

# Supplier-Buyer Relationships In Indian Manufacturing Environment: An Empirical Study

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**Abstract**— This paper presents an empirical study of supplier-buyer relationships practices in the Indian manufacturing industries. Although the research in the area of supply chain management (SCM) has grown in recent time, the literature has yet to furnish an accepted explanation for supplier-buyer relationships are to be manifested in SCM given external and internal uncertainties to explore procurement flexibility. These manufacturing industries have been involved in such supplier-buyer relationships management practices to the extent of their participation as suppliers, distributors and in other capacities as business partners. This study confirms and validates that Indian manufacturing industries' are facing significant pressures from external as well as internal stakeholders to adopt such relationships practices. Initial results gave a better understanding of which procurement flexibility is preferred when facing different environmental challenges. The results indicate strong, positive, and direct relationships between factors affecting supplier-buyer relationships and external as well as internal uncertainties.

**Keywords**— supplier-buyer relationships; procurement flexibility; empirical study; manufacturing industries; multiple linear regression

## I. INTRODUCTION

The term supply chain management (SCM) was introduced in the 1980s and the concept has changed quite in the past decades. Its function has always been procurement, manufacturing, distribution, marketing and after sales service. There are several players with conflicting objectives in every supply chain network; the conflicting objectives of such players have led to delays, excessive inventory, lack of production capacity, material distribution problems, poor customer service, and wasted resources. Important link in supply chain exist on the upstream section of the supply chain network i.e. between manufacturer and his suppliers. All the entities in supply chain are suppliers and manufacturers who add value along the supply chain. A successful relationship is one in which there is mutual sharing of risk and rewards, clear understanding of each other's roles and responsibilities, high level of commitment and trust, long-term orientation, mutual information sharing, a sincere desire to win and responsiveness towards each other's and end customer's need. A supply chain network consists of supplier, manufacturer and customer, as shown in Fig. 1.

Supply chain is a network of facilities and distribution options that performs the functions of procurement of

materials, transformation of these materials into intermediate and finished products and delivery to customers.



Fig 1. Schematic representation of a typical supply chain

SCM has been defined in several ways by incorporating the end-to-end activities such as purchasing, manufacturing, selling, marketing, after sales service and management of various relationships with suppliers and customers. SCM should not be confused with supplier management. SCM covers a far broader scope

Manufacturers face an increasingly uncertain internal as well as external environment. Therefore, in today's competitive environment, it is critical that manufacturing industries have organizational flexibility in real time to respond to environmental uncertainties. Flexibility is the organization's ability to meet an increasing variety of customers' expectation without additional costs, time, organizational disruptions, or performance losses. It is widely argued that in order to be competitive, it is critical that manufacturing industries organizations respond to such uncertainties as rapidly as possible.

To be competitive and enhance their competitive advantage, manufacturers also create strategic alliances; i.e. relationships with their suppliers and buyers via transferring information and materials/product flow to each other. Consequently, developing and maintaining flexible and responsive supply chain networks could make the difference between survival and demise for manufacturing firms and, consequently, the supply chain networks' future competitiveness and the continued survival of the entities within them.

The supplier-buyer relationship role is repeated along the supply chain network between the entities. Although the activities between the various entities along the supply chain network are different and independent of each other, desirable flexibility elements and dimensions remain the same; hence, the supplier-buyer flexibility elements and dimensions are repeated along the supply chain network, but in different environments and situations.

There is, however, inadequate research in the Indian manufacturing sector in terms of supplier capabilities or

procurement activities. The current research is developed to fill that gap by identifying the various constraints and strategic procurement activities of Indian manufacturers.

## II. REVIEW OF LITERATURE

It can be seen that the globally acceptable definition of SCM does not exist. The common thread in any definition is that SCM seeks to integrate performance measures over multiple firms or processes, rather than taking perspective of a single firm or process. The study of Koste and Malhotra (1999) have pointed out the relationship between the different flexibility dimensions and come to a hierarchy of flexibility dimensions, also called a vertical classification as shown in Fig. 2. This hierarchy consists of different tiers in which the lower tiers, which are more tactical, contain the flexibility dimensions that serve as building blocks for the upper tiers, which are more strategic.

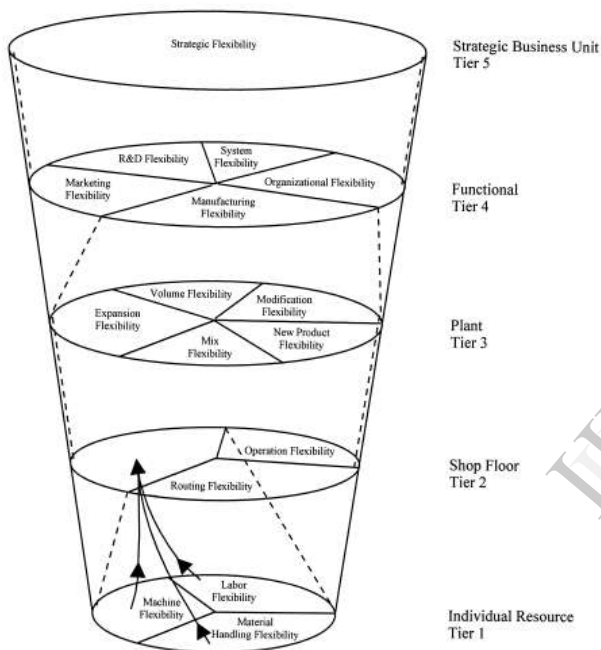


Fig. 2. Hierarchy of flexibility dimensions (Koste and Malhotra, 1999)

Majority of literature speaks about concept of organizational structural design but establishing the compatibility and capabilities of the existing organizational structure needs more efforts. It is also necessary for all the organizations involved in the supply chain to think alike and ensure that their links are connected smoothly (Handfield and Betchel 2002).

Buyer supplier relationship depends upon strategic requirements of the organization, supplier performance, mode of operation and personal factors. Strategic issues may be who to choose as a partner and for what type of product or service. Out of these mode of operation may be pricing, structure, information exchange levels, technology are qualitative and rest three i.e. business area, product or process are quantitative (Mohanty and Gahan 2012). Researchers have found few parameters like innovation and technology, strategic collaboration and new product influencing supplier-manufacturer relationship.

### 2.1 Framework for supply chain performance measurement

Framework for measurement of performance of any supply chain depends on the extent to which flexibility can be achieved. Supply chain needs to be flexible so as to accommodate foreseen and unforeseen uncertainties in supply chain environment. It is imperative to identify the uncertainties based on which flexibility dimensions are decided. After determining dimensions, a mechanism is required to be evolved to measure the extent of achievement. This is done by deciding the appropriate elements.

#### 2.1.1 Uncertainty

Uncertainty can be defined as the state of being unsure of something due to some reasons. Uncertainty affects the internal as well as external business environment in which firms compete and is changing continuously. The literature available on uncertainty is scattered and does not pinpoint the specific sources of uncertainty. Important sources of uncertainty identified in the literature and inherent in a supply chain are customer demand (Davis 1993; Gerwin 1993; Wilding 1998; Petrovic et al. 1999; Li et al. 2001; Simangunsong et al. 2012), customer reliability (Gerwin 1993; Petrovic et al. 1999; An-Yuan Chang 2011). Additionally, raw materials prices (Badri et al. 2000; Priem et al. 2002; An-Yuan Chang 2011), raw materials availability (Swamidass and Newell 1987; Anupindi and Akella 1993; Wilding 1998; Gullu et al. 1999; Badri et al. 2000; An-Yuan Chang 2011), inflation (Davis 1993; Simangunsong et al. 2012), technology (Swamidass and Newell 1987; Gerwin 1993; Simangunsong et al. 2012), productivity (Davis 1993; Gerwin 1993; Li et al. 2001; Priem et al. 2002; Simangunsong et al. 2012), quality and quality of supply (Davis 1993; An-Yuan Chang 2011), and price variations due to exchange rate fluctuations (Badri et al. 2000; Priem et al. 2002; An-Yuan Chang 2011) are other sources for uncertainty. Moreover, increasing global competition (Badri et al. 2000; Priem et al. 2002; Simangunsong et al. 2012), accelerating technological change (Badri et al. 2000; An-Yuan Chang 2011), and expanding customer expectations (An-Yuan Chang 2011) are creating a turbulent environment.

It can therefore be seen that the factors of uncertainty are derived from two areas, namely external and internal. In any supply chain, it is expected that, the uncertainties within nodes i.e. internal uncertainties should be taken care of by concerned node / organization. The uncertainties causing due to external factors are environmental uncertainty. The internal uncertainties represent the ability of the system to adapt, whereas the external uncertainties are market-oriented representing the ability of the system to meet customer demands.

#### 2.1.2 Flexibility Dimensions

Dimension is defined as the competence and capabilities, which is related to the characteristics and functions of the situation / system. Flexibility is a complex concept partly because of its multidimensional construct. The literature classifies flexibility as shown in TABLE 1.

TABLE 1. SUPPLY CHAIN FLEXIBILITY DIMENSIONS

Functional aspects: operations, marketing and logistics	Browne <i>et al.</i> 1984; Sethi and Sethi 1990; Gupta and Somers 1996; Koste and Malhotra 1999; Vickery <i>et al.</i> 1999; Vokurka and O'Leary-Kelly 2000; D'souza and Williams 2000; Beach <i>et al.</i> 2000; Zhang <i>et al.</i> 2002; Duclos <i>et al.</i> 2003; Lunnus <i>et al.</i> 2003; Koste <i>et al.</i> 2004; Sanchez and Perez 2005; Fantasy <i>et al.</i> 2010; Chau 2011.
Hierarchical aspects: shop, plant or company level	Sethi and Sethi 1990; Gupta and Somers 1999; Koste and Malhotra 1999; Vickery <i>et al.</i> 1999; Vokurka and O'Leary-Kelly 2000; Fantasy <i>et al.</i> 2010; Chau 2011.
Measurement aspects: focused on global flexibility measures vs. context specific ones	Browne <i>et al.</i> 1984; Sethi and Sethi 1990; Gerwin 1993; Vickery <i>et al.</i> 1999; Vokurka and O'Leary-Kelly 2000; Golden and Powell 2000; Duclos <i>et al.</i> 2003; Lunnus <i>et al.</i> 2003; Koste <i>et al.</i> 2004; Sanchez and Perez 2005; Moon <i>et al.</i> 2012.
Strategic aspects: centered on the strategic relevance of flexibility	Gerwin 1993; Gupta and Somers 1996; (Vickery <i>et al.</i> 1999); Vokurka and O'Leary-Kelly 2000; Golden and Powell 2000; Duclos <i>et al.</i> 2003; Lunnus <i>et al.</i> 2003; Sanchez and Perez 2005; Fantasy <i>et al.</i> 2010; Chau 2011; Moon <i>et al.</i> 2012.
Time horizon aspects: long-term vs. short-term flexibility	Golden and Powell 2000; Duclos <i>et al.</i> 2003; Lunnus <i>et al.</i> 2003; Moon <i>et al.</i> 2012.
Object of change: product, mix, volume	Browne <i>et al.</i> 1984; Sethi and Sethi 1990; Gerwin 1993; Suarez <i>et al.</i> 1995; Gupta and Somers 1996; Koste and Malhotra 1999; Vickery <i>et al.</i> 1999; Vokurka and O'Leary-Kelly 2000; D'souza and Williams 2000; Beach <i>et al.</i> 2000; Zhang <i>et al.</i> 2002; Koste <i>et al.</i> 2004; Narsimhan <i>et al.</i> 2004; Sanchez and Perez 2005.

There is no unified agreement among researchers on the supply chain flexibility classification. The difficulty in classifying flexibility rose due to large number of dimensions in manufacturing flexibility itself.

It can be seen from literature that, only cross functional and cross company efforts to increase flexibility and eliminate uncertainties can create the level of performance.

Although some researchers have started addressing flexibility from the supply chain perspective, a majority of the current literature continues to address flexibility from the viewpoint of a manufacturing system or a production system as a single entity in supply chain. While the manufacturing flexibility literature provides a 'bottom-up' view of flexibility in an organisation, it is perhaps business strategy literature that provides the 'top-down' view. Manufacturing flexibility research can be used to help determine the components of supply chain flexibility and consequently of procurement flexibility. The literature presented and most relevant to dimensions of supplier-buyer flexibility in context with procurement flexibility has been reproduced in TABLE 2, so as to assist in identifying flexibility dimensions appropriately.

TABLE 2. SUMMARY OF SUPPLY CHAIN FLEXIBILITY DIMENSIONS

Sr. No.	Types of supply chain flexibility	Vickery <i>et al.</i>	Zhang <i>et al.</i>	Lunnus <i>et al.</i>	Duclos <i>et al.</i>	Fantasy <i>et al.</i>
1	New product / launch flexibility	✓	✓			
2	Product / Product development flexibility	✓	✓			
3	Sourcing / Supply / Procurement Flexibility	✓		✓	✓	✓
4	Responsiveness Flexibility	✓				
5	Operations Flexibility			✓	✓	
6	Market Flexibility				✓	✓
7	Logistics / Delivery / Distribution Flexibility	✓	✓	✓	✓	✓
8	Organisational Flexibility			✓	✓	
9	Information systems / Spanning Flexibility		✓	✓	✓	✓
10	Manufacturing Flexibility		✓			✓
11	Supply Chain Flexibility					✓

In summary, each author used different dimensions to identify supply chain flexibility, as is done in the manufacturing flexibility literature. However, in the supply chain context the dimensions should be related to supply chain functions.

### 2.1.3 Flexibility Elements

After identifying dimensions of flexibility, it becomes imperative to measure each of these dimensions so as to measure performance of supply chain. Further it is also possible to have more than one measure for a particular dimension. The performance measures so identified are regarded as element. Element is a construct / attributes which describe the dimensions of flexibility more elaborately.

Flexibility elements vary in accordance with the strategies employed within various manufacturing industries. Therefore, by intention and design various industries will have a different emphasis on the dimensions as well as elements. Flexibility elements proposed by various researchers are presented in TABLE 3.

TABLE 3. SUMMARY OF SUPPLY CHAIN FLEXIBILITY ELEMENTS

Authors	Range	Mobility	Uniformity	Efficiency	Responsiveness	Robustness	Variability
Upton (1994)	✓	✓	✓				
Koste & Malhotra (1999)	✓	✓	✓				
Beach <i>et al.</i> (2000)	✓	✓	✓				
D'souza and Williams (2000)	✓	✓					
Golden and Powell (2000)				✓	✓	✓	✓
Zhang <i>et al.</i> (2002)	✓	✓	✓				
Chau (2011)				✓	✓	✓	✓

The different elements identified by various investigators indicate that the range, mobility and uniformity can measure all flexibility dimensions irrespective of whether flexibility is being measured for individual node or a pair of node of any supply chain.

Efficiency is the capability to react within the time constraints efficiently, while Responsiveness is quality of reacting in various situations which measures speed. Efficiency and responsiveness are related to time limits and measured in



number which is representing range element. Robustness is the characteristic of strongness and indicates the strength which refers to unforeseen environmental uncertainties which is representing uniformity element. Versatility is a measure of the range of activities and refers to accommodating foreseen environmental uncertainties.

Some of the findings from the review of literature are as follows:

- The scanning of literature reveals that though ample information is available on purchasing and supplier-manufacturer relationship, it does not speak on measurement scale for supplier-manufacturer procurement flexibility. Procurement is critical in the manufacturing sector as it maintains the continuous production of components, materials and products. If there is a disruption in the supply, the production process is hampered. The literature reveals lack of established generalizable measures of flexibility in procurement relationships.
- Majority literature is focused on manufacturing flexibility. However, the manufacturing flexibility dimensions, with modifications, may be used to align the procurement flexibility dimensions within the definition of supply chain management. An attempt is necessary in this direction to narrow the identified gap.

Therefore supply chain flexibility has to be examined from an integrative and customer oriented perspective.

### III. DEVELOPMENT OF RESEARCH HYPOTHESES

In the context of supplier-buyer relationship to explore procurement flexibility, there are number of management practices suggested in literature. The same strategy / practice can have different degrees of importance at each level of the supply chain in manufacturing industries. In fact, the decision-making in selecting the appropriate strategies / practices remains to be daunting challenge to supply chain management managers.

This study tries to expand the internal and external uncertainties affecting on the supplier-buyer relationship practices in Indian manufacturing industries, which has been explored in this research study to the external uncertainties as requirements of fluctuating customer demand which is affecting manufacturing strategy, Substitute imported products are affecting product sales, Changing government regulations and tariffs are affecting company / organization, and product obsolescence rate (Fig. 3). This generates the first hypothesis of this study 'H1' as:

H1: The supplier-buyer relationship in manufacturing industries is affected by various external uncertainties.

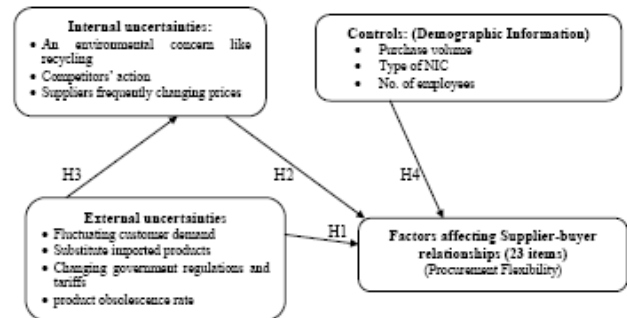


Fig. 3. Development of research hypotheses for this study

Manufacturing industries are not only influenced by external uncertainties i.e. environmental concerns like recycling, competitors' action, and frequently changing the price by suppliers but also internal uncertainties affect supplier-buyer relationships. The above uncertainties compiled one hypothesis on internal uncertainties which may be expressed as H2:

H2: The supplier-buyer relationship in manufacturing industries is also affected by internal uncertainties.

As discussed above, the addition of internal uncertainties reasonably compliments the external uncertainties in explaining the supplier-buyer relationships. A manufacturing industry's internal uncertainties may be viewed as intermediate variables to adjust the influences of external uncertainties. This generates one more hypothesis on the relationship of external uncertainties and internal uncertainties in supplier-buyer relationships in this study, which may be documented as H3:

H3: The relationships between an industry's external uncertainties and factors affecting supplier-buyer relationships are mediated by internal uncertainties.

The manufacturing industries in India have been classified with respect to purchase volume of that industry in a that financial year, type of industry which is classified according to National Industries Classification (NIC) code, and no. of employees working in that manufacturing industry. The three hypotheses for these control variables, namely, purchase volume, type of NIC, no. of employees and can be documented as H41, H42, and H43:

H41: There is a significant difference in the mean scores for different industries purchase volumes in respect of different factors affecting supplier-buyer relationships.

H42: There is a significant difference in the mean scores for different type of NIC codes of industries in respect of different factors affecting supplier-buyer relationships.

H43: There is a significant difference in the mean scores for different industries based on no. of employees in respect of different factors affecting supplier-buyer relationships.

In order to establish that the manufacturing industries population do indeed carry out different practices of supplier-buyer relationships in a heterogeneous manner given the heterogeneity in purchase volume, type of NIC, no. of employees, these hypotheses, namely, H41, H42 and H43 have been particularly presented in order to communicate to a wider (industrial) audience.

IV. RESEARCH METHODOLOGY

The research methodology aids the researchers in allocation of limited resources by posing crucial choices. Its essentials are depicted in Fig. 4.

4.1 Exploring data

In this study, a survey questionnaire for measurement of factors affecting on supplier-buyer relationships to explore procurement flexibility in manufacturing industries of India was developed based on research of Mohanty and Prakash (2013). It was pilot tested with 15 respondents working in manufacturing industries having sound knowledge of supply chain management practices and procurement activities. It helped including internal and external uncertainties for supplier-buyer relationships in the study. Accordingly, the research framework for this study was developed (see Fig. 4), which is the basis for testing of research hypotheses.

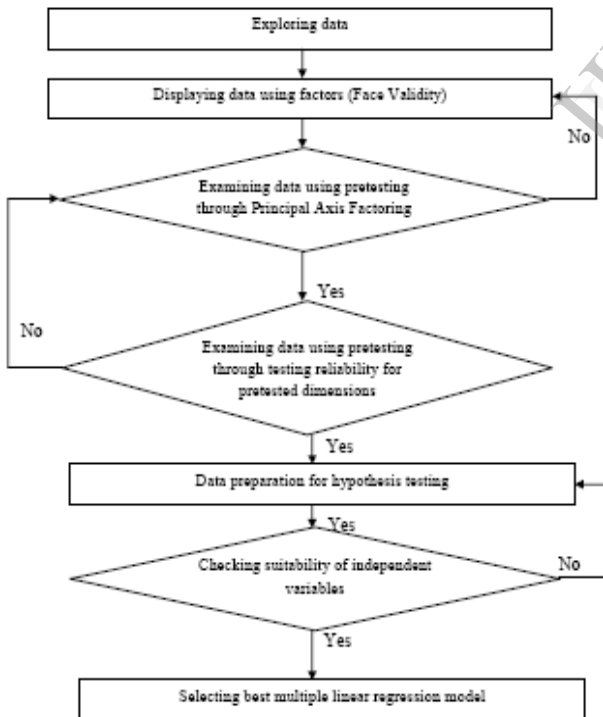


Fig. 4. Schematic diagram of research methodology

The survey for studying supplier-buyer relationship practices were carried out in two stages. Data were collected from questionnaires administered in January 2013 for identifying factors of supplier-buyer relationships in the first stage of survey. The questionnaire used in this research had 23

statements (see TABLE 4) for mapping the profile of the target respondents from manufacturing industries in India, where respondents had to agree on a scale of 1-7. Likert scale with seven responses for each item with scores ranging from ‘strongly disagree’ 1 to ‘strongly agree’ 7 is used in the measuring instrument. To improve the content validity after the first stage of survey, the measurement items relating to critical supplier-buyer relationship practices were assessed by four academic experts in supply chain management, who accepted for critical supplier-buyer relationship practices/measures to include six sub-constructs as flexibility in relationships, namely information exchange, supplier integration, supply chain strategy, design adaptability, supplier flexibility, and supplier logistics as a result of the factor analysis of the first stage of survey (see TABLE 5).

TABLE 4. CRITICAL PRACTICES FOR SUPPLIER-BUYER RELATIONSHIP IMPLEMENTATION

Variable No.	Critical Practices
VAR01	We receive and provide sufficient range of information from / to suppliers.
VAR02	Our suppliers are willing to share critical information with us.
VAR03	Our information system (IS) is well integrated with our prominent supplier's IS.
VAR04	Routine transfer of information on invoicing is done without human intervention.
VAR05	Information received from our suppliers is reliable.
VAR06	Information received from our suppliers is accurate and is in real time.
VAR07	Information sent to our suppliers is accurate and in real time.
VAR08	Our suppliers carry sufficient inventory to cater to our demands.
VAR09	Our suppliers can easily adjust to changes in our demand schedules.
VAR10	Our suppliers are capable of flexible delivery schedules at short notice.
VAR11	We can change over to different suppliers easily in a short time and at a low cost.
VAR12	Our suppliers can deliver new components/materials easily and in a short time.
VAR13	Our suppliers can deliver new components/materials at a low price and with the same quality.
VAR14	Our suppliers can implement product design changes easily and in a short time.
VAR15	Our suppliers can implement product design changes at a low cost and with the same quality.
VAR16	Time required for our suppliers to switch from one part mix to another is short.
VAR17	Our suppliers can deliver materials and components along various routes.
VAR18	Our suppliers can modify these routes easily and in a real time.
VAR19	All material handling routes exhibit similar performance levels.
VAR20	Transport facilities to handle materials of different shapes and sizes are flexible.
VAR21	We have a range of organisational strategies for supplier integration.
VAR22	These organisational strategies are easy but are costly to implement in short time.
VAR23	Our organisational structure has the flexibility to improve operational relationships with our suppliers.

TABLE 5. FACTOR ANALYSIS OF SUPPLIER-BUYER RELATIONSHIPS STATEMENTS

	Factor Loading	Percent variance explained	Cronbach's alpha
<b>[F1] Factor 1: Information Exchange</b>		<b>31.196</b>	<b>0.844</b>
[VAR01] We receive and provide sufficient range of information from/to suppliers	0.706		
[VAR07] Information sent to our suppliers is accurate and in real time	0.652		
[VAR06] Information received from our suppliers is accurate and in real time	0.649		
[VAR02] Our suppliers are willing to share critical information with us	0.621		
[VAR03] Our information system (IS) is well integrated with our prominent supplier's IS	0.548		
[VAR20] Transport facilities to handle materials of different shapes and sizes are flexible	0.547		
[VAR05] Information received from our suppliers is reliable	0.533		
[VAR04] Routine transfer of information on invoicing is done without human intervention	0.502		
<b>[F2] Factor 2: Supplier Integration</b>		<b>8.542</b>	<b>0.747</b>
[VAR09] Our suppliers can easily adjust to changes in our demand schedules	0.756		
[VAR10] Our suppliers are capable of flexible delivery schedules at short notice	0.670		
[VAR08] Our suppliers carry sufficient inventory to cater to our demands	0.617		
[VAR11] We can change over to different suppliers easily in a short time and at a low cost	0.569		
<b>[F3] Factor 3: Supply Chain Strategy</b>		<b>7.971</b>	<b>0.778</b>
[VAR23] Our organisational structure has the flexibility to improve operational relationships with our suppliers	0.778		
[VAR21] We have a range of organisational strategies for supplier integration	0.761		
[VAR22] These organisational strategies are easy but are costly to implement in short time	0.711		
<b>[F4] Factor 4: Design Adaptability</b>		<b>6.446</b>	<b>0.904</b>
[VAR13] Our suppliers can deliver new components/materials at a low price and with the same quality	0.860		
[VAR15] Our suppliers can implement product design changes at a low cost and with the same quality	0.849		
<b>[F5] Factor 5: Supplier Flexibility</b>		<b>5.636</b>	<b>0.674</b>
[VAR12] Our suppliers can deliver new components/materials easily and in a short time	0.761		
[VAR14] Our suppliers can implement product design changes easily and in a short time	0.724		
[VAR16] Time required for our suppliers to switch from one part mix to another is short	0.663		
<b>[F6] Factor 6: Supplier Logistics</b>		<b>4.835</b>	<b>0.618</b>
[VAR18] Our suppliers can modify these routes easily and in a real time	0.753		
[VAR17] Our suppliers can deliver materials and components along various routes	0.700		
[VAR19] All material handling routes exhibit similar performance levels	0.670		

#### 4.2 Displaying data using factors

In the first stage of survey based on convenience sampling, 123 final completed and acceptable questionnaires comprising of 23 items revealed a six-factor structure that explained 64.625% of total variance as shown in TABLE 5. The criteria for retaining the six factors were Eigen values greater than one and the ability to describe and label each factor. To assess the reliability of responses, Cronbach's alpha coefficient was calculated, and is found to be acceptable for the items within each factor solution. Also, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found to be 0.825, which is considered adequate. There is the obligatory requirement of 0.60 or above for Cronbach's alpha coefficient to demonstrate internal consistency of the established scales (Nunnally 1988). Likewise, the minimum acceptable value of KMO is 0.5 (Prakash, Mohanty, and Kallurkar 2011). Therefore, it can be concluded that the matrix did not suffer from multicollinearity or singularity.

This establishes the face validity of supplier-buyer relationship factors (TABLE 5), which are briefly described below:

- Information Exchange Flexibility - Receiving and providing sufficient range of information from manufacturer and/or to suppliers with accuracy and in real time is necessary. Suppliers willing to share critical information with manufacturers and information system (IS) are well integrated at suppliers and manufacturer end and also routine transfer of

information on invoicing is done without human Intervention is essential one for the effective supplier-buyer relationships.

- Supplier Integration Flexibility – To cope up with, volatile situation at manufacturer end, suppliers are capable and easily adjust to changes in demand schedules by carrying sufficient inventory. If not, manufacturers are capable change over to different suppliers easily in a short time and at a low cost. Such flexibility is essential at manufacturer and supplier end to strengthen the relationships.

- Supply Chain Strategy Flexibility - Organizational structure of manufacturer has the flexibility to improve operational relationships with their suppliers, also they have a range of organizational strategies for supplier integration and these organizational strategies are easy but are costly to implement in short time for better supplier-buyer relationships. Such flexibility is required at manufacturer and supplier end to strengthen the relationships.

- Design Adaptability Flexibility – Suppliers can deliver new components/materials at a low price and with the same quality and they can implement product design changes at a low cost and with the same quality. Such flexibility is required at supplier end to strengthen the relationships.

- Supplier Flexibility - Suppliers can deliver new components/materials easily and in a short time and implement product design changes easily and in a short time and also time required for suppliers to switch from one part mix to another is short. Such flexibility is required at supplier end to strengthen the relationships.

- Supplier Logistics Flexibility - Suppliers can deliver materials and components along various routes and modify these routes easily and in a real time. All material handling routes exhibit similar performance levels. Such flexibility is required at supplier end to strengthen the relationships. The result of the factor analysis has established for professionals in procurement/purchase that it is becoming increasingly important to be flexible by applying the flexibility principles to all facets of the supplier-buyer relationship: information exchange, supplier integration, organisational strategy, supplier flexibility and logistics to explore procurement flexibility.

#### 4.3 Examining data using pretesting through principal axis factoring

Generally, when measures are developed, some type of pre-test should be performed. It ensures that items not behaving statistically as expected may need to be refined or deleted. The pre-test is carried out building the confirmatory factor analysis. At this stage, each scale dimension of supplier-buyer relationship was subjected to PAF using varimax rotation on data of 123 respondents, which had provided the results of EFA as 'information exchange flexibility', 'supplier integration flexibility', 'supply chain strategy flexibility', 'design adaptability flexibility', 'supplier flexibility', and 'supplier logistics flexibility'. The purpose of subjecting the items in a sub-scale to PAF was to verify if all of the items loaded highly on a single factor. The final loadings for each sub-scale are summarized in TABLE 6.



TABLE 6. SCALE PURIFICATION

	Final Loading
<b>Factor 1: [F1] Information Exchange</b>	
VAR01 We receives and provides sufficient range of information from / to suppliers	0.760
VAR07 Information sent to our suppliers is accurate and in real time	0.733
VAR06 Information received from our suppliers is accurate and is in real time	0.693
VAR02 Our suppliers are willing to share critical information with us	0.647
VAR03 Our information system (IS) is well integrated with our prominent supplier's IS	0.642
VAR20 Transport facilities to handle materials of different shapes and sizes are flexible	0.603
VAR05 Information received from our suppliers is reliable	0.544
VAR04 Routine transfer of information on invoicing is done without human Intervention	0.462
<b>Factor 2: [F2] Supplier Integration</b>	
VAR09 Our suppliers can easily adjust to changes in our demand schedules	0.797
VAR10 Our suppliers are capable of flexible delivery schedules at short notice	0.703
VAR08 Our suppliers carry sufficient inventory to cater to our demands	0.569
VAR11 We can change over to different suppliers easily in a short time and at a low cost	0.533
<b>Factor 3: [F3] Supply Chain Strategy</b>	
VAR23 Our organisational structure has the flexibility to improve operational relationships with our suppliers	0.777
VAR21 We have a range of organisational strategies for supplier integration	0.742
VAR22 These organisational strategies are easy but are costly to implement in short time	0.686
<b>Factor 4: [F4] Design Adaptability</b>	
VAR13 Our suppliers can deliver new components/materials at a low price and with the same quality	0.909
VAR15 Our suppliers can implement product design changes at a low cost and with the same quality	0.909
<b>Factor 5: [F5] Supplier Flexibility</b>	
VAR12 Our suppliers can deliver new components/materials easily and in a short time	0.743
VAR14 Our suppliers can implement product design changes easily and in a short time	0.640
VAR16 Time required for our suppliers to switch from one part mix to another is short	0.540
<b>Factor 6: [F6] Supplier Logistics</b>	
VAR18 Our suppliers can modify these routes easily and in a real time	0.634
VAR17 Our suppliers can deliver materials and components along various routes	0.628
VAR19 All material handling routes exhibit similar performance levels	0.594

#### 4.4. Examining data using pre-testing through testing reliability for pre-tested dimensions

In the second stage of survey, we have selected our respondents across India who are directly associated with procurement/purchase department in manufacturing industries. We have used purposive non-probability sampling in this study, as we believed that some specific people can have only the information required in the survey. We had distributed 900 questionnaires in the independent sample; out of which 423 completed questionnaires were collected and analysed successful with the reliability test (TABLE 7). In this stage, we had also included external and internal uncertainties as we suggested formerly in the pilot testing.

For the second stage of survey, only pre-tested dimensions along with measures for the external uncertainties comprised fluctuating customer demand; substitute imported products, changing government regulations & tariffs, and product obsolescence rate; and measures for the internal uncertainties comprised environmental concern like recycling, competitors' action, and frequently price change from suppliers.

Data were collected using independent samples in the second stage of survey from questionnaires administered in December 2013 for studying the research hypotheses.

TABLE 7. RELIABILITY ANALYSIS

Dimension	Cronbach alpha
Information Exchange	0.847
Supplier Integration	0.753
Supply Chain Strategy	0.784
Design Adaptability	0.912
Supplier Flexibility	0.686
Supplier Logistics	0.619
External uncertainties	0.600
Internal uncertainties	0.613

#### 4.5 Data preparation for hypotheses testing

##### 4.5.1 Descriptive statistics

The control variables indicate manufacturing industries where the total size of independent sample was 423. 5.20% of the textile manufacturing companies (NIC code 17), 3.30% of the paper and paper product manufacturing companies (NIC code 21), 10.87% of the chemicals and chemical products manufacturing companies (NIC code 24), 5.20% of the rubber & plastic products manufacturing companies (NIC code 25), 11.11% of the basic metals related manufacturing companies (NIC code 27), 14.18% of the fabricated metal products, except machinery & equipment manufacturing companies (NIC code 28), 33.09% of the machinery & equipment manufacturing companies (NIC code 29), 4.96% of the electrical machinery & apparatus manufacturing companies (NIC code 31), 4.49% of the radio, television, & communication equipment manufacturing companies (NIC code 32), 2.36% of the medical, precision, & optical instruments manufacturing companies (NIC code 33), 2.60% of the motor vehicles, trailers, & semi-trailers manufacturing companies (NIC code 34), and 2.60% of the other transport equipment manufacturing companies (NIC code 35). It can be seen that majorly all types of manufacturing industries adequately either by size or by type.

##### 4.5.2 Operationalisation of the variables

**Dependent variable:** The dependent variable in this study is factors affecting supplier-buyer relationships; a company's overall supplier-buyer relationships practice level. Six factors of supplier-buyer relationships activities were identified to estimate a company's overall level of supplier-buyer relationships practices in the current Indian context (TABLE 5 - 7).

**Control Variables:** They are size, type and the industrial sector to which it belongs.

**Independent Variables:** A seven-point Likert scale was used to measure the importance, strength or degree of each item in respect of external uncertainties and internal uncertainties variables, where each item with scores ranging from 'strongly disagree' 1 to 'strongly agree' 7 is used in the measuring instrument to estimate its relationship with factors affecting supplier-buyer relationships to explore procurement flexibility. These have been considered as determinantal

reasons for implementation of supplier-buyer relationship activities. Various items of external uncertainties were fluctuating customer demand (FCD), substitute imported products (SIP), changing government regulations and tariffs (CGRT), and product obsolescence rate (POR). Various items of internal uncertainties are recycling (RCY), competitors' action (COA), and frequently price change from suppliers (FPCS).

V. RESULTS AND DISCUSSION

5.1 Checking for suitability of independent variables

Pearson rank correlation was used to give a preliminary observation of the relationships between the overall level of supplier-buyer relationship practices and the determinant factors identified earlier. The correlation matrix is shown in TABLE 8.

TABLE 8. CORRELATION COEFFICIENTS OF SUPPLIER-BUYER RELATIONSHIP FLEXIBILITY AND THE DETERMINANT FACTORS

		Correlations							
		FCD	SIP	CGRT	POR	RCY	COA	FPCS	Supplier-Buyer Rela. Flex.
FCD	Pearson Correlation	1	0.411**	0.347**	0.215**	0.303**	0.207**	0.123*	0.162**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.011	0.001
	N	423	423	423	423	423	423	423	423
SIP	Pearson Correlation	0.411**	1	0.418**	0.146**	0.318**	0.207**	0.339**	0.247**
	Sig. (2-tailed)	0.000		0.000	0.003	0.000	0.000	0.000	0.000
	N	423	423	423	423	423	423	423	423
CGRT	Pearson Correlation	0.347**	0.418**	1	0.118*	0.331**	0.160*	0.273**	0.263**
	Sig. (2-tailed)	0.000	0.000		0.015	0.000	0.039	0.000	0.000
	N	423	423	423	423	423	423	423	423
POR	Pearson Correlation	0.215**	0.146**	0.118*	1	0.058	0.202**	0.224**	0.208**
	Sig. (2-tailed)	0.000	0.003	0.015		0.236	0.000	0.000	0.000
	N	423	423	423	423	423	423	423	423
RCY	Pearson Correlation	0.303**	0.318**	0.331**	0.058	1	0.390**	0.368**	0.231**
	Sig. (2-tailed)	0.000	0.000	0.000	0.236		0.000	0.000	0.000
	N	423	423	423	423	423	423	423	423
COA	Pearson Correlation	0.207**	0.207**	0.160*	0.202**	0.390**	1	0.283**	0.108*
	Sig. (2-tailed)	0.000	0.000	0.039	0.000	0.000		0.000	0.026
	N	423	423	423	423	423	423	423	423
FPCS	Pearson Correlation	0.123*	0.339**	0.273**	0.224**	0.368**	0.283**	1	0.114*
	Sig. (2-tailed)	0.011	0.000	0.000	0.000	0.000	0.000		0.019
	N	423	423	423	423	423	423	423	423
Supplier-Buyer Rela. Flex.	Pearson Correlation	0.162**	0.247**	0.263**	0.208**	0.231**	0.108*	0.114*	1
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000	0.026	0.019	
	N	423	423	423	423	423	423	423	423

\*\* Correlation is significant at the 0.01 level (2-tailed).  
\* Correlation is significant at the 0.05 level (2-tailed).

This indicates that supplier-buyer relationship flexibility is significantly correlated with all external uncertainties variables, and internal uncertainties variables like RCY and FPCS. Standard multiple regressions were performed with factors affecting supplier-buyer relationships flexibility as the dependent variable and each of the determinant factors and controls as independent variables. The results are listed in TABLE 9.

TABLE 9. GOODNESS OF FIT OF THE MODEL

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. error of the estimate	Durbin-Watson
1	0.726	0.531	0.542	0.24918	1.842
2	0.275	0.176	0.169	0.43144	1.809
3	0.718	0.601	0.606	0.22027	2.178
4	0.736	0.626	0.603	0.20739	2.082

The level of multicollinearity between the variables was tested by an inspection of the condition index and variance proportions in the SPSS collinearity diagnostics TABLE. According to the criteria given by Tabachnick and Fidell (2001), multi collinearity is not a problem in this analysis since each condition index is less than 30 and the variance proportions are much less than 50.

This study has used four alternative models using multiple regression analysis, which is listed below:

- Model 1: With predictors as (constant), FCD, SIP, CGRT, POR and dependent variable as Suppl. - Buyer relationship.
- Model 2: With predictors as (constant), RCY, COA, FPCS and dependent variable as Suppl. - Buyer relationship.
- Model 3: With predictors as (constant), FCD, SIP, CGRT, POR, RCY, COA, FPCS and dependent variable as Suppl. - Buyer relationship.
- Model 4: With predictors as (constant), FCD, SIP, CGRT, POR, RCY, COA, FPCS, Purchase volume, NIC Code, No. of Employees and dependent variable as Suppl. - Buyer relationship.

The best value of 'R2' has been obtained for Model 4 as 0.626, which means that 62.6% of variation is explained (see TABLE 9), which does establish discriminant validity, which is the extent to which a measure does not correlate with other constructs from which it is supposed to differ. The 'Adjusted R2' adjusts for the number of explanatory terms (independent variables) in a model and increases only if the new independent variable(s) improve(s) the model more than would be expected by chance.

5.2 Selecting the best multiple linear regression Model for Hypotheses Testing

The best model has been found to be Model 4, which applies control variables mediating the determinant external and internal uncertainties for determining the supplier-buyer relationships to explore procurement flexibility, whose regression results are shown in TABLES 13. Additionally, regression results have been shown in TABLES 10-12 for Model 1, Model 2, and Model 3, respectively.

According to TABLES 9 and 13, therefore, the best model as 'Model 4' can be written as:

$$\text{Supplier-Buyer Relationships} = 5.376 + [\text{Purchase volume (0.156)} + \text{NIC Code (-0.070)} + \text{No. of Employees (0.066)} + \text{FCD (0.154)} + \text{SIP (-0.095)} + \text{CGRT (0.006)} + \text{POR (0.094)} + \text{RCY (0.146)} + \text{COA (0.094)} + \text{FPCS (0.053)}] \dots\dots\dots (1)$$

TABLE 10. REGRESSION RESULTS FOR MODEL 1 OF SUPPLIER-BUYER RELATIONSHIP

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	6.382	0.298		21.423	0.000
	FCD	0.134	0.031	0.144	2.650	0.008
	SIP	-0.024	0.044	-0.031	-0.533	0.581
	CGRT	0.049	0.042	0.063	1.168	0.243
	POR	0.105	0.041	0.127	2.599	0.010

TABLE 11. REGRESSION RESULTS FOR MODEL 2 OF SUPPLIER-BUYER RELATIONSHIP

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
2	(Constant)	6.365	0.254		25.079	0.000
	RCY	0.162	0.048	0.182	3.405	0.001
	COA	0.122	0.049	0.127	2.462	0.014
	FPCS	0.031	0.044	0.036	0.699	0.485



TABLE 12. REGRESSION RESULTS FOR MODEL 3 OF SUPPLIER-BUYER RELATIONSHIP

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.766	0.328		17.607	0.000
FCD	0.098	0.031	0.104	1.923	0.053
SIP	-0.065	0.044	-0.082	-1.466	0.143
CGRT	0.019	0.042	0.024	0.445	0.656
POR	0.091	0.041	0.110	2.229	0.026
RCY	0.155	0.050	0.174	3.093	0.002
COA	0.098	0.050	0.103	1.964	0.050
FPCS	0.025	0.046	0.029	0.546	0.586

TABLE 13. REGRESSION RESULTS FOR MODEL 4 OF SUPPLIER-BUYER RELATIONSHIP

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.376	0.429		12.546	0.000
Purchase volume	0.156	0.091	0.090	1.709	0.088
NIC Code	-0.070	0.026	-0.132	-2.634	0.009
No. of Employees	0.066	0.068	0.051	0.976	0.330
FCD	0.154	0.054	0.164	2.844	0.005
SIP	-0.095	0.045	-0.120	-2.113	0.033
CGRT	0.006	0.044	0.008	0.146	0.884
POR	0.094	0.041	0.113	2.310	0.021
RCY	0.146	0.050	0.163	2.920	0.004
COA	0.094	0.050	0.099	1.898	0.058
FPCS	0.053	0.046	0.062	1.147	0.252

It is to be seen from TABLE 13 and 'Equation (1)' that the all the variables are included in the Model 4 and in Equation (1), which seen that all this variables are significant, so it may be concluded that Model 4 is the best model, from the multiple regression analysis. This establishes nomological validity, which is the extent to which the scale correlates in theoretically predicted ways with measures of different but related constructs.

The regression results in TABLE 9 and 13 indicate that H1 is completely supported in general. This implies that fluctuating customer demand is affecting manufacturers' manufacturing strategy, substitute imported products are also affecting on their product sales, changing government regulations and tariffs are directly affecting on manufacturing industries, and product obsolescence rate is also low, which are the external uncertainties affecting on supplier-buyer relationships. Among the internal uncertainties, H2 is supported implying that environmental concern like recycling is affecting manufacturing strategy, also difficult to predict competitors' action, and manufacturers' are suffering from frequently price change from their suppliers.

There are no obvious changes in the significances of the regression results of Model 1, Model 2, and Model 3, which proves that the mediation function of internal uncertainties does occur and H3 is fully supported (see TABLE 10-12).

Again, there are no obvious changes in the significances of the regression results listed in TABLES 10 – 13, which means that there exists generally significant control for the mediation function of external uncertainties and H4 is generally supported except the variable 'NIC code', which stands for H42. The best model 'Model 4' has established that the manufacturing industries population in India do indeed carry out different phases of supplier-buyer relationships

management practices, though in a heterogeneous and diverse manner with respect to the heterogeneity and diversity in size and nature of business for manufacturing industries in India.

The empirical work carried out allows understanding of how the manufacturing industries population dealing with environmental uncertainty matters in a generic sense. This research has established key decision areas for supplier-buyer relationships management, which are validated factors of supplier-buyer relationships management.

## VI. CONCLUDING REMARKS

Indian manufacturing industries are facing significant pressures from internal as well as external uncertainties environment, to maintain good relationships with supplier; manufacturers are striving for the same to achieve procurement flexibility. Among external uncertainties, fluctuating customer demand and internal uncertainties like environmental concern i.e. recycling are mostly affecting on supplier-buyer relationships in manufacturing sector of India.

It has been also established in Indian manufacturing industries context that external uncertainties and adoption of supplier-buyer relationship management practices are fully mediated by internal uncertainties. The manufacturing industries population in India does indeed carry out different phases of the supplier-buyer relationship management practices, though in a heterogeneous /diversified manner with respect to heterogeneity/diversity in size and nature of business for manufacturing industries in India.

This paper has laid a broad foundation for ongoing programme of research concerning the integration of external and internal uncertainties for supplier-buyer relationships practices in supply chain. Completing this study brings together aspects of theory as well as practice. For theory, this study is an expansion of previous studies on supplier-buyer relationship management practices utilizing data from India, one of the emerging economies, which contributes to the literature of manufacturing industries and supplier-buyer relationship management practices to confirm and expand the scope of theoretical applications. For practice, supplier-buyer relationship management practices in India has been seen to be described by six important factors as information exchange flexibility, supplier integration flexibility, supply chain strategy flexibility, design adaptability flexibility, supplier flexibility, and supplier logistics flexibility.

In summary, a supplier-buyer relationship management practice is about making more efficient of all resources to explore procurement flexibility in between suppliers and manufacturers'. When we conduct business, regardless of whether business is in manufacturing, service, or transport; the overall strategy of supplier-buyer relationship management practices is to increase procurement efficiency in manufacturing industries in India.

Precautions were taken in this research study to ensure respondents rated the questions based on their understanding of their positions and the firms where they work. The wording of the survey questions was carefully edited before and after the pre-test to ensure the questions would be salient and applicable to the participants and accepted by experts in the field of supply chain management. Despite these precautions, key limitations in the empirical study are present. These include the lack of correct/proper participant database, weakness associated with cross-sectional surveys and constraints on the depth of information provided in survey methodology research and also knowledge of respondents'. The determinants/ factors used in this research study are may not be sufficient enough to describe a broader term like supplier-buyer relationship management practices.

Future studies can take other factors affecting on competence and efficacy of supplier-buyer relationship management practices; those are not considered in this study. Future research in this area of supplier-buyer relationship management practices is promising not only for academicians in this area, but also for practitioners seeking to find competitive advantage in the management of supply chain management, operations management in increasingly challenging and competitive global business markets. Also, the future research can apply structural equation modeling for supplier-buyer relationship management practices to explore procurement flexibility, which is a technique to efficiently include a whole range of standard multivariate analysis and analysis of variance.

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