and access, competitiveness and credibility and Quality and cost effectiveness will move in one direction and on higher priority.

Table 3 shows the alignment of Factors of VoP and VoC. Here we can conclude that one to one mapping of factors of VoP and VoC is quite insignificant. One to many mapping is shown above in the table under single sourcing and multiple sourcing scenario. For example under single sourcing scenario Factor 1 of VoP is aligned with Factor 1 of VoC and Factor 4 of VoC with Intraclass correlation coefficient is .609 and .549 respectively. So interpretation can be made that as per VoC and VoP dimension Certification and Compliances is important factor loaded with highest score and in one direction and satisfied however other dimensions under factor one is inline with factor 3 and factor 4 hence the intraclass correlation is also less because of this confounding factor. So its suggest that VoP stakeholders and organization to understand the VoC aspects in all aspects directions such that satisfaction of the customer can be enhanced.

Limitations of this study are as follows:

- a) Availability of data especially in IT industry for Infrastructure management services is a challenge. More data can be captured which may be give some changes in results
- b) Coverage of all aspects regarding a particular service of IT industry and measure the perception is a challenge
- c) There are aspects under each dimension. To collect all unique aspects is challenging. Hence there may be some confounding aspects in the designing of the questionnaire
- d) To find the ultimate customer representative of different accounts is challenging. So we consider the representatives within the organization which is close proximity with the customer, also engage in customer/account relationship management.

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