

## Customer-Supplier Interactions in Crowdsourcing Practices: Customer Participation on Creating and Sharing of new Product Value.

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### Abstract

*Crowdsourcing communities' participation revolves around customers throughout all steps of creating ideas and product value. Firms across manufacturing industries and suppliers have started to interact with customers/users to understand their knowledge, creative ideas and influence. However, little research exists that looks at the interactions between customers and networking suppliers through crowdsourcing to know how product value is created. Using institutional arrangement perspective to develop an end to end model, we tested model empirically based on sample of 185 manufacturers of construction safety equipment, electronic and optics, metal and metal working, and rubber and plastic products industries.*

*The results show that customer participation affects product value and ideas creation by improving effectiveness of the new designed product development process by enhancing ideas sharing and customer-supplier interactions. Concerning product development process, customer resources investments are enhanced by increasing the soundness of the customer participation process.*

*Our findings contribute to a better understanding of customer participation on the customers' share of new ideas and product value contribution part which is based on the dependence and equity perspective. Finally, we propose several suggestions for the distribution of knowledge sharing and product value to ensure the distribution of value is fair.*

**Keywords:** Crowdsourcing practices, Customer participation, new product value, Relationship Marketing, Ideas and Innovation.

### Introduction

The involvement of online communities and customers allow to assess the initial certain business models and to identify success factors and risks for industrial firms. Recent literature holds a number of associated concepts which has widely addressed the user involvement and customer interaction in product ideas through crowdsourcing practices (Writz et al., 2010). Numerous scholars emphasize customers as inspirers of new products and creators of idea generation (Alam, 2006; Bonner, 2009). Interaction with customers in product development process, increases their willingness to pay for the product (Franke & Piller, 2004) and they are recognizing their importance as external source in ideas generation and product development at lower cost (Vargo & Lusch, 2004; von Hippel, 2005).

Communities of customers play important role in the creation and development of product value (Ozer, 2003; Prahalad & Ramaswamy, 2004). The integration of customers' involvement shapes positive attitudes and effect intentions on community based innovations (Fuller & Matzler, 2007; Hemetsberger & Godula, 2007). Different studies suggest that customer participation can be very helpful for community relationship building in different forms of value creation (Andersen, 2005; Osterwalder & Pigneur, 2010). Market space is comprised of customers and products, customers are playing an active role in creating and competing for value as 'customers are fundamentally changing the dynamics of the market place' (Thomas, Marius & Sven, 2007). Customers are no more only confined to simply buying a product but also shifting the balance of power between buyers and sellers. By involving customers more actively in new product

development, ideas can be generated though crowdsourcing, which more are likely creating value of the product.

However, although customers' participation on creating new product value has become central importance, most previous research has focused on issues in customers' participation in new product development and on their share of the created value (Bonner, 2009; Fang et al. 2008) but this study concentrates on customer share of value along with crowdsourcing practices. Whereas some studies address such type of customer value creation, but little is known about customer ultimate share for the product value with implementation of crowdsourcing practices. With our research, we aim to contribute to the understanding of the role of customer participation in the creation of ideas and new product value and the share of ultimate product value by the customer with effect of crowdsourcing. As technology is upgraded and customers are rapidly adopting these technologies so online participation of customers pushes suppliers to invite crowd into creative input. Despite the implementation of crowdsourcing practices in many companies but still it is little understood (Djelassi & Decoopman, 2013). More specifically, the following three questions are addressed:

1. How customer participation in the new product development process have an effect on the size of the new product total net value?
2. How does implementation of crowdsourcing practices involving customer participation affect new product value creation from value based perspective?
3. How is the appropriation of value pie determined for the customer's share of the new product value?

The first research question addresses to the practices of suppliers who believe that customer involvement in new

product development process improves the performance of the product but they leave the effective mechanism of value creation. To shed light on the appropriate efforts in improving effect of customer participation on new product value creation, this study gives the mediating mechanism to improve the understanding of the interactions between customer and supplier through information sharing and efforts in product development from customer perspective.

Regarding the second question, implementation of crowdsourcing practices through customer process can determine the customer-focused performance in value creation of new product. In addition, key dimensions to enhance customer supplier interactions in specific investments for new product development can be implemented to increase the impact of customer participation.

In customer-supplier interactions and relationships, impact of customer participation on the customers' share of the new product "value pie" remains under researched (Jap, 2001). The third question deals with new product value pie based on customer equity perspective.

From an institutional arrangement perspective (Carson et al. 1999), this research into value creation of new product development represents an essential step to develop an end-to-end model for customer-supplier interactions in crowdsourcing from customer viewpoint. This paper presents overall research stream on the relationship between manufacturers and their stakeholders (customers/communities) relatively dependency that effects on each partner to capture new product value. This research is significant to the firms that manage key product development stakeholders, of which customers are most important ones and how involving customers, firms can integrate customers into product development to ensure the relational equity in value share (Cannon & Homburg, 2001; Sawhney & Zabin, 2002; Mithas et al., 2005).

Further sections of this paper are organized as follows: we first construct our conceptual model and develop hypothesis. Then we describe our empirical study, data collection procedures, measurements and analysis of conceptual framework. Finally, we present the result obtained, theoretical contributions, managerial implications, research limitations and future research directions.

### **Theoretical Background**

The business activities are shifted from products to customers and customer-supplier interactions have been gaining attention in crowdsourcing practices of firms. Institutional arrangement perspective (Carson et al., 1999) provides a suitable framework for researching the creation of value in firm to firm relationships. This theoretical framework explains relationships between supplier and customer as cooperative partners for mutual benefits (Davis & North, 1971; Harland, Knight and Cousins, 2004). As an accepted paradigm, this perspective appears in relationship marketing and in exchange of value creation with mutual dependency between the exchange partners with joint benefits (Heide & Miner 1992; Carson et al., 1999). An increasing number of firms perceive that as they develop relationships associated

with joint value, they will receive share of the larger joint value (Carson et al., 1999; Mennon et al., 2005).

In domains of interactions between customer and supplier, joint activities and joint benefits (Carson et al. 1999) are the two elements from perspective of institutional arrangement which contribute to firm owned maximization (Eric et al. 2008). Joint activities can be defined as the degree of value creation to which each party occupy that may affects the size of value pie. Joint benefits can be defined as the degree to which each party penetrates share of the value pie. The development of supplier-customer interactions through customer participation in new product development process can better be analyzed by institutional arrangement perspective specifically based on value creation and sharing by customer (Andersen, 2005).

In customer-supplier interactions, the shared 'value pie' is still difficult to understanding (Jap, 2001); the total size of the new product value and customer slice of share of the pie created in customer participation with supplier in new product development process.

Research in marketing has extensively explored on efforts and value obtained by suppliers in new product development having customer participation. This research perspective is exclusively customers' share of value pie obtained by them in new product development process along with implementation of crowdsourcing practices.

In new product development, customer participation is complex and complicated and it is difficult to understand how customer participation influences the new product value pie and to determine customer's share is multifaceted. Customer participation refers to all forms of involvement in product development process as collaborators, competitors, information providers and co-creators (Prahalad & Ramaswamy, 2004; Chen et al., 2013). Crowdsourcing initiatives in consumer business domain (Brabham, 2008) engage customers as active participants in designs input and suggestions (Auh et al., 2007; Bolton & Saxena, 2009) and customer active involvement can help to provide direct input in negotiations with supplier over pricing, delivery and other financial service provisions (Jap, 2001; Auh et al., 2007; Etgar, 2008). Customers' involvements in the development process through crowdsourcing show a lower power imbalance and a higher dependence on the supplier.

The next section outlines the conceptual model for the involvement of customer participation in new product development process through crowdsourcing practices and customer ultimate value, details the hypotheses and identifies three units of analysis; impact of customer participation in new product development process, customer share out of total value and ultimate new product value attained by the customer.

### **Conceptual Model**

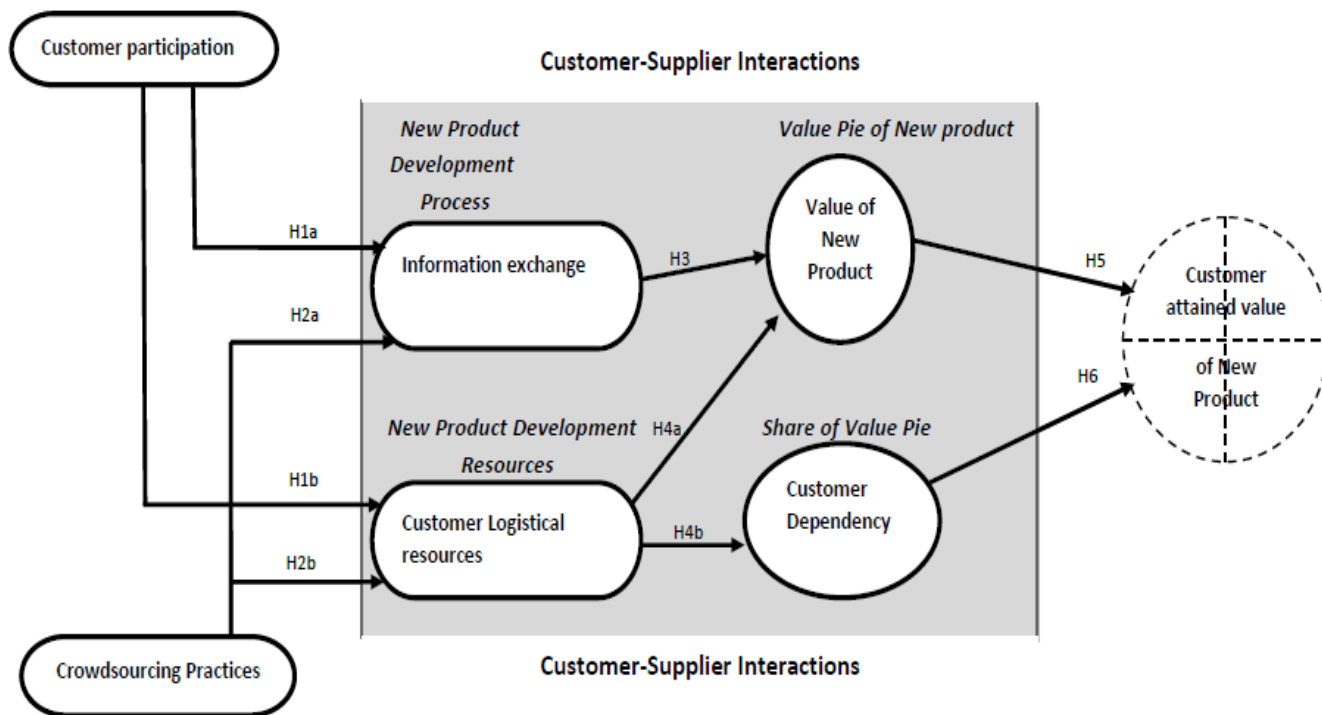
The conceptual model for this study is illustrated in figure 1. The diagram shows that influence of customer participation on creating and sharing of new product value through crowdsourcing can be characterized as (1) customer participation in new product development process through

information sharing and logistical resources (2) implementation of crowdsourcing practices for customers to exchange knowledge and logistics (3) effect of customer participation in new product development process on product value pie (4) customer dependency on supplier and (5) ultimate new product value attained by the customer. According to the model, implementation of crowdsourcing practices in firms for maximum participation of customer influences over all on new product value which in turn exerts an effective customer-supplier interactions.

The concept of customer participation is seen as actively involvement in companies' process and significantly related to value creation (Beckett & Nayak, 2008; Payne et al., 2008; Vargo & Lusch, 2004). The customer is regarded as valuable resource of information, knowledge, ideas and valued solution for firms (Prahalad & Ramaswamy, 2004; Lusch & Vargo, 2006; Vargo & Lusch, 2008). The successful process

of new product development depends on customer participation through knowledge exchange, co-designing, using self-service technologies and ideas generation (Etgar, 2008). The degree to which customer is involved both mentally and physically in new product development process can play a role in new product value creation (Palmatier, 2006). Customers now easily communicate new ideas to the companies through social networks, websites and knowledge exchange in new product development activities (Jap, 2001). By involving customers more actively in the new product development process can improve amounts of information, intensity and effectiveness (Hauser et al., 2006). For knowledge exchange, high degree of customer contact with supplier helps in creating effective commitment (Auh et al. 2007). Thus, first hypothesis is stated as:

H1a: Customer participation in new product development has positive effect on knowledge exchange.



**Figure 1.** Impact of customer participation on creating and sharing new product value through crowdsourcing practices.

Customer logistical resources refer to customer's ability to participate in new product development by pertinent resources as customer specific investments such as knowledge, skills, experience, design tools and self-service technologies (Etgar, 2008). Supplier-customer interactions as viewed from customer's perspective focus on resources exchange that gives a competitive advantage to inputs or contribution by customer. Scholars in the field of business and marketing have identified that customer specific investments increase confidence of both parties and provide an opportunity to closely monitor each other's behavior at various stages of new product development process (Palmatier et al. 2006). We expect that:

H1b: Customer participation in new product development has positive impact on relationship specific resources investments by the customer

Crowdsourcing is closely related to customer empowerment (Fuchs & Schreier, 2011) and implementations of crowdsourcing practices via suppliers (innovation brokers) are examples of customer innovative ideas in new product development process (Lichtenthaler & Ernst, 2008). From the perspective of customer participation on methods employed by firm seeking innovative ideas, the formalization of crowdsourcing practices enhance product development process involving the customers to improve cooperation

between suppliers and customers. Therefore, our third hypothesis states that,

H2a: Customer participation through knowledge exchange under formalization of crowdsourcing practices has greater impact on new product development process.

H2b: Customer relationship specific resources investment under formalization of crowdsourcing practices has greater impact on new product development process.

Several scholars have shown that knowledge exchange between customer and supplier at the early stages of new product development process can significantly contribute to the size of new product value pie (Auh et al. 2007; Johnston et al. 2004). The close contact of customer with supplier shows the depth and extent of customer engagement in new product development process to help supplier to make appropriate adjustments (Wathne et al., 2001; Joshi & Sharma, 2004). Customer experience and customer ideas generation in designs and engineering options create a focus on customer and supplier constant knowledge exchange (DeFillippi & Roser, 2014). Therefore, the information exchange by the customer in new product development process increases the size of the new product value pie. This leads us to the following hypothesis.

H3: The degree of knowledge exchange by customer has a positive impact in new product value.

Customer resources investment refers to logistical arrangements like technical and administrative relationship specific investments by customers (Borys & Jemison, 1989; Walter, 2006). It is therefore not surprising that customer-specific investment enhances the quality and collective good standard of product value (Zhao et al, 2007). Customer participation in professional services of new product development process increases the ultimate value of new product. Thus, we predict the following.

H4a: Customer resources investment has a positive effect on new product value.

The sharing of value is a function of power/dependence and dependence in customer-supplier interactions has a direct effect on sharing of value between them (Wilson, 1995). Equity theory assumes utility maximizing actors (Walster et al, 1978) and it also assumes relative justice (Gosh & John 1999). Customer specific investments in new product development process during interactions increase dependence on supplier and power imbalance is the flip side of dependency (Heide 1994; Palmatier et al. 2007). Customer-supplier dependency in relationship represents mutual dependence (Piskorski and Casciaro, 2006) and customer's resources investment can increase the new product value pie but depicts power imbalance as customer's dependence increases mutual dependence (Heide, 1994; Casciaro and Piskorski, 2005). The level of customer's dependence may vary as new product development outcomes are uncertain and in negotiations suppliers often attempt to pursue cost reduction strategy but they also increase the customer's dependence on them (Jap, 2001). Thus customer specific resources investment can

increase product value and also increase customer dependence.

H4b: Customer resources investment associated with customer relationship specific investment has positive effect on customer dependence.

In previous research, value creation and value sharing provide little insight into interactions between customer and supplier as way of crowdsourcing practices. Two important perspectives of customer participation in new product development process are net value creation and share of value pie which is still remain under researched (Jap, 2001). From institutional arrangement perspective (Carson et al, 1999), the ultimate product value attained by the customer means the overall benefit that customer gains in new product development process. Customer input in knowledge exchange and resources investment in new product development process also determine the ultimate value attained by the customer.

The dependence of customer on supplier may effect on outcomes of new product with respect to joint value creation and sharing (Gosh and John 1999, 2005) and a high dependency of one party decreases the willingness to accommodate other party's needs (Heide, 1994). Based on the above discussion, the following hypotheses are as follows:

H5: The size of the new product value pie has a positive impact on the ultimate new product value attained by the customer.

H6: Customer dependency has a negative effect on new product value attained by the customer.

## **Methodology**

The main objective of our research is to obtain deep understanding of customer obtained value in new product development process and implementation of crowdsourcing practices to investigate the customer participation in value creation to integrate the crowd into value creation process. The most important in this study is customers that are dealing with manufacturing companies and for this purpose; from commercial list broker, list of firms was obtained. In terms of customer participation, construction safety equipment, electronic and optics, metal and metal working, and rubber and plastic products industries are selected because in these industries customers participate mostly in new product development process.

### *Sampling Frame and Data Collection Procedure*

For the study population more than 500 firms were shortlisted from China industrial city Yi Wu the ones those dealing with manufacturing firms as this city is having many international partnering companies and commercial firms are involved in business to business relationships (Heide, 2003). China as an emerging economy appears to be an interesting country for customer participation and product development on requirements of customers from most of the parts of the world. From a commercial list broker, sample of 500 potential firms with complete mailing addresses including emails, dealing with manufacturing companies from the last five years and are involved in most of the new product development



projects. Out of 500 firms, with several personal visits of researchers and after verifying physical existence of the firms, only 370 respondents holding positions mostly at the level of purchasing and production managers/heads were found appropriate to be involved in the study. Out of total 370 selected firms, only 185 firms came up with full information and were included in data analysis as sample study.

The participants spent almost 8 years in their current position and most of the key informants were purchasing managers. A sample breakdown by manufacturing companies was 62 (33.3%) from construction safety equipment, 49 (26%) from electronic & optics, 43 (23.1%) from metal and metal working and 31 (16.6%) from rubber & plastic products industries.

The survey included questionnaire to assess the participation of customer in NPD. The questions measured (on seven-point Likert scales, anchored at 1 =fully disagree; 7=fully agree). Survey questionnaire with personalized cover letters were emailed and after ten days, reminders were sent. To make sure that the questionnaires were distributed to appropriate respondent, we initially called them by phone and motivated them to complete the questionnaire. After two reminders and personal telephonic persuasion, questionnaire with excessive missing data was eliminated, the final sample consisted of 185 (51% effective response) was received. Using Armstrong and Overton's (1997), we found no significant differences ( $p > .05$ ) between early and late respondents which suggest that nonresponse bias was not a problem.

#### Survey instrument and measures

Initially a series of interviews were conducted with top managers from different firms to know the patterns of customer involvement in new product development process. On the basis of these interviews and a review of previous research, the questionnaire was developed. We used multi scale items to collect data for all constructs. A 7-point Likert type scale ranging from 1 (strongly disagree) to 7 (strongly agree), was used to assess the items, except where otherwise specifically mentioned.

The scales employed in this research were either adapted from existing literature or extracted from our field interviews and further modified accordingly. We conducted eight extended interviews with managers of different firms across the four industries mentioned above. On the basis of these interviews, level of customer participation in supplier new product development process broadened our understanding. Subsequently, the level and degree of the involvement of customer in new product development process was emerged through these in depth interviews.

*Customer participation* to the new product development process was measured with 10 activities targeting the level and degree of participation of the customer. For level of customer participation, we asked to select with respect to each activity 'involved' and 'not involved'. The customer involved in the activity, further was asked to answer the degree of

participation in activity using seven point likert scales. The items for customer participation in new product development process were adopted from Auh et al. (2007) and Fang et al. (2008).

Customer participation formality in new product development process through *practices of crowdsourcing* was measured with four items developed by researchers. Crowdsourcing formally specifies the scale and nature of customer participation (Djelassi & Decoopman, 2013) and Crowdsourcing formality for customer participation in new product development process encompasses two essential elements (Vargo & Lusch, 2008; Baron & Warnaby, 2011): (1) key resources for companies can be directly acquired from customers that are skills and knowledge (Arnould, Price & Malshe, 2006). (2) Key activities in the product development process are related to customer participation in knowledge exchange from initial idea through to marketing.

To capture the *new product value*, six items were adopted from Fang et al., (2008) to measure direct and indirect benefits of the product. The *knowledge exchange* measure included four items from Heide & John (1990) and this constructs were used to know the extent of information exchange by customer in new product development process.

The measure of *customer resources investments* used four items developed by Heide & John (1990) to evaluate the customer relationship investments. The assessment of the *customer dependence* relied on three items adopted from Kumar et al., (1995). Customers were asked to measure their dependence on suppliers.

To capture the perceived size of *value pie attained by the customer*, this study used three items adopted from Fang et al., (2008). Some control variables 'customers' tenure of relationship with supplier' and 'participation in number of joint projects' were also included in the study to know the new product value attained by the customer.

To measure the proposed model, we first attested the validity and reliability of scales used (Gerbing & Anderson, 1988). In the second step, hypotheses were tested. Reliability was tested by means of internal consistency ( $> 0.9$ ) and convergent validity by assessing items reliability of each measure by using factor loading ( $> 0.7$ ), Cronbach's alpha ( $> 0.7$ ), composite reliability (CR) ( $> 0.7$ ) of each construct and the average variance extracted (AVE) ( $> 0.5$ ).

#### Results

Table 1 and 2 indicate the convergent and discriminant validity of the scales. As shown in table 1, the measurement items all have statistically significant loadings ranging from 0.56 to 0.90. The Cronbach's alpha of the constructs ranges from 0.66 to 0.81 and composite reliability ranges from 0.80 to 0.94, both of which exceed the benchmark of 0.7, thus confirming constructs and items reliability. Table 1 also shows, all the constructs have average variance extracted well above the acclaimed value of 0.50, ranging from 0.55 to 0.75.

Table 1. Reliabilities, validity and loadings

Construct name/items	Loading	t-value	AVE	Composite reliability	Cronbach's alpha
Customer Participation in NPD	.75	126.95	0.55	0.855	.66
New Product Value			0.66	0.925	.74
NPV1	.66	16.67			
NPV2	.95	14.58			
NPV3	.90	15.16			
NPV4	.69	20.54			
NPV5	.75	16.07			
NPV6	.88	20.26			
Knowledge Exchange			0.61	0.807	.72
KNWEXC1	.73	19.73			
KNWEXC2	.82	26.21			
KNWEXC3	.77	20.39			
KNWEXC4	.78	9.94			
Customer Dependence			0.65	0.856	.83
CUS-DEP1	.90	57.20			
CUS-DEP2	.80	10.99			
CUS-DEP3	.73	34.17			
Customer Resources Investments			0.66	0.883	.72
CUS-INVEST1	.82	24.22			
CUS-INVEST2	.68	32.21			
CUS-INVEST3	.83	18.69			
CUS-INVEST4	.67	12.06			
New Product Value Attained by Customer			0.72	0.843	.80
NPV-by-CUS1	.72	63.25			
NPV-by-CUS2	.73	26.45			
NPV-by-CUS3	.65	73.89			
Crowdsourcing Practices Formalization			0.75	0.946	.81
Crowd-Practices1	.76	28.74			
Crowd-Practices2	.81	16.52			
Crowd-Practices3	.79	24.12			
Crowd-Practices4	.68	33.12			

In table 2, discriminant validity of all construct is established since all square roots of AVEs are much larger than the construct correlations. The descriptive statistics for construct

with higher mean score indicates they were highly evaluated by respondents and correlation between any pair of constructs shows more positive correlation (table 2).

**Table 2.** Descriptive statistics, discriminant validity and correlations

Constructs	Mean	SD	1	2	3	4	5	6	7	8	9
1 Customer participation	6.44	1.40	<b>.78</b>								
2 New product value	5.58	1.20	.46**	<b>.82</b>							
3 Knowledge exchange	5.72	1.19	.37**	.25**	<b>.87</b>						
4 Customer dependence	5.52	1.40	.51**	.48**	.18**	<b>.79</b>					
5 Customer resources investments	5.38	1.21	.41**	.32**	.22**	.41**	<b>.80</b>				
6 New product value attained by customer	5.43	1.10	.45**	.47**	.44**	.27**	.34**	<b>.77</b>			
7 Customer participation through crowdsourcing formality	5.58	1.58	.67**	.18**	.11	.25**	.21**	.53**	<b>.75</b>		
8 Relationship tenure	4.42	0.91	.07	-.02	-.01	.01	.11	.06	.13	n/a	
9 Number of projects completed	3.36	0.74	.10	.15**	.13	.11	.14**	.01	-.10	-.09	n/a

Bold numbers on the diagonal indicate the square root of the average variance extracted

\*P < 0.05; \*\*P < 0.01;

Path analysis is used to assess the proposed hypotheses relationships. Table 3 includes the path coefficients, t-values of the model estimation. The empirical results indicate that customer participation has significantly positive effects on both knowledge exchange ( $\beta = .47$ ,  $p < .01$ ) and customer resource investments ( $\beta = .31$ ,  $p < .01$ ) supporting H1a and H1b. H2a is supported because customer participation crowdsourcing practices formalities has greater impact on knowledge exchange ( $\beta = .23$ ,  $p < .05$ ) but H2b is not supported as customer participation crowdsourcing practices has not significant effect on customer resources investments ( $\beta = .12$ , ns.).

Knowledge exchange has significant and positive impact on new product value ( $\beta = .16$ ,  $p < .05$ ) and customer

dependency ( $\beta = .19$ ,  $p < .05$ ) and new product value ( $\beta = .23$ ,  $p < .05$ ) are positively affected by customer resources investments. The control variable of number of joint projects completed has positive impact on new product value ( $\beta = .31$ ,  $p < .01$ ). Thus, hypotheses H3, H4a and H4b are all corroborated.

New product value had greater impact on new product value attained by customer ( $\beta = .30$ ,  $p < .01$ ) supporting H5. Customer dependency does not significantly influence new product value attained by customer ( $\beta = .09$ , ns.) rejecting H6. The control variable of relationship tenure has no significant relation with new product value attained by customer.

**Table 3.** Hypothesis main impacts

Hypothesis	Impact of	On	Path coefficient	t value	Hypothesis supported
H1a	Customer participation	Knowledge exchange	.47	4.36*	Yes
H1b	Customer Participation	Customer resources investments	.31	3.18*	Yes
H2a	Crowdsourcing formalities	Knowledge Exchange	.23	1.97**	Yes
H2b	Crowdsourcing formalities	Customer resources investments	-.12	1.01	No
$R^2$ (knowledge exchange) = .48; $R^2$ (customer resources investments) = .25					
H3	Knowledge exchange	New product value	.16	1.75**	Yes
H4a	Customer resources investments	New product value	.23	1.89**	Yes
H4b	Customer resources investments	Customer dependency	.19	1.73**	Yes
control	No of projects completed	New product value	.31	2.82*	
$R^2$ (new product value) = .43; $R^2$ (customer dependency) = .22					
H5	New product value	New product value attained by	.30	2.74*	Yes

		customer			
H6	Customer dependency	New product value attained by customer	-.03	1.01	No
control	Relationship Tenure	New product value attained by customer	.09	0.96	

$$R^2 \text{ (new product value obtained by customer)} = .30$$

\*\*\* Significant at the 1% level (one-sided test).

\*\* Significant at the 5% level (one-sided test).

\* Significant at the 10% level (one-sided test).

## Discussion

Supplier-customer interactions in crowdsourcing practices develop mutual linkages and dependence on each other (Heide & John, 1988). Customer participation in new product development process may offer financial benefits and recognition of long term relationships of supplier-customer (Anderson & Weitz, 1989; Anderson & Narus, 1990). This stream of research typically concentrates on product development process performance (Dyer & Singh, 1998; Prahalad & Ramaswamy, 2000) but there has been scarce research on value creation of new product development and share of customer in value pie through crowdsourcing practices. The results of this research indicate theoretical and managerial implications of the output of research questions.

The answers of research questions in this study from institutional arrangement perspective might offer some explanations and development of conceptual model elaborates value creation and value sharing of new product development between customer and supplier (Carson et al., 1999). Our findings support most of the hypotheses and are consistent with conceptual model revealing the size of new product value pie and share of customer integrated through crowdsourcing practices as exception.

To elucidate first research question of this study, customer participation and degree of involvement in new product development process shows the impact of customer involvement (knowledge exchange and customer resources investments) by improving new product development process. the results highlights the importance of customer participation in new product development process where both parties supplier and customer have to contribute on long term exchange and to gain higher share of the business.

From the perspective of customer resources investments, this study also increases the importance of stockpiles by both supplier and customer interactions. The results support that customer relationship specific investments can increase the magnitude of the value of new product and it also shows indication for customers to improve their involvement in new product development process to peruse supplier to involve more customers in their specified projects.

To enlighten second research question of this study, Crowdsourcing practices formalization shows significant impact of customer participation on knowledge exchange in

creating new product value. The implementation of crowdsourcing practices through formal rules provides the opportunities to managers to increase the involvement. Effective implementation of crowdsourcing practices suggests that customers with high degree of involvement in new product development process are the prime partners for value creation of new product.

Our results indicate that crowdsourcing formalities have no impact on customer resources investments. Given these findings, the magnitude of the customer participation would be expected to vary across products in formalization of crowdsourcing practices.

Furthermore, in business to business relationships, share of value pie of new product regarding third research question provides more insights into equity and dependence sides. Without more value for customers, a bigger value pie increases only the perception of inequity and also increases the dependence of customer on supplier. Open and frequent exchange of information has an impact on new product value and customer resources investment also increase the new product value but customer resources investments moderates the dependence of customer. The results suggest that customers those who are dependent on supplier receive less value of new product.

To explore the impacts of customer participation on new product value attained by customer, the proposed model suggests that as customer dependency increases, the value of new product attained by customer will increase. The hypothesized link between new product value created by customer and new product value attained by customer may exist at a higher level of significance but customer dependency reduces customer new product value received.

In aggregate, the model explores the institutional arrangement to reconnoiter how customer participation produces new product value attained by customer as partner. The strongest drivers of value creation and value sharing contribute to highlight the importance of customer participation in new product development process and value attained by customer. This research analysis reveals that value created by customer of new product has positive perceptions but their fair share of value pie attained is reduced. The perceived size of the value pie has little importance as findings



show impact of value created by customer on value attained by customer tends to be reduced due to customer dependence.

#### **Managerial implications and potential contributions**

The empirical results of our study show that in business to business relationships, average of relationship tenure is 4.5 years that highlights the less utilization of each partner exchanges. From implementation point of view, customers should communicate frequently and openly if they want to capture bigger share of the value pie to participate in crowdsourcing. To integrate customers in value creation of products in crowdsourcing practices is becoming a major issue for companies and especially managerial concern (von Hippel, 2005).

Crowdsourcing is bit technical and complex as compare to marketing and customer participation effects on relationship marketing and on business models. The new generation is using more social media this is the concern of this study that customer-supplier relationships in crowdsourcing via online depict knowledge exchange as important tie for business to business relationships (Mohr and Nevin, 1990). This study offers an institutional perspective of stabilizing customer-supplier interaction through crowdsourcing practices on the basis of effective communication. Through better knowledge exchange the partners can develop better understanding of sharing of value pie and they can better understand equity perspective. To bridge the gap between managerial metrics and academic studies, this study represents customer participations importance in new product development value attained by customer as quality drive in creating value pie rather than customer participation impact on share of the value pie (Carson et al., 1999).

One of the findings of our analysis is the rejection of H2b and H6 related to customers' resources investments and customer dependency on supplier through crowdsourcing practices, indicates that companies must introduce formal regulations to promote crowdsourcing practices (Bolton et al., 2013). The collaborative projects and problem observation are necessary to be observed by managers while implementing formal rules of crowdsourcing (Majchrzak et al., 2012). The crowd should be allowed to share the contributions through formal participation activities. Crowdsourcing process needs identifiable share of ideas generations. Customer dependency gives feelings to crowd as on back stages and firms should emphasize on strategic lever for external sourcing of information.

In this study, we examine the customer value creation and sharing of new product through practice of

crowdsourcing. This practice is not a focus of marketing research and is not considered in business models. Our study relates of customer participation and crowdsourcing operations for companies. This study extends on customer participation by providing a framework for examining value creation through crowdsourcing practices.

#### **Limitations and direction to future research**

This study adds more in importance of customer participation in new product development through crowdsourcing practices and provides understanding how suppliers can pursue more customer participation (Chen et al., 2013). This study has several limitations which denote to possible future research. The items of the measurements are adopted that were used before which has traditional conceptualization of supplier-customer relationship and little were constructed by researchers. The authors interpreted well those measurements reported by customers but new measurement models should be developed to assess the size of the value pie obtained by customer.

Dyadic data shows the customer perception in creating and sharing of new product value, further research is needed to know the size of value pie from suppliers' and customers' perspectives simultaneously in different projects. Additional research should extend the institutional perspective model, add relationship crowdsourcing constructs and include other theoretical perspectives.

The analysis of customer participation in creating new product value overall improves the new product development process but to capture the mechanism of value creating and sharing in multiple crowdsourcing projects is the direction to future research. This study shows the positive impacts of customer participation but researchers should attempt to trace the negative impacts as well of customer participation in new product development.

Finally, this study integrates customer participation in new product development process related to supplier-customer interactions in crowdsourcing practices; therefore further future models should combine crowdsourcing communities sharing approach from suppliers' perspectives.

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## Appendix MEASURES

### Customer participation in new product development

Ten activities were identified to know customer activities in new product development involved (0="not involved" and 1="involved")

1. creativity of new Idea. 2. product modification 3. product description 4. evaluation of business 5. designing of product 6. manufacturing of product part 7. functional model of product 8. product testing 9. development of new product team 10. controlling and monitoring of the development process.

The activities involved marked yes then how intensely were you involved (1="very superficial" and 7="very deeply").

### New Product Value

- |   |      |
|---|------|
| 1. The component provided by this supplier is produced at low cost.                             | NPV1 |
| 2. The component provided by this supplier is highly innovative.                                | NPV2 |
| 3. The component provided by this supplier is of high quality.                                  | NPV3 |
| 4. The component provided by this supplier complies very well with our assembly processes.      | NPV4 |
| 5. The component provided by this supplier improves the engineering process of our end product. | NPV5 |
| 6. The component provided by this supplier improves the overall functioning of the end product. | NPV6 |

### Information Exchange during NPD process

- |   |         |
|---|---------|
| 1. We expect that significant knowledge will be shared in the relationship.                         | KNWEXC1 |
| 2. We are expected to keep the other partner informed about changes that could affect that partner. | KNWEXC2 |
| 3. Exchange of information and knowledge between partners take place frequently.                    | KNWEXC3 |
| 4. It is expected that we will share proprietary information and knowledge if it can enhance        | KNWEXC4 |

### Customer dependence on supplier

- |  |          |
|--|----------|
| 1. It would be difficult to replace this supplier.               | CUS-DEP1 |
| 2. If this relationship ended, we would face a significant loss. | CUS-DEP2 |
| 3. We are quite dependent on this supplier.                      | CUS-DEP3 |

### Customer specific investments in new product development During the NPD process

- |  |           |
|--|-----------|
| 1. We have made significant investments in tooling and equipment dedicated to our relationship with this supplier. | CUS-INVE1 |
| 2. Our production system has been tailored to meet the requirements of dealing with this supplier                  | CUS-INVE2 |
| 3. Our production system has been tailored to use the particular components bought from this supplier.             | CUS-INVE4 |
| 4. Gearing up to deal with this supplier requires highly specialized tools and equipment.                          | CUS-INVE5 |

### New product value obtained by customer

- |  |          |
|--|----------|
| 1. For the involvements and efforts you input in the component, I would say the component is of great value. | NPV-CUS1 |
| 2. For the price and efforts, I am very satisfied with the functioning of the product.                       | NPV-CUS2 |
| 3. I would think of the component as providing great value.  | NPV-CUS3 |

### Customer participation formality through crowdsourcing practices

- |  |            |
|--|------------|
| 1. We are involved in the NPD process of this Component on the basis of customer creativity involvement. | Crowd-Pra1 |
| 2. We feel systemized while participating with this supplier arrangement for product improvement.        | Crowd-Pra2 |
| 3. There is compulsory regarding our involvement in this supplier's NPD process of the component.        | Crowd-Pra3 |
| 4. We follow a set pattern in our participation activities of the NPD                                    | Crowd-Pra4 |

the quality of the NPD process and our relationship.

process.

All scales are 7-point scales, with "strongly disagree" and "strongly agree" as the anchors, unless noted otherwise

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