Supplier and Customer Facilitation in Manufacturing Companies of Pakistan: Scale Development and Validation

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Abstract

The aim of present research is to develop and validate scale of supplier and customer facilitation in new product development process. It is noticed in previous research that suppliers and customers are involved in new product development process. However, it is commonly observed that their involvement varies from culture to culture. This aspect was specifically ignored in previous research. To fill this gap supplier and customer's facilitation construct is developed and tested in Pakistan's manufacturing organizations. For this purpose, simple random sampling technique for selection of manufacturing firms is utilized which is further supported by purposive sampling technique for distributing questionnaires among the managers involved in new product development process. Based on both probability and non-probability techniques 450 questionnaires were distributed to the targeted sample, whereas, 380 questionnaires were received back and out of which 328 were valid ones. So, the sample size for current research was 328 resulted in72% response rate. The results of study approved the validity and reliability of both scale (i.e., Supplier and Customer's facilitation). The present study has introduced such scales which are equally applicable for Asian and Western country's manufacturing companies which are involved in continuous product development process. This study has provided fresh and important avenues by incorporating the role of suppliers and customers as a facilitator in new product development and supply chain literature for research scholars, academia and industry.

***Keywords*:** supplier facilitation, customer facilitation, scale development, scale validation

Background of Research

A growing body of literature, for example (Brown & Eisenhardt, 1995; Lin *et al*., 2010; Parker, 2000; Shamsuzzoha, Kyllonen, & Helo, 2009) suggests that companies will perform well if they collaborate with suppliers and customers in their new product development (NPD) process.

For instance, when manufacturing firms collaboratively work with suppliers and customers can improve productivity and product quality, obtaining access to new markets and lowering costs, reducing new product development time for achieving competitive advantage (Ragatz et al., 2002; van Echtelt et al., 2008). Many manufacturing firms are striving to achieve competitive advantage. This is only possible if new products are successful with effective new product development process. The most essential area of concern is to know the causes of new product success and failure.

It is also essential to be aware with the new product success drivers of developing countries because these might be different from developed countries due to cultural context and other reasons (Rasiah, 2011; Jogulu & Ferkins, 2012; McDonald, 2012; Huang & Tsai, 2013). It is noticed that day by day business environment is becoming more competitive and fast paced. In this situation firms are using many commercial and economic arrangements for innovation, new product developments and new product success. One of these factors is the external sources to ensure firm's competitiveness (Knudsen, 2007; Lau et al. 2010; Fuchs & Schreier, 2011). These external sources include suppliers and customers involvement in different stages of NPD process. In past research end or lead users of product are taken as customers. In western context the involvement of suppliers and customers is applicable; however, this aspect can vary from culture to culture. For example, it is commonly observed in Pakistani manufacturing companies that customers (end or lead users) are not involved in NPD process rather business customers which are distributors, wholesalers and retailers who are facilitating in NPD process while distributing timely products in the market. Even the suppliers are only facilitating NPD process by provision of on time and good quality raw material. Keeping in mind this observation it can be suggested that the role of suppliers and customers vary from culture to culture. Therefore, the aim of current research is to develop and test such scales which can be equally applicable to manufacturing companies of developed and developing countries.

Literature Review

Supplier Facilitation

Suppliers can be defined as strategic collaborators and strong relationship between suppliers and manufacturing firm is important (Koufters *et al.,* 2005). Such relationships require commitment, trust, and open communication between these collaborators. The role of suppliers is

very critical in new product development process (Chaudhuri, Mohantay, & Singh, 2013). The two aspects are considered important i.e., supplier's involvement and supplier's integration. In NPD process supplier involvement provides benefit as it can increase the product quality and reduces development time (Hartley *et al*., 1997). As on time delivery of raw or finished material, is required for the production of new products (Johansson *et al.*, 2006). Supplier integration has seen important in NPD process e.g., product design and production stage of development process (Wynstra & Pierick, 2000) which resulted in benefits for manufacturing organizations.

Another important point, which needs to be highlighted, is the extent and level of supplier's involvement and integration in NPD process. Some researchers suggest that whether suppliers are involved in every stage of NPD process (Handfield, Ragatz, Peterson, & Monczka, 1999; Petersen, Handfield, & Ragatz, 2003) or supplier integration is significant in innovation and product model design stage (Walter, 2003). Therefore, in previous literature (Arend, 2006; Chen, Damanpour, & Reilly, 2010; Das, Narasimhan & Talluri, 2006; Feng, Sun, Sohal & Wang, 2014; Handfield, & Ragatz, 2005; Jayaram & Pathak, 2013; Koufteros & Marcoulides, 2006; Petersen, Kouvelis, Chambers, & Wang, 2006; Rothaermel & Deeds, 2004; Song, Di Benedetto, & Song, 2010; Wong *et al*., 2012) the role of suppliers is taken as their involvement, alliance, integration and close relationship of manufacturers with suppliers in NPD process. However, the deficiency in previous literature is a generalization issue of supplier's involvement and integration construct, as this construct is not applicable equally to develop and developing countries. Therefore, supplier's facilitation in providing information and knowledge about on time availability of raw material should be explored as a construct.

Customer Facilitation

The second important component is the customer facilitation. As customers can facilitate in providing information, communication, and knowledge of product demanded in the market, which can be integrated in NPD process for achieving ideal costs and timely production (Cooper & Kleinschmidt, 1986; Cordero 1990; Elofson, & Robinson, 2007; Lai, Chen, Chiu & Pai, 2011; Lynch & O'Toole, 2006; Prahalad & Ramaswanay, 2004; Ramani & Kumar, 2008; Rothwell, 1994; Zirger & Maidique, 1990). In previous research, the customers taken in NPD process are taken as end users or lead users (Cooper & Kleinschmidt, 1986; Feng, Sun & Zhang, 2010; Handfield & Bechtel, 2002; Liker & Choi 2004; Ragatz *et al*., 2002;

Sethi, Smith & Park, 2001; Stank *et al*., 2001; Ward & Zhou, 2006; Zirger & Maidique, 1990). However, the important point here is that these customers are not the end users but these are distributors, wholesalers and retailers also called channel collaboration (Buzzell & Ortmeyer, 1995; Frazier, 1999; Martin & Grbac, 2003; Mentzer *et al*., 2000; Sandoe *et al*., 2001; Sudharshan & Sanchez, 1998). The integration of customer in product development process also helps in maintaining relationship with customers; such relationship can create opportunities to get competitive advantages for firms (Simpson *et al.*, 2001; Spekman *et al*., 2002).

The role of distributors as an intermediary is studied differently in previous work, for example, they help in provision of specialized solution and act as a bridge between company and consumers (Lynn, Reddy, & Aram 1996; Stankiewicz 1995). However, their role is also taken as a communicator (Mohr & Nevin, 1990; Nygaard, 1999; Wilson & Nielson, 2001) formal and informal information share provider (Anderson & Narus, 1990; Mohr & Nevin, 1990; Nygaard, 1999) and understand each other's goals, coordinate and cooperate to achieve mutual benefit (Song & Zhao, 2004). This shows that manufacturer and customer (distributors, wholesalers and retailers) help each other in information sharing, coordinate and cooperate with each other to achieve NPD process goals. Therefore, the role of customers for proficiency of NPD process cannot be neglected. Though, many studies have conducted in explaining the link between customer integration and new product success. However, in those studies the customer integration is considered as the integration of product users. Still, there is a deficiency in literature to study the role of distributors, wholesalers, and retailers as a facilitator in NPD process. Current research is bridging this gap by studying the facilitation provided by customers. The information and knowledge provided by these customers, if understood and managed properly could enhance NPD proficiency.

Research Methodology

Respondents

A sampling frame of 500 companies was collected from directory of ministry of industries & production, Pakistan Stock Exchange, SECP and Industrial Development Board. On identified firms simple random sampling technique was applied. From the random numbers table of Walpole (1990) the firms were selected based on simple random sampling procedure. The local and multinational firms were arranged according to years of their establishment and number of employees. Total 50 firms were selected out

of 500 firms which constituted 10 percent of the total identified population. Since the sampled population was a three digits number, a group of three digits was read from left to right, starting from first row and first column of the random number's table of Walpole (1990). The number that was less than and equal to 500 was selected and repeated numbers were also skipped. Among the managers of 50 selected companies 9 questionnaires in each company at their head offices were distributed in person. Keeping in view this, 450 questionnaires were distributed among 50 selected large scale manufacturing companies operating in Pakistan, 380 questionnaires were received back and 52 questionnaires were not completely filled by respondents, so the sample size for this research was 328. The response rate was 72% which is quite reasonable. As suggested by Tabachnick and Fidell (2007) sample size of 200 and recommended by VanVoorhis and Morgan (2007) sample size of 300 is considered good in social science research. In current research sample size (n=328) is reasonable enough to perform further statistical tests.

Scale Development

An idea for developing items of customer (06 items) and supplier facilitation (05 items) scales were taken from Chen and Paulraj, (2004); Li *et al*. (2006). Each item is measured on five-point Likert's scale with 5 representing strongly agree and 1 representing strongly disagree. Prior permission is also taken via an email from researchers whose scales were adapted / modified according to cultural context. Further, face and content validity of items was carried out by experts in the field of marketing, linguistics and NPD team members working in various manufacturing companies of Pakistan.

Results and Discussion

Confirmatory Factor Analysis

For the analysis first of all confirmatory factor analysis (CFA) is applied on both scales. The reason for applying CFA before applying exploratory factor analysis (EFA) is to confirm the validity of scales. The CFA reported in this study are adopted from Byrne (2010) model fit criteria. The results of CFA reported in Table 1 indicates that CMIN/DF, p-value, Goodness of Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Normed Fit Index (NFI), Non-Normed Fit Index/Tucker-Lewis Index,(NNFI/TLI), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Relative Fit Index (RFI), Root Mean Square Residual (RMR), Root

Mean Square (RMESA) that items of both supplier and customer facilitation scales are falling under very good fit index as criteria adopted from Byrne (2010).

Table 1. *Confirmatory Factor Analysis of Supplier and Customer Facilitation*

Scales	CMIN /DF	P	GFI	AGFI	NFI	TLI /NNFI	CFI	IFI	RFI	RMR	RMSEA
Sup. Facl. 5 Items	2.180	.053	.97	.91	.96	.958	.979	.980	.96	.021	.090
Cust. Fac. 6 Items	1.085	.369	.99	.98	.99	.998	.999	.999	.98	.011	.016

Exploratory Factor Analysis

Exploratory factor analysis technique was used for measuring validity of study instrument. Prior to performing factor analysis, Kaiser-Mayer-Olkin (KMO) test of sample adequacy and Bartlett's test of Sphericity were used to confirm adequacy of study sample. It is recommended that KMO value greater than 0.50 (Kiaser, 1974) and Bartlett's test significance level less than 0.05 (Bartlett, 1954) are the indicators of appropriate factors. Further, principal component method and varimax rotation method was used which are considered most authentic and reliable tools for factor analysis in social science research (Stevens, 1996; Tabachnick & Fidell, 2007).

A test of sampling adequacy for both scales; (i) Customer facilitation and (ii) supplier facilitation is carried out through Kaiser-Meyer-Olkin (KMO) and Bartlett's test of Sphericity. KMO measure sample adequacy reported is 0.850 and Bartlett test has significance level of p = 0.000. This shows that factor analysis of the data is appropriate because KMO value greater than 0.50 (Kiaser, 1974) and Bartlett's test significance level less than 0.05 (Bartellet, 1954) are the indicators of appropriate factors. In the factor solution of the EFA yielded Eigen values of 4.972 and 1.597, accounting for 30.45% and 29.25% variance with accumulated variance of 59.71%. This indicates that 59.711% variability in the data has been modeled by the two extracted factors. Both scales are further measured through principal component analysis (PCA) and varimax rotation method for extracting factors from a set of data in order to verify goodness of measure. After factor analysis, it is noticed that all items fall under their respective scales as presented in Table 2. Items CF1 to CF6 are extracted in component 1 which is termed as customer facilitation, items

SF1 to SF5 extracted in component 2 which are named as supplier facilitation.

Table 2. *Factor Loadings for Suppler and Customer Facilitation Scale*

Item No.	Item Description	Component 1	Component 2
CF1	Our key customers (distributors, wholesalers, and retailers) facilitate us by putting forward improved proposals for our products.	**.712**	.285
CF2	Our key customers (distributors, wholesalers, and retailers) facilitate us by informing us about the latest market demands.	**.810**	.199
CF3	Our key customers (distributors, wholesalers, and retailers) facilitate us by providing feedback of existing products to improve the consumer requirements of new product.	**.782**	.038
CF4	Our key customers (distributors, wholesalers, and retailers) facilitate us by suggesting strategies to improve the existing products.	**.753**	.155
CF5	Our key customers (distributors, wholesalers, and retailers) facilitate us during launching new products for on time delivery of products to the market.	**.650**	.319
CF6	Our key customers (distributors, wholesalers, and retailers) facilitate us after launching new products by providing feedback of consumers.	**.605**	.376
SF1	Our key suppliers facilitate us in providing on time delivery of raw material, parts and supplies in utilization of developing new products.	.177	**.785**
SF2	Our key suppliers facilitate us by providing low cost raw material, parts and supplies needed for new product development.	.168	**.812**
SF3	Our key suppliers facilitate us in providing high quality raw material, parts, and supplies in utilization of developing new products.	.134	**.814**
SF4	Our key suppliers facilitate us by meeting our volume requirements on a consistent basis.	.274	**.681**
SF5	Our key suppliers facilitate us by consistently meeting our overall requirements.	.262	**.652**

Reliability

It is recommended by researchers that an acceptable value which indicates good reliability of construct is 0.70 (Kerlinger, 1986; Munro, 2005; Tavakol & Dennick, 2011; Zinbarg, Revelle, Yovel & Li, 2005). The result of alpha reliability test indicates that all the scales have reliability

value greater than 0.70 as depicted in Table 3.The reliability value for customer facilitation with 06 items is reported as 0.850 and supplier facilitation having 05 items is 0.840 as presented in Table 3.

Table 3. *Alpha Reliability Coefficient of Supplier and Customer Facilitation*

	No. of Items	Alpha Coefficient
Customer Facilitation	06	0.850
Supplier Facilitation	05	0.840

The two most vital aspects studied in present research are supplier facilitation and customer facilitation. Suppliers facilitate for high quality, low cost and on time delivery of raw material, parts, materials and supplies which are important to utilize in new product development process of manufacturing companies. In previous literature (Arend, 2006; Chen, Damanpour, & Reilly, 2010; Das, Narasimhan & Talluri, 2006; Di Benedetto, & Song, 2010; Feng, Sun, Sohal & Wang, 2014; Koufteros & Marcoulides, 2006; Kouvelis, Chambers, & Wang, 2006; Petersen, Handfield, & Ragatz, 2005; Rothaermel & Deeds, 2004; Song, Jayaram & Pathak, 2013;) the role of suppliers is taken as their involvement, alliance, integration and close relationship with suppliers in NPD process. However, from culture to culture the role of supplier varies which is not taken into account in previous studies. Therefore, this study incorporated this particular construct according to the observed culture of Pakistan's manufacturing organizations in which suppliers facilitate in provision of on time delivery, quality and low cost raw material rather than their involvement in NPD process.

Another construct in present research used is the customer facilitation. In past research the involvement and integration of customers (end users) in NPD process is studied extensively (Cooper & Kleinschmidt, 1986; Feng, Sun, & Zhang, 2010; Handfield & Bechtel, 2002; Liker & Choi 2004; Ragatz *et al*., 2002; Sethi, Smith, & Park, 2001; Stank *et al*., 2001; Ward & Zhou, 2006; Zirger & Maidique, 1990). However, the role of customer involvement and integration is different from culture to culture and company to company. In present study the distributors, wholesalers, and retailers rather than end users are taken as customers who can facilitates in NPD process. These channel members can facilitate in product improvement proposals and strategies, informed about latest market demands, on time delivery of new products in the market, and feedback of customers after launching the products in the market. Operational and

definitional inconsistencies are also overcome in present research by adding generalized constructs which can be applicable to every culture and environment.

Conclusion and Future Research

The aim of current research is to develop and validate such scales which can be applicable for the manufacturing companies of developed and developing countries. As in past research suppliers and customers are involved, integrate and collaborate in NPD process. However, according to cultural context their role can vary which was ignored in previous literature. To fill this gap their role as a facilitator is studied in present research. Keeping in mind this objective the supplier and customer facilitation scales were developed with the help of literature review and experts opinions. Further, the validity with confirmatory and exploratory factor analysis was carried out. The reliability of both scales was assessed with Cronbach's alpha value. The results of both validity and reliability have approved the suggested scales of current research. This research has only developed and tested supplier and customer's facilitation scales. However, in future research these two factors can be studied as an independent variables and their impact on NPD process or new product success can be analyzed. Keeping in view the operational aspects of manufacturing companies of Pakistan other aspects can be explored. Further for future research these scales can be tested in comparison of other cultures. Hence, this research is providing new avenues for academicians and industry practitioners about the role of suppliers and customers as facilitators.

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