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Supplier service quality in supply chains of Indian SMEs: A dual direction dyadic perspective

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A B S T R A C T

This paper investigates the role played by service quality at supplier-manufacturer dyad in small-medium manufacturing units, and presents a model to establish that contribution of both the supplier and manufacturer towards service quality could lead to satisfaction followed by loyalty. The research design for this study includes a combination of literature survey, exploratory interviews with practitioners, and a questionnaire survey conducted through interview schedule from 120 respondents working in different small-medium manufacturing units of North India. Structural equation modeling (SEM) is used for data analysis. The paper develops dual directional scales to evaluate service quality at supplier-manufacturer dyad and tests a set of four propositions. A model showing linkages of manufacturer (manufacturing unit's) service quality with supplier service quality leading to satisfaction and loyalty is also developed. The model is empirically tested and is found to be fit. This study would be of interest to SME managers particularly engaged in 'purchase' function and researchers working on inter-firm supply chains in such units. This study recommends forming strong collaborative relationships with suppliers to achieve a win-win situation.

1. Introduction

The fierce competition of today's marketplace is forcing small & medium-sized enterprises (SMEs) to reshape their strategies in order to curtail overall cost and cut down inefficiencies. Therefore, there is a growing recognition of building and nurturing relationships with supply chain partners for improvements in profitability, serviceability and reduced costs in the supply chain (Kannan & Tan, 2003). Purchasing is the ultimate goldmine for success to supply-chain enterprises. Because of the mutual benefits they offer (Autry & Golicic, 2010), partnerships or strategic alliances between suppliers and manufacturers (i.e. buyers) have emerged as a popular business trend (Chen, 2011), and are being looked upon as the wave of the future (Gupta & Singh, 2017).

Partnership with suppliers is recognized as a major purchasing strategy (Saleh & Sweis, 2017; Stanley & Wisner, 2002). Partnership is a source of competitive advantage for both the supplier and the manufacturing unit (Carr *et al*., 2008). Successful manufacturing organizations leverage on the direct and indirect network of their suppliers to gain competitive advantage (Stanworth, 2012). Some of the typical benefits of suppliers as a manufacturing channel partner can be envisaged as:

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- Helps in reducing overhead costs through involvement in design, transportation etc.
- Helps the manufacturer to focus on core issues.
- Suppliers with large supply bases can act faster and deliver better quality of material and services.
- Suppliers may add on the service in the form of organizing training programmers, technical services, design inputs, etc. for better service.
- Suppliers with sound financial backups may provide cushioning against fluctuating fund flows.

Managing suppliers is critical to adding value in the supply chain since this function has both *intrinsic* and *extrinsic* customers (Seth *et al*., 2006; Prakash, 2014). Supplier (extrinsic) service quality, SSQ refers to the manner in which staff of the supplier unit serves the requisitions made by manufacturing unit and what attitudes they hold towards the unit. Whereas, Manufacturer (intrinsic) service quality, MSQ refers to the manner in which staff of the manufacturing unit facilitates the functioning of its supplier and what attitudes they hold towards its employees.

In context of SMEs, supplier development is the practice of reducing the number of direct material suppliers and forming strategic alliances with few selected suppliers and devoting resources to increase firm's performance and capabilities (Corsten & Felde, 2005). In the past, developing inter-firm linkages with suppliers was considered to be uneconomical for manufacturing units because of the large supply bases and distant relationships with suppliers (Gonzalez *et al*., 2004). Some of the issues regarded critical to supplier relationship management (Gupta *et al*., 2014; Johnston & Kristal, 2008; Amad *et al*., 2008) are as follows:

- Reliance of the manufacturing units on a few dependable suppliers.
- Consideration of quality vs. price tradeoff in selection of suppliers.
- Appropriateness of information provided to suppliers by the manufacturing units.
- Usefulness of the technical assistance provided to suppliers by the manufacturers.
- Involvement of the manufacturer in its suppliers' product development process.
- The manufacturing units entering into long-term contracts with its suppliers.
- Clarity of specifications provided to suppliers by the manufacturers.

Supplier partnership deals with the long-term relationship between the manufacturing unit and its suppliers, and includes make/buy decisions and global sourcing. Small-medium manufacturing units prefer to have few reliable suppliers, and are therefore reducing the number of suppliers, and sometimes relying on a sole source. In an attempt to regain their competitiveness, these units should adopt the Japanese Keiretsu system of manufacturers and suppliers working in lockstep (DeWitt *et al*., 2006). For supply chain effectiveness, manufacturers and suppliers need to keep costs across the supply chain low so that they result in lower market prices and higher margins. This is akin to gain-sharing arrangements wherein everyone who contributes to greater profitability is rewarded.

The inter-firm linkages between the suppliers and small-medium manufacturing units could relate to product, process, service and market, and through these linkages it is expected that the suppliers will provide necessary support to its SMEs and contribute to the process of creating appropriate technologies. In this backdrop the present research work has been undertaken (Holl, 2008).

Supply chain management is a big umbrella under which suppliers of supplier to end users are there. It consists of all parties which are directly or indirectly involved in fulfilling the customer's request. Everyone is a customer of its upstream so customer focus & customer satisfaction are the key issues of supply chain management. Viewed from customer's side it is the quality of product, value for money & post sales facilities. A key feature of present day business is the idea that it is the supply chains that compete, not companies and the success or failure of supply chains is ultimately determined in the

marketplace by the end user i.e. consumer. As competition moves beyond a single firm into supply chain, focus is shifting from management of internal practice alone (Nix, 2001). Demanding competition in today's global markets, introduction of products with short life cycles, and the discriminating expectations of customers have forced organizations to invest in, and focus attention on supply chains as system which is affected by the environment (Gupta & Singh, 2015; Lusch *et al*., 2007; Benton & Maloni, 2005; Tracey & Tan, 2001).

SME sector in India, once shielded by the Government policies of reservation, quota and license etc., but the sector is facing a number of challenges to survive due to globalization (Saranga, 2009). Studies on Indian SMEs are largely confined to competitive priorities, manufacturing strategies, capacity building, and innovation trends. The motivation to carry this research is due to following gaps identified in literature.

- There are few studies that have been devoted to the analysis of 'service quality in supply chain' especially with manufacturing which indicates the lack of systematic effort in studying various aspects of service related issues in Indian context.
- Though, there are many qualitative studies on performances measurements (frameworks, guidelines, reviews etc.) but no study has focused on measuring the service quality in a quantitative frame work based on supply chain orientation.
- Much of the research in service quality has focused on exploring relationships between few intangible factors (service quality, satisfaction and loyalty) on different service sectors, except for manufacturing sectors.
- There does not appear a systematic effort to study upstream, organizational and downstream issues to investigate impact of service quality in supply chain.
- Most of the researchers considered only few factors to discuss the service quality. There is no available literature which considers the tangible and intangible factors both to measure the service quality.
- Most of the researchers discussed the various techniques which can be used to compare the factors or some techniques which can be used to find an index value, but none of them have been applied to find the value of service quality in supply chain in manufacturing industry in quantitative form.

Researchers suggest that service quality is positively associated with customer satisfaction (Izogo *et al*., 2015; Arasli *et al*., 2005). Studies establish a positive relationship of service quality with customer loyalty (Santouridis *et al*., 2012; Ganesan, 2007; Ehigie, 2006) too. Service quality is also linked to behavioral outcomes as Word-of-Mouth, complaint, recommending, and switching (Yavas *et al*., 2004).

In this paper, a focused review of literature was made to develop an instrument for conducting a questionnaire survey. Application of EFA, CFA and SEM brings out a model to answer these questions.

2. Literature Review

A close relationship between channel participants shares the risks and rewards and has willingness to maintain the relationship over the long-term (Kaynak, 2003; Cooper & Ellram, 1993). Carr and Pearson (1999) also found that strong collaborative long-term relationship with key suppliers have a positive influence on the firms' financial performance. Commodity knowledge, cultivation of qualified suppliers, and professionalism were rated as the three most important qualitative criteria (Jun & Cai, 2010). The continued association with partners enhances service quality of the channel. While there

have been studies concerning to product quality, very few have worked on facilitating the working of supplier firms in supply chain.

It is well recognized that SMEs lack resources such as, technical, financial, efficient distribution, skilled labor, etc. Lemma *et al*. (2015) viewed that one way to access these resources is to develop useful horizontal linkages with upstream (supply-related) and downstream (distribution-related) supply chain partners to earn the value from co-operative advantages. Inter-firm linkages can be broadly defined as a process of setting up a continuous business relationship between enterprises in commercially and economically advantageous activities for both parties involved.

Collaboration is a set of management levers that enables cost saving through transfer of best practices, improve effectiveness of decision making through sharing of opinion, induces innovation through cross-pollination of ideas and enhance capacity of collective action (Hansen & Nohria, 2004). Since much of the value addition occurs in the upstream stages (i.e. supply function) of the supply chain, manufacturers need to manage business-to-business relationships (B2B) with their suppliers. Coordination, collaboration, commitment, communication, trust, flexibility, dependence, joint engineering, and information technology based integration are possible if partners are contributing equal value (Govindan *et al*., 2010; Wouters *et al*., 2007). To manage collaborative relationships, it is critical to measure performance on service quality scales. Feedbacks on customer requirements, capabilities of the manufacturing unit and its suppliers, and ongoing collaborations are vital as they reveal the inner working of collaborative processes (Jagdev & Thoben, 2001).

In order to achieve results in the supply chain, it is critical to address supplier firms' issues through providing a nurturing and proactive work environment, and developing their competencies. By building each other's competencies and promoting a systems thinking can help eliminate functional bottlenecks, develop a process perspective, and direct competencies towards integrative efforts. Leading manufacturing organizations invest in skill up-gradation of supply chain partners by providing on-site training on quality, lean operations, process improvement, and product design (Johnsen, 2009; Grant, 2005). Various issues related to relationship management in supply chain with respect to the supply function are enlisted in table 1. Collaborative relationships characterized by trust and equitable win-win thinking, are the key to successful supply chains (Wu *et al*., 2010; Rogers *et al*., 2007).

Though, the output delivered by supplier firm is a well explored area in literature but studies on the applicability of service quality attributes at supplier-manufacturer interface are nascent. Thus there is a major scope for visualizing the attributes of supplier and manufacturer service quality, followed by developing a model to establish their linkages with satisfaction and loyalty.

Table 1
Relationship Issues at the Supplier-Manufacturer dyad

Type	Bilateral
Characteristics	Strength, Closeness, Physical proximity
Dimensions	Coordination, Collaboration, Commitment, Communication, Trust, Flexibility, Dependence
Development	Strategic/ Operational alignment
Infrastructure	Partner selection intangible criteria, tangible criteria
Information Exchange	Information Systems, Knowledge Transfer

Source: Prakash *et al*., 2011, Pagell *et al*., 2010, Johnsen, 2009

The study is conducted in exploratory framework using structured interview schedule. The framework shown in Fig. 1 represents the possible relationship among the variables, which will be tested.

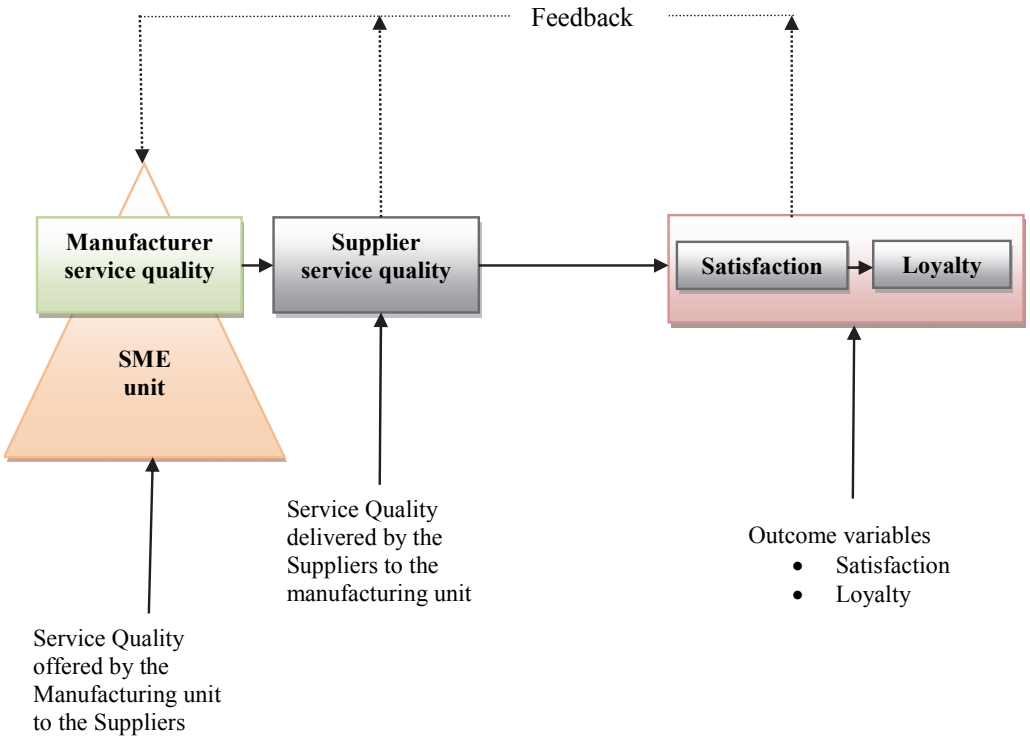

Fig. 1. Conceptual Research Framework

Parasuraman *et al*. (1985, 1988) in their pioneering work identified five components of service quality *viz*. reliability, assurance, tangibles, empathy, and responsiveness. These five dimensions used to evaluate service quality are called SERVQUAL dimensions. Carr (2007) proposed a major limitation of SERVQUAL scale by stating that it does not consider equity theory for selection of SQ determinants, though it is well established that SME suppliers as well as manufacturers do evaluate service by way of 'fairness' is often evaluated in business encounters.

Fig. 2. Relationship between Independent, Mediating and Dependent Variables

The hybrid scale comprising FAIRSERV (Carr, 2007), in conjunction with SERVQUAL (Parasuraman *et al*., 1988) is considered suitable for this study, since its outcome parameters are satisfaction and loyalty intensions. The preliminary questionnaire is on five attributes of SERVQUAL scale and "Systematic Fairness" dimension of FAIRSERV model. Taking cues from both existing scales to measure service quality, we have made a modest attempt at designing a new scale based on the combination of the two metrics. Fig. 2 depicts the relationship of the Exogenous, Intervening, and Endogenous variables used in this research.

3. Research Methodology

Fig. 3 shows the methodology used for determining factors of manufacturer and supplier service quality followed by establishing their linkages with satisfaction and loyalty. This work is based on studies conducted by Seth *et al*. (2006) and Prakash (2011).

The questionnaire was generated using with a focus on supply related issues using a combination of SERVQUAL (Parasuraman *et al*., 1985, 1988) and FAIRSERV (Carr, 2007) scales. It was refined after focus group discussion with five managers working in different SMEs and three academicians with work published in similar area.

The questionnaire thus emerged comprised four sections as follows:

- Section-A comprises 21 items related to service quality offered by the manufacturer towards supplier (MSQ) and 1 item measuring overall manufacturer service quality (OMSQ).
- Section-B consists of 24 items related to service quality delivered by supplier (SSQ) and 1 item measuring overall supplier service quality (OSSQ).
- Section-C consists of *two* outcome variables viz. *satisfaction* (mapped by 2 items) and *loyalty* (mapped by 3 items).
- Section-D focuses focused on gathering the demographic information.

The research methodology is based on empirical data collected through interview schedule. The objective of survey was to examine supplier service quality (internal & external) in supply chain with relevant data collected from Indian manufacturing small-medium manufacturing units. Research parameters (R-A-T-E-R-F) selected were based on insights gained through literature and extensive field visits as well as exploratory interviews with professionals.

The pilot study was conducted in May-July, 2017. The main survey was conducted from August 2017 to February 2018 by approaching working executives personally and in majority of cases, interviewer himself filling the questionnaire sitting along with them. The advantages of interviewer soliciting the question, details and explanations, an opportunity administer highly complex questionnaires, improved ability to contact hard to reach populations, higher response rates, and increased confidence that data collection instructions are followed (Froza, 2002). This was felt necessary in order to reach response rate of more than 50% in operations management discipline (Flynn et al. 1990). Kang & Bradley (2002) also recommended 'in- person distribution and collection method' for improving the response rate.

Some blank questionnaires were also left with some executives with some executive with a request of getting completed from executives known to them. A covering letter describing the objectives the research was also enclosed.

Prior appointments were arranged for explaining and distributing questionnaires majority of cases the responses from the executives were collected on the same day. Sometimes, on the request from the executives, the questionnaires were left with the executive and then collecting personally on the scheduled day. The purpose of this approach was to enhance the response rate and improve the quality of data.

The method of snowball sampling (Nargundkar, 2003) was used to execute this survey. The respondents were top executives of supplier firms working for small-medium manufacturing units located in North India. Respondents were asked to respond their perceptions of service quality that was being offered to them by manufacturing units manufacturing units on 5-point Likert scale. The researcher approached 165 respondents serving in different small-medium manufacturing units and was able to elicit data from 120 respondents, thus fetching a response rate of 73% which was quite satisfactory. Majority of the respondents belonged to the top management of unit including Proprietors, MDs, Unit Heads, Chief Works Managers, GMs, Sales Managers, Logistics In-charge, Executive Engineers, Heads of different departments & sections etc.

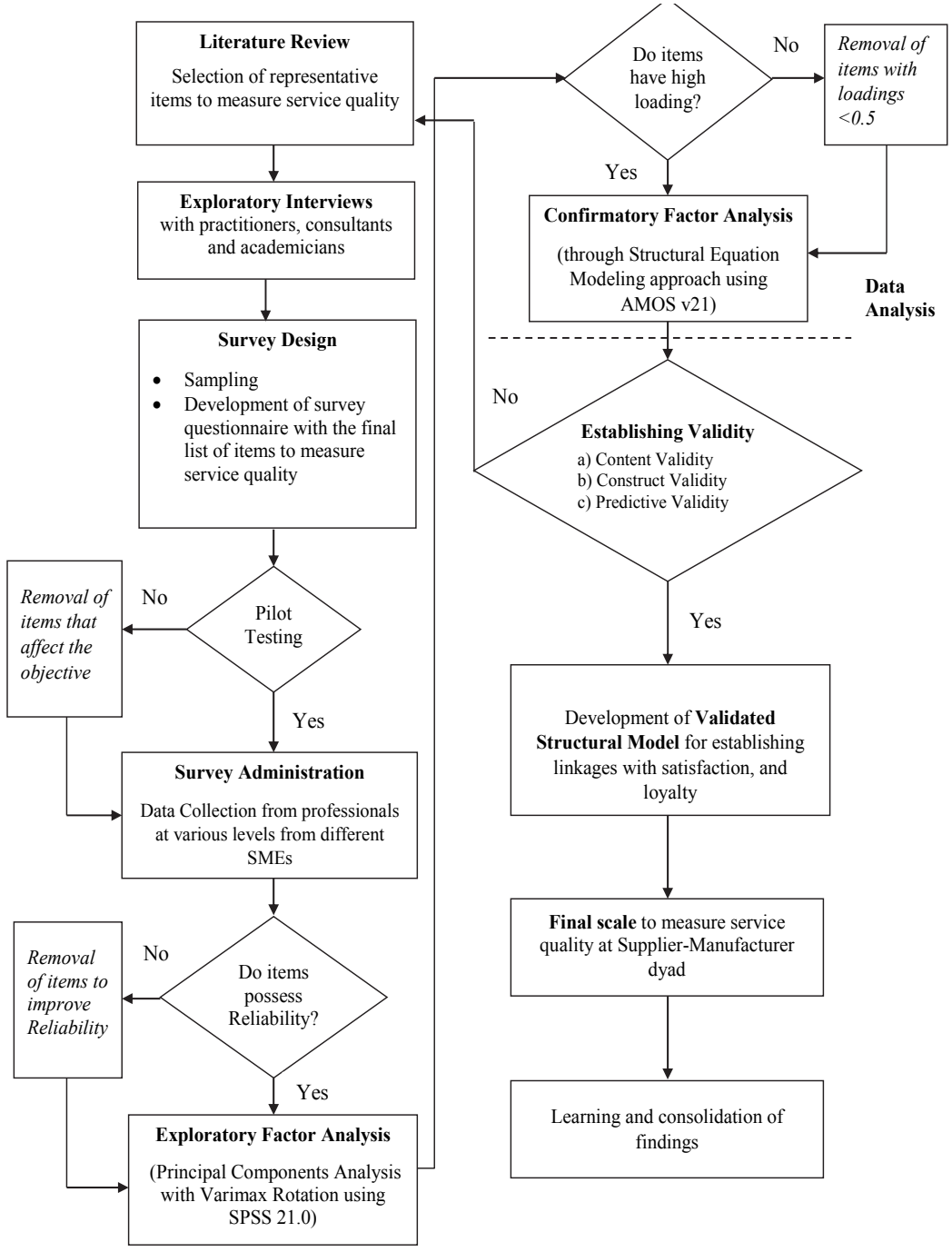

Fig. 3. Flow chart of research methodology adopted for measurement and modeling of service quality at Supplier-Manufacturer interface

The type of manufacturing activity being carried by the respondent units is shown in table 2.

Table 2
Type of product being manufactured by respondent units (N = 120)

Type of Manufacturing Unit	**Small Scale**	**Medium Scale**
Number & Percentage	87 (73%)	33 (27%)
Type of Product		
Auto Parts	26 (≈22%)	9 (≈8%)
Hand Tools	15 (≈13%)	5 (≈4%)
Casting Components	12 (≈10%)	4 (≈3%)
Valve manufacturing	9 (≈8%)	4 (≈3%)
Rolled Products	6 (≈5%)	4 (≈3%)
Machine Tools	6 (≈5%)	3 (≈2%)
Sheet Metal Components	5 (≈4%)	2 (≈2%)
Fasteners	4 (≈3%)	2 (≈2%)
Multi Products	4 (≈3%)	Nil

The demographic distribution of respondents is presented in Table 3. The respondents have been categorized on the basis of number of years of experience, qualifications, and functional area of work.

Table 3
Demographic distribution of respondents (N = 120)

Experience			**Qualification**			**Functional Area of work**		
Distribution	n	%	Distribution	n	%	Department	n	%
2- 5 years	42	35	MBA/M.Tech./M.Sc.	16	13	Procurement	48	40
6-10 years	24	20	BBA/B.Tech./B.Sc.	43	36	Inventory/Store	28	23
11-15 years	26	22	MA/BA/B.Com.	24	20	Marketing/Sales	20	17
16-20 years	16	13	Technical Diploma	22	18	Production	14	12
above 20 years	12	10	Intermediate/below	15	13	Quality Control	10	08

We find that most of the respondents have work experience in the range 2 to 10 years, hold engineering qualification, and work in the areas of personnel management.

4. Data Analysis

Since the factors of the scale along with indicators used to measure MSQ and SSQ are synthesized from the literature, the imperative is first to assess the scales for reliability, EFA and CFA.

4.1. Reliability Analysis

The reliability of both MSQ and SSQ scales was analyzed using Cronbach alpha coefficient (Cronin & Taylor 1992; Lee *et al*., 2000) using IBM SPSS v21 and the output is depicted in table 4.

Table 4
Reliability Analysis of items in MSQ and SSQ scale

Service Quality Measurement	MSQ items (n = 21)	SSQ items (n = 24)
Value of α	0.926	0.897
Finding	Quite Good (Nunnally & Bernstein, 1978).	

4.2. Exploratory Factor Analysis (EFA)

EFA is a multivariate statistical technique commonly used to explore the dimensionality of a measurement. The IBM SPSS v21 was used for this purpose. The main objective of using EFA in this paper is to group the factors into various sub-groups for making further analysis simpler. Prior to application of EFA, Bartlett test of Sphericity is used to verify appropriateness of factor analysis (Hair

et al., 2010). To check whether the sample size is adequate or not, Kaiser-Meyer-Olkin (KMO) test of sample adequacy (N= 120, in this case) and significance value was performed. The value of KMO greater than 0.6 with the value for significance less than 0.005, indicate data size is sufficient for grouping the various relevant factors (Tabachnick & Fidell, 2007). The score of Bartlett test of sphericity and the KMO value is depicted in Table 5.

Table 5
KMO and Bartlett's Test of Sphericity

KMO Measure for Sampling Adequacy		**MSQ scale**	**SSQ scale**
		.888	.880
Bartlett's Test of Sphericity	2101	2101	2221
	210	210	231
	.000	.000	.000

The results being significant, indicate the suitability for factor analysis (Hair *et al*., 2010).

EFA conducted using the Principle Component Analysis (PCA) with Kaiser Normalization (Eigen values greater than 1) and varimax rotation procedure resulted in the extraction of five factors each for MSQ and SSQ scale, explaining 74.802 and 73.301 per cent of the variance respectively. These factor loadings are consistent with the suggested factor structure of the scale. Output of exploratory factor analysis using SPSS v21 is presented in Table 6 and Table 7.

Table 6
Communalities, Factor Structure and Loadings for Items of MSQ

S. No.	**Factors and Associated Items**	**Communalities**	**Factor Structure and loadings**			
Assurance						
1.	Long term collaborative relationship	.859	.879			
2.	Purchase orders are timely and accurate	.851	.881			
3.	Has modern and adequate physical facilities	.851	.882			
4.	Possesses right tools and equipment	.821	.890			
5.	Terms & conditions are fair with supplier	.735	.822			
6.	Confidentiality in transactions	.698	.699			
Communication						
7.	Honest in providing information/ financial data	.792		.854		
8.	Pays attention to suppliers' views in dealings	.540		.667		
9.	Shares information related to inventory	.647		.756		
10.	Inform changes in manufacturing schedule	.760		.833		
11.	Prompt feedback about quality of products	.816		.853		
12.	Have latest IT infrastructure	.635		.761		
Alignment						
13.	Flexible approach in dealing with suppliers	.693			.736	
14.	Shares company's future plans with suppliers	.819			.820	
15.	Equitable sharing of responsibilities	.803			.811	
16.	Shares knowledge/training/innovation base	.863			.852	
17.	Based at convenient & approachable location	.865			.869	
Responsiveness						
18.	Willingness to share supplier problems	.698				.814
19.	Supplier's queries are heard & solved promptly	.604				.735
20.	Respect and positive attitude for supplier	.730				.828
21.	Values convenience of suppliers	.630				.714
Reliability (Cronbach Alpha Value) of identified factors			**.947**	**.911**	**.939**	**.814**

Principal Component Method with Varimax Rotation Loading ≥ .56 (Pitt *et al*., 1995)

As shown in above Table 6, the extracted factors were named as: Assurance, Communication, Alignment, and Responsiveness. All the items have significant communalities (not less than 0.50) (Hair *et al.*, 2010) and significant factor loadings (not less than 0.55) (Pitt *et al.*, 1995). Internal reliability of the items of the various factors of the MSQ scale is examined using the Cronbach alpha coefficients (Bagozzi & Yi, 1988). In this analysis, reliability score for each factor ranges from 81.4% to 94.7 % as shown in Table 6 and hence is acceptable (Nunnally & Bernstein, 1978).

Likewise on the SSQ scale, the five factors were named as: *Credibility*, *Relationship*, *Alignment*, *Understanding*, and *Dependability*. All the items have significant communalities and factor loadings. The reliability score for each factor ranges from 83.6% to 95.1% as shown in table 7 and hence is acceptable.

Table 7

Communalities, Factor Structure and Loadings for Items of SSQ Scale

S. No.	Factors and Associated Items	Communalities	Factor Structure & loadings				
Credibility							
1.	Supplier has strong market reputation	.707	.766				
2.	Supplier has financial strength	.854	.866				
3.	Supplier has flexibility to change product design	.792	.864				
4.	Supplier has required knowledge/expertise/skills	.794	.843				
5.	Has competent & technically sound employees	.813	.846				
6.	Supplier is innovative in operations	.745	.797				
7.	Supplier has latest IT infrastructure	.792	.872				
Relationship							
8.	Supplier has long-term relationship with your unit	.677		.622			
9.	Supplier agrees to flexible terms & conditions	.736		.702			
10.	Supplier has willingness to serve your unit	.645		.646			
11.	Supplier's employees are polite & courteous	.689		.698			
12.	Supplier is fair in dealings with your unit	.720		.700			
13.	Terms & conditions with your unit are fair	.763		.686			
Alignment							
14.	Supplier uses right tools/equipment/technology	.712			.812		
15.	Supplier has modern & certified facilities	.775			.859		
16.	Supplier is easily approachable	.695			.815		
17.	Supplier has quick solutions to failures/complaints	.706			.884		
Understanding							
18.	Supplier understands requirements of your unit	.689				.778	
19.	Supplier values your convenience	.726				.827	
20.	Shares work related information and knowledge	.682				.801	
21.	Honest in providing information/access to you	.646				.753	
Dependability							
22.	Delivers right quality and quantity in right time	.848					.857
23.	Supplier charges minimum price for supplies	.812					.849
24.	Supplier maintains confidentiality in operations	.766					.836
Reliability (Cronbach Alpha Value) of identified factors			**.894**	**.951**	**.861**	**.836**	**.872**

Principal Components Method with Varimax Rotation Loading ≥ .53 (Pitt *et al*., 1995)

4.3. Confirmatory Factor Analysis (CFA)

CFA is undertaken to further validate the scales for measuring MSQ and SSQ. CFA model is run using SPSS AMOS v21, for 4 individual factors describing MSQ scale and 5 factors describing SSQ scale, with respective items. Table 8 shows the key model fit indices for the individual factors.

Table 8
Key fit Indices for measurement model of MSQ and SSQ scale

MSQ scale						
Factors	**C**min/**df**	**RMR**	**GFI**	**NFI**	**CFI**	**RMSEA**
Assurance	1.346	.009	.982	.991	.998	.054
Communication	1.337	.024	.970	.978	.994	.053
Alignment	.760	.008	.990	.994	1.000	.000
Responsiveness	.367	.012	.997	.995	1.000	.000
SSQ scale						
Factors	**C**min/**df**	**RMR**	**GFI**	**NFI**	**CFI**	**RMSEA**
Credibility	.496	.007	.987	.994	1.000	.000
Relationship	.968	.018	.982	1.000	1.000	.000
Alignment	3.232	.018	.974	.972	.980	.037
Understanding	.529	.013	.996	.994	1.000	.000
Dependability	---	.000	1.000	1.000	1.000	---

Since all the GFI values are greater than 0.9, the validation of individual factors of CFA models is established (Hair *et al*., 2010).

4.4. CFA matrix development and scale purification

4.4.1. CFA matrix development for MSQ and SSQ scale

In order to develop the measurement scale, the covariance matrices between the four factors identified for MSQ scale and five factors identified for SSQ scale was created as shown in Fig. 4 and Fig. 5.

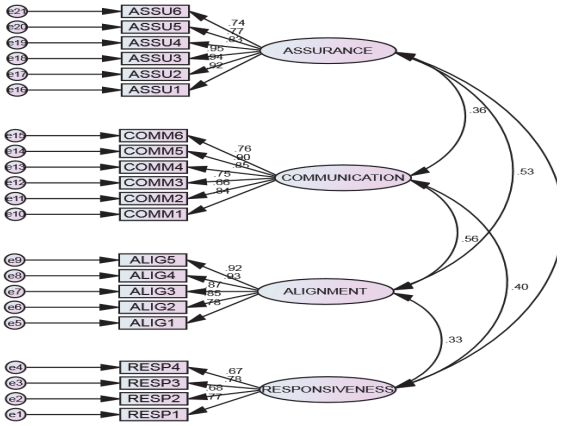

Fig. 4. Theoretical framework for development of MSQ Scale

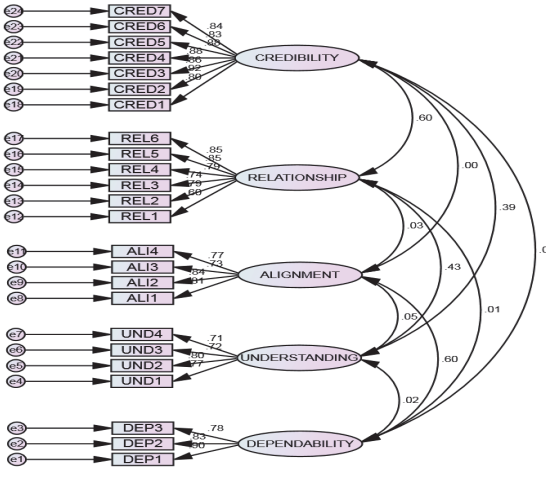

Fig. 5. Theoretical framework for development of SSQ Scale

4.4.2. CFA matrix purification for MSQ and SSQ scale

For purification of MSQ scale, three iterations runs of CFA were performed to obtain satisfactory goodness of fit indices. During this process, 5 items out of initial 21 items were deleted due to low explained variance. The five items were:

i. the manufacturing unit maintains confidentiality in transactions;
ii. the unit possesses the latest information technology infrastructure;
iii. the unit pays attention to suppliers' views in dealings;
iv. the unit has an equitable sharing of responsibilities with the supplier firm; and
v. the unit is based at convenient & approachable location.

The final model consisting of four attributes and 16 unique sub-factors is depicted in Fig. 6.

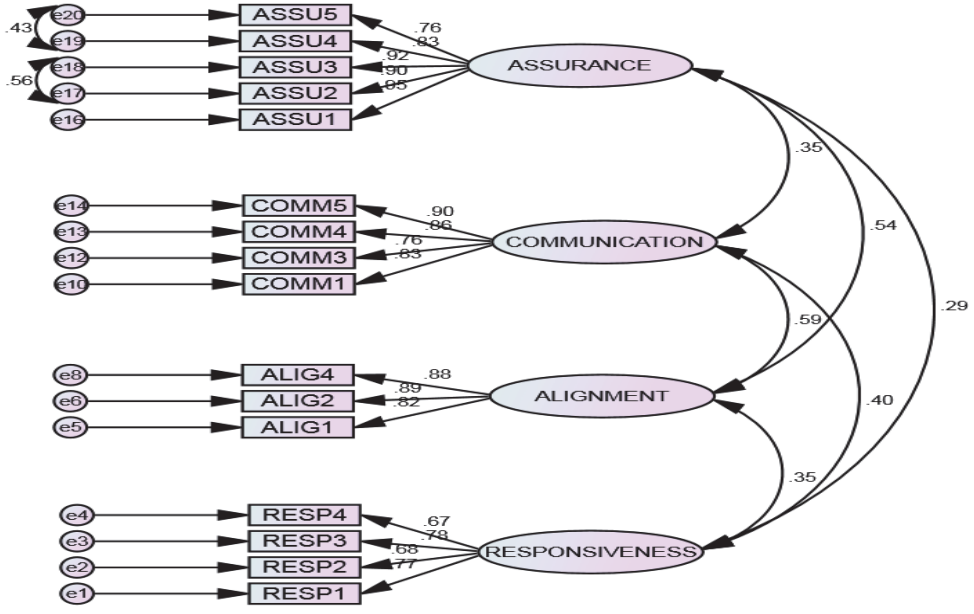

Fig. 6. CFA Model Development for measuring MSQ

Various goodness-of-fit indices are obtained by running the model using AMOS v 21. The Normed Chi-square value for this model is 0.993, which represents a good fit. The acceptable ratio of Normed Chi-square value is up to 3 or even 5 (Hooper *et al*., 2008; Hox & Bechger, 1998). The Goodness-of-Fit Index (GFI), the Comparative-Fit-Index (CFI) and the Normed-Fit-Index (NFI) values for this model were 0.913, 1.000, and 0.937 respectively. The RMSEA value of 0.000 indicates a perfect fit. From these values it is inferred that model represents an adequate fit.

Likewise for SSQ scale, five iterations runs of CFA were performed to obtain satisfactory goodness of fit indices. During this process, one dimension viz. *Alignment*, was completely dropped. In total, 11 out of an initial 24 items were deleted owing to low variance. The deleted items were:

i. the supplier has financial strength
ii. the supplier has required knowledge/expertise/skills
iii. the supplier firm has latest infrastructure;
iv. the supplier has willingness to serve your unit
v. the supplier is fair in dealings with your unit

vi. terms & conditions with the unit are reasonable
vii. the supplier uses right tools/equipment/technology
viii. the supplier has modern & certified facilities
ix. the supplier is easily approachable
x. the supplier has quick solutions to failures/complaints
xi. the supplier maintains confidentiality in operations

The final model consisting of 4 factors and 13 sub-factors is depicted in Fig. 7.

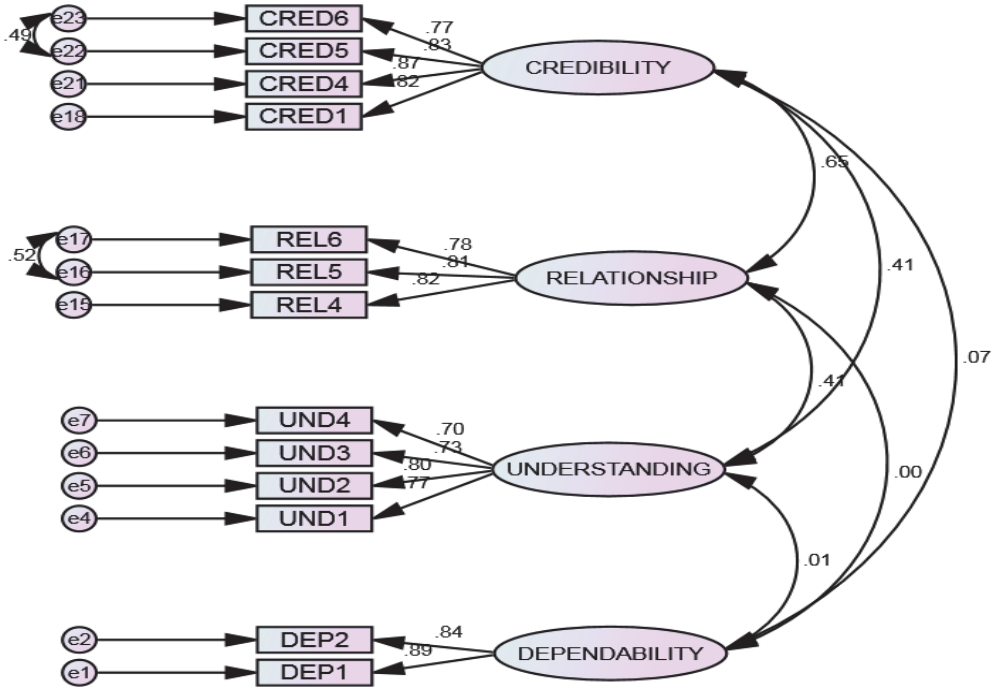

Fig. 7. CFA Model Development for measuring SSQ

The Normed Chi-square value for this model is 1.342, which represents a good fit. The GFI, CFI, and NFI values for this model were 0.911, 0.977, and 0.918 respectively. The RMSEA value of 0.054 indicates a reasonable fit. From these values it is inferred that model represents an adequate fit.

5. Conceptual Model and Analysis

The following two models have been conceptualized:

- **Model-I** to examine the impact of *Manufacturer service quality* on *Supplier service quality*,
- **Model-II** to examine the impact of *Supplier service quality* on *Satisfaction*, and *Loyalty*.

5.1. Model-I

This model is conceptualized to evaluate the impact of MSQ on SSQ. Fig. 8 depicts schematic diagram of structural relationship between exogenous latent variable MSQ and endogenous latent variable SSQ using factors of the scales as identified by EFA followed by CFA.

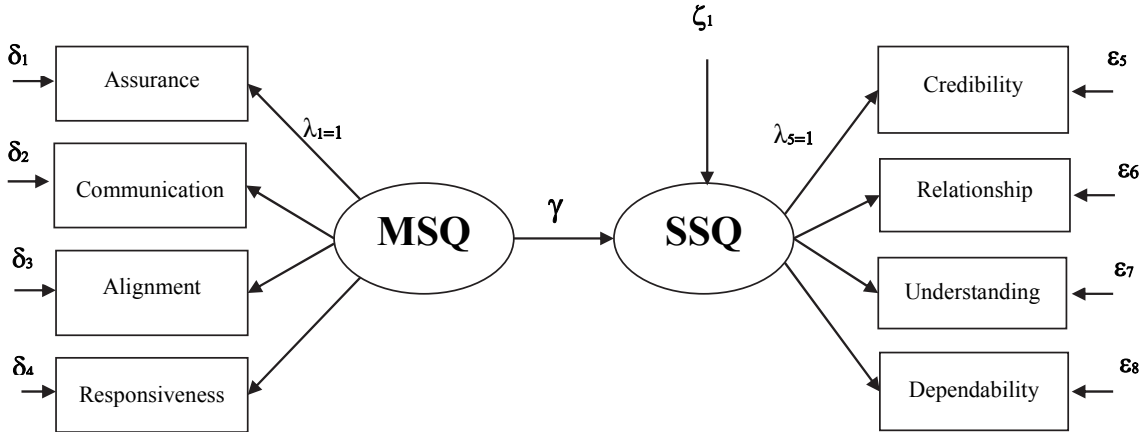

Fig. 8. Conceptual Model representing the relationship between MSQ and SSQ

Notations:

λ: Factor loadings in measurement part of MSQ/SSQ
δ: Residual errors in measurement part of MSQ
γ: Path Coefficient from MSQ to SSQ
ε: Residual errors in measurement part of SSQ
ζ: Residual error in SSQ

5.1.1. Analysis of Model-I

Proposition 1: *Manufacturer service quality* is a source of *Supplier service quality*. The following hypothesis is developed for testing this relationship:

S. No.	Null Hypothesis (H_0)	Alternative Hypothesis (Ha)
H_1	Path coefficient γ is not significantly different form 0.	*Manufacturer service quality* is positively linked to *supplier service quality*.

5.1.2. Model Fit

Various goodness-of-fit indices are obtained by running the model using AMOS v21. The Normed Chi-square value for this model is 1.657, which represents a good fit. The GFI, CFI, and NFI values for this model were 0.945, 0.977, and 0.944 respectively. The RMSR value of 0.027 and RMSEA value of 0.074 also indicates a reasonable fit. Fig. 9 depicts the pictorial representation of various path estimates of the model-I.

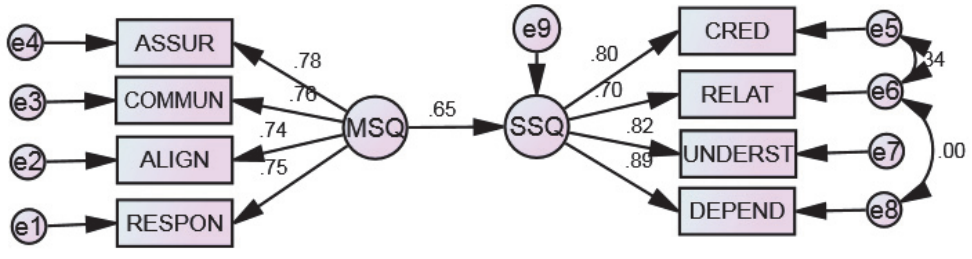

Fig. 9. Path estimates of Model-I

Various path estimates between exogenous and endogenous latent variables of the model-I are depicted in Table 9. All the regression weights were significant which is in line with the hypothesized relationships.

Table 9
Regression Weights for Model-I

Path	Standardized Regression Weight Estimate
MSQ to SSQ	0.65
MSQ to Assurance	**0.78**
MSQ to Communication	0.76
MSQ to Alignment	0.74
MSQ to Responsiveness	0.75
SSQ to Credibility	0.80
SSQ to Relationship	0.70
SSQ to Understanding	0.82
SSQ to Dependability	**0.89**

The regression weight for the *Assurance* dimension was highest for *manufacturer service quality* (MSQ) towards *supplier*, whereas the regression weight for *Dependability* was highest for measuring *supplier service quality* (SSQ) in such units. The Standardized Regression Weight for the path linking exogenous latent variable *manufacturer service quality* to endogenous latent variable *supplier service quality* was 0.65 which was found to be significant at a significance level of 5%. Therefore, the alternative hypothesis H_a of MSQ positively impacting the SSQ is accepted.

5.2. Model-II

The model-II is conceptualized to understand the relationship between MSQ and SSQ with *satisfaction* and *loyalty* at manufacturing unit-supplier interface. The conceptual structural model for this relationship is depicted in Fig. 10.

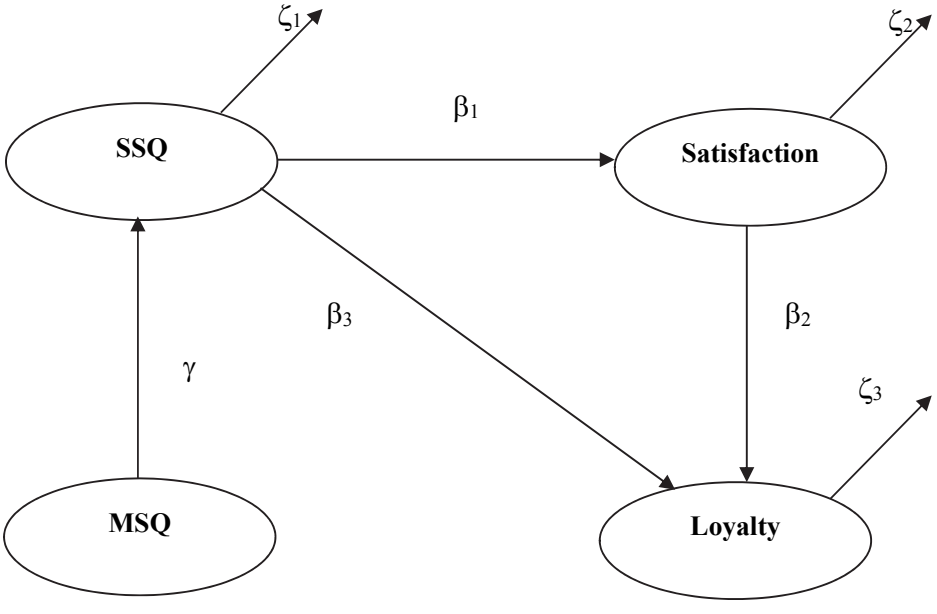

Fig. 10. Conceptual Structural Model-II

Notations:

γ: Path Coefficient from MSQ → SSQ

$\beta_1, \beta_2, \beta_3$: Path Coefficients from SSQ →Satisfaction; Satisfaction →Loyalty, SSQ → Loyalty, resp.

$\zeta_1, \zeta_2, \zeta_3$: Residual error in measurement of SSQ, Satisfaction, and Loyalty respectively

5.2.1. Analysis of Model-II

Proposition 2: *Supplier service quality* is a source of *Satisfaction*.
Proposition 3: *Satisfaction* is a source of *Loyalty*.
Proposition 4: *Supplier service quality* is a source of *Loyalty*.
The following hypotheses are developed for testing this relationship:

S. No.	Null Hypothesis (H_0)	Alternative Hypothesis (Ha)
H_2	$H_0$2: Path coefficient β_1 is not significantly different from 0.	H_a2: SSQ is positively linked to *Satisfaction*.
H_3	$H_0$3: Path coefficient β_2 is not significantly different from 0.	H_a3: *Satisfaction* from the *supplier* is positively linked to *Loyalty*.
H_4	$H_0$4: Path coefficient β_3 is not significantly different from 0.	H_a4: *SSQ* is positively linked to *Loyalty*.

5.2.2. Model Fit

Various goodness-of-fit indices are obtained by running the model using AMOS v21. The Normed Chi-square value for this model is 1.607, which represents a good fit. The GFI, CFI, and NFI values for this model were 0.941, 0.946, and 0.978 respectively. The RMSR value of 0.070 and RMSEA value of 0.071 indicate a reasonable fit.

Fig. 11 depicts the pictorial representation of various path estimates of the model-II.

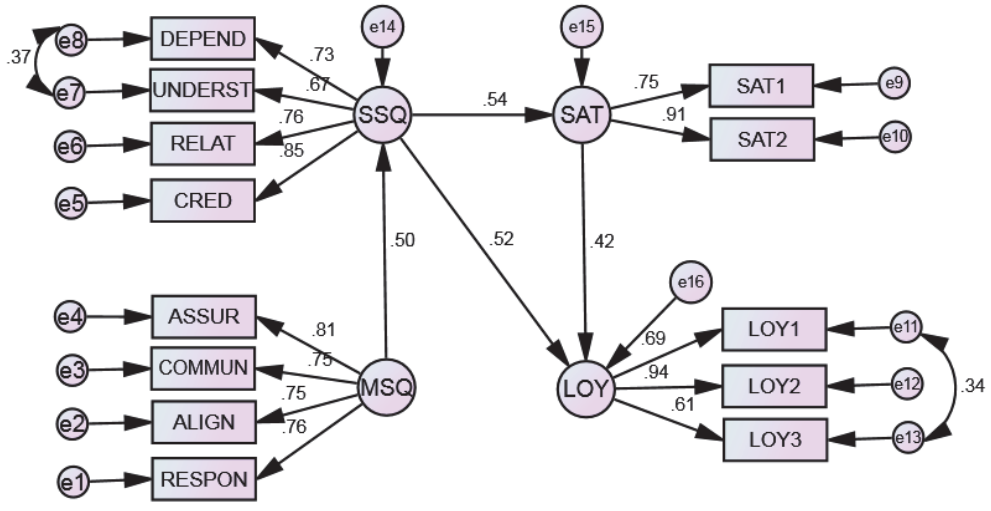

Fig. 11. Path estimates of Model-II

Various path estimates among latent variables of the model-II are depicted in table 10. The positive signs of the parameters representing the paths between the latent variables are in line with hypothesized relationships.

Table 10
Results for Structural Relationship in the Model-II

Path	Estimate	t value*	Conclusion
SSQ to Satisfaction	0.54	6.178	Supported
SSQ to Loyalty	0.52	3.568	Supported
Satisfaction to Loyalty	0.42	3.770	Supported

*-1.96 < t < 1.96 indicate that parameter is not significantly different from zero at 5% level of significance.

The Standardized Regression Weight for the path linking *SSQ* to *Satisfaction* was 0.54 which was found to be significant at a significance level of .05. Therefore, the alternative hypothesis H_a2 of *Supplier service quality* (*i.e.,* service quality delivered by the supplier) positively impacting the *Satisfaction* of manufacturer is accepted.

The Standardized Regression Weight for the path linking *Satisfaction* to *Loyalty* was 0.42 which was found to be significant at a significance level of 5%. Therefore, the alternative hypothesis H_a3 of *Satisfaction* perceived by manufacturer from the services delivered by Supplier positively impacting the *Loyalty* is accepted.

The Standardized Regression Weight for the path linking *SSQ* to *Loyalty* was 0.52 which was found to be significant at a significance level of 5%. Therefore, the alternative hypothesis H_a4 of *SSQ* positively impacting the *Loyalty* is accepted.

6. Conclusions

The present study was intended to study a) *Service quality* offered by the manufacturing unit (MSQ) towards facilitation of working of its supplier; b) *Supplier service quality* (SSQ) delivered by supplier; and c) the relationship of these constructs i.e. MSQ and SSQ with *satisfaction* and *loyalty* measures. The insights provided by this study can help managers and researchers in further understanding the service quality issues relating to the supply function in SMEs. This paper also comes out with a set of four hypotheses as enumerated in previous section at supplier-manufacturer interface. Some of the typical benefits of the proposed scales are as follows:

i. The proposed structure fills the gaps that exist in the conceptualization of service quality issues related to purchasing and supply functions in small-medium enterprises of emerging economies like India. The study brings out useful determinants (four each) to measure both MSQ and SSQ. The scores on individual sub-dimensions indicate suggestions for improvements to managers along those areas.
ii. The MSQ and SSQ scales can also be used as diagnostic tools for identifying poor and/or excellent performance to benchmark across multiple departments within a single manufacturing unit. Furthermore, any of these situations can also be compared across time.
iii. The study also derived linkages between *MSQ* and *SSQ* with *satisfaction* and *loyalty* based on structural equation modeling. Operations improve process and design quality, reduce waste, fine-tune internal processes and develop synchronized linkages with suppliers and distributors, and thereby achieve operational efficiencies. By way of cost reduction and increase in product and service reliability, these operational efficiencies improve the attractiveness of the products and services. In the market, improved service quality enhances satisfaction and loyalty of suppliers, and lures them away from competitors who are perceived low in service quality.
iv. Thus, to achieve loyalty, it is vital for supply chain stakeholders to coordinate, synchronize and integrate their activities to produce desired outputs by incorporating service quality initiatives.

However, these findings can be extended to add distributor, retailer and end user's perspective. Traditionally, service quality driven operations have been overlooked in such units with an understanding that transaction specific opportunistic approach may work best for SMEs.

Mohanty *et al*. (2014) argue that in the supply of raw materials, the quality of service is a major factor in competition. This may be more relevant in the SME clusters where manufacturers produce intrinsically similar products. This study demonstrates that high service quality is increasingly important as a tool which is used by the supplier towards their manufacturers. The service quality provided by the supplier and manufacturer to each other helps in establishing close relationships. Close relationships are important in creating mutual commitment and understanding. Various empirical studies on the supply function demonstrate that satisfaction is derived from relationships between the supplier and the manufacturer. The findings of this study are in line those of other scholars who report that satisfaction results from satisfaction with products and services (Prakash *et al*., 2014) and satisfaction with various facets of the manufacturing organization (i.e., manufacturers) such as financial or social aspects (Sanzo *et al*., 2003).

In order to compete globally, these units need to benchmark themselves against quality standards and practices of small manufacturers in countries such as USA, the European Union, and Japan. Nevertheless, in their quest for excellence, these units should evolve at a fast pace, and shift from rigid traditional structure to more responsive and customer-centric business models, replacing vertical business process with horizontal business processes so as to increase organizational and process flexibility, and sharing information with their stake-holders and coordinate processes leading to effective and timely decision making and responsiveness to customer needs.

In a nutshell, the honest sharing of operational information, integrating supply chain strategy, promptness in handling queries or failures, meeting deadlines, maintaining secrecy in dealings, flexibility in terms and conditions as per requirements, and preference for long-term collaborative relationship are few attributes that need to be incorporated at various supplier-manufacturer dyad of the supply chain.

At this point it is essential to offer a caveat that some scholars have suggested that SME managers, instead of building relationships with suppliers, still adhere to practices such as competition between suppliers to drive down prices, and weeding out suppliers who do not provide competitive prices (Amad et al., 2008). Grant (2005) has suggested that in the case of logistics based services, there is often a dichotomy in what manufacturers say that they consider as desirable (relationship with supplier), and what they actually practice (transaction-specific behavior). However, this dichotomy has so far not been resolved in this study.

7. Limitations of the Study

In this research, an attempt was made to study and evaluate supplier service quality in supply chain. Supplier Service quality is a main concern in supply chain and provides a useful framework to explore consequences of service quality for the upstream chain and reports a strong significance. Limitations of this study are as follows:

1. Though large number of factor has been considered for evaluation, some external factors like legal, political etc. not considered.
2. Factors for this study have been identified from the available literature which published in various reputed journals. There are chances that more research articles can be cited which are not included in the present research.
3. This study is based on the collection of data with the opinion of experts, hence there is a chance of biasing.

4. The data collection is for manufacturing supply chain only.
5. This study used survey method which was restricted to North India, while application of this methodology in other regions may change the predict result of this study.

8. Scope for Future Research

There are always chances of improvements in every work or research. Following are the expected scope for future work:

- The data collection approach used in the present study was snow ball sampling method, other sampling methods may be adopted for the same purpose.
- As EFA, CFA, and SEM were used to evaluate the service quality in present study, some other MADM technique may be used for the same purpose.
- This study was restricted to northern region of India, other regions of India may be considered for the same study.
- Some more number of factors may be identified for each drives of supply chain.
- The study considered supplier supply chain in this study in a manufacturing chain, others supply chains may be considered.

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