Consumer involvement in NPD different stages: Survey and case study

Yanmin Xue, Menghui Huang
School of Art and Design, Xi'an University of Technology, Xi'an, Shaanxi, CHINA

Abstract: The positive significance of consumers involving in enterprise NPD has been generally realized. But the involvement condition in each stage of the NPD and involving modes remain to be further research. This paper uses field experience and questionnaire survey to research consumers involving in Chinese SMEs NPD. Main content includes typical stages of NPD, which NPD stages consumers are involved in and should be involved in, and involving mode in each NPD stage, etc. Based on the investigation results, a case study of integrated consumers into wardrobe design is carried out on a Chinese furniture enterprise. Customer is involved in multiple stages of NPD, in which crowdsourcing model based on network has been applied. The application introducing customer in stages of NPD has been achieved good results. The positive significance of consumers involving in enterprise NPD has been generally realized. But the involvement condition in each stage of the NPD and involving modes remain to be further research. This paper uses field experience and questionnaire survey to research consumers involving in Chinese SMEs NPD. Main content includes typical stages of NPD, which NPD stages consumers are involved in and should be involved in, and involving mode in each NPD stage, etc. Based on the investigation results, a case study of integrated consumers into wardrobe design is carried out on a Chinese furniture enterprise. Customer is involved in multiple stages of NPD, in which crowdsourcing model based on network has been applied. The application introducing customer in stages of NPD has been achieved good results.

Key words: Customer involving, NPD, stages, case study, crowdsourcing

1 Introduction

Consumer involving in NPD has a positive meaning. Good cooperation with customer can reduce developing cost (Juho Ylimäki, 2014), bring higher creative efficiency (Jepesen, L.B., 2003). Firms cooperating with customers would spend less effort in terms of time and money to achieve a certain innovation, not only being able to reduce the costs of the trial and error process but also the number of faulty prototypes until attaining the desired product (Gloria Sanchez-Gonzalez, 2014). Customer participation enables the firm to customize its offerings to better meet customers' needs, leads to improved service quality, which in turn leads to more favorable assessments of the firms' service and increases customers' intentions to spend and actual spending with the firm, leading ultimately to improved firm performance. (Liem Viet Ngo, 2013); A close relationship between customers and the manufacturer offers opportunities for improving the accuracy of demand information, which reduces manufacturer's product design and production planning time and inventory obsolescence, allowing it to be more responsive to customer needs. (Yuanqiong He, 2014)

Most of the literature considers NPD as a whole process, only analysis its antecedent and consequences. Stages in which consumers involved are seldom researched. Although in practice, it is hard to decompose NPD process into different stages, it is conducive to further analysis and understanding of the product innovation process. Petter Stenmark (2011) surveyed the customer involvement in three stages of outdoor gear and clothing companies: The first is Idea generation and product specification. The second is concept development and prototype testing. The last one is use. Carlota Lorenzo-Romero (2014) agreed the four stages in NPD (1) Idea Generation, (2) Concept Development, (3) Product Design and (4) Prototyping/Testing. Mario Schaarshmidt (2014) analysis five main phases in NPD: discovery, concept, development, test and market introduction. Klaus Brockhoff (2003) adopted a six stage model of NPD: idea generation, concept development, development and engineering, prototype testing, pre-announcement and market launch. The research needs more about the customer involving degree and modes study.

Customer involving mode in NPD stages is mentioned in some literature, but there is no specialized research. In recent years, research on crowdsourcing began to rise, which is involving mode under Web2.0 and some good results have been achieved. Souad Djelassi (2013) carried on five case studies of consumer goods companies and suggested that the implementation of crowdsourcing operations affects the components of an existing business model. And crowdsourcing generates a win-win relationship, creating value for both firms and customers. Rashmi Sandeep Nadang (2014) surveyed several companies who carried on crowdsourcing. He analyzed on the Positives and Negatives of Crowdsourcing. In which the negatives are time consuming, uncertainty, employee morale. There are also some succeed examples of crowdsourcing, such as MIUI Mobile. This paper will do some preliminary survey on crowdsourcing in Chinese enterprise.

Research indicates that when consumer to involve in NPD, what involving mode at each stage, are the two hot issues of concern of enterprises. Based on the above literature review result, this paper did further survey on consumers involving condition of Chinese enterprises. The survey content includes: enterprise NPD typical stages, consumers involving condition in NPD, the stages suitable for customers to involve in, customer involving mode, the view on crowdsourcing and practical crowdsourcing application, etc. Research includes field survey in plant and questionnaire. Finally, the paper applied research analysis results in one
China enterprise new product design. Some online sections corresponding to the typical NPD stages are integrated into the enterprise website. Through the consumers' online crowdsourcing, the NPD received a better effect.

2 Methodology
2.1 Enterprise investigation
To have a preliminary understanding on consumer involvement in enterprise NPD, the authors interned in one Chinese furniture enterprise for three months, participating in the new product development (NPD). Through experiencing, the NPD process is observed and summarized. In general, the enterprise's NPD process is as follows: NPD is charged by Development Department in Technical Center. The designers get the sales condition, the need of customer and dealer from trade ministry. Then they start to do brainstorm to get many concepts. The concepts are expressed through 2D sketch and the final 3D rendering. In this period, they will constantly communicate with the director of the technique department. The selected product concept is made into prototype for testing. After testing qualified, it will be produced for a small amount of trial production. Use network platform such as Tmall shop or Taobao website to market a small scale. The product with good market feedback will be formally mass-produced. At this point, departments including design, Internet marketer, marketing, trade will actively cooperate with each other to put this product to the market. The author also made some research on several other enterprises' NPD process. They are similar with above. Analysis of this kind of NPD process, some certain problems exist in it.

1) Lack of product planning, new product market positioning is not accurate. From the above NPD process description, the enterprise to develop new products is generally based on information from sales report, dealer's demand and manager's decision, etc. The study of consumer demand is relatively lacking. So there are not enough market bases, and the product positioning lacks direction. Even the product can get profit in a short time, but the enterprise lack of innovation will not obtain the royalty by the customer. Once lack of a dealer orders, enterprises will fall into a passive situation and finally be eliminated by the market.

2) Consumer participation in NPD process is less and most of the consumers are in process of passive acceptance. At the beginning of the NPD process, sales can reflect consumer attitude towards products. The later trial sale also can get consumer preferences for this product. Besides the above two stages, there is almost no consumers participation. And the early sales figures and late trial sales data are also relatively simple to understand market. The specific needs and feedback of consumers did not get understood. Positive influence of consumers involving in NPD fails to reflect.

3) Companies hope to be able to accurately grasp the market demand and attract a wider range of consumer involvement. While the situation of consumers involved in the NPD is not optimistic, but most of the enterprises show the desire and interest to strengthen the practice and management of customer involvement. What suffer them are lack of management and financial support.

2.2 Questionnaire
On the basis of investigation in enterprise, the author designed a questionnaire to investigate consumer involving stage and degree in NPD. Respondents mainly are managers, designers and users. Depending on the different types of the respondents, they need to answer different questions. Managers and designers need to answer is enterprise background, typical stages of NPD, the NPD stages in which consumer involved in, consumer involving condition in each stage, etc. Consumers are to answer which stages once involved in and the involving mode. The questionnaire also wanted to know which stages the consumers are expected to participate in. This should be answered by all the respondents. At the end of questionnaire, crowdsoursing is mentioned. It is based on present new medias to attract more consumers to participate in NPD. The crowdsourcing mode is asked. This can provide reference for enterprise to run cooperation with customers based on new media. The main questions in the questionnaire are shown in figure 1.

Research mainly takes the following three ways. First is the network mode: send survey questionnaire to the enterprise people and consumers, through network means, such as QQ, MSN, and Email. Followed by is the field investigation, carry the printed questionnaire to the enterprise, and communicate with enterprise personnel. Personnel filled in it after understanding. The third is interview: through interviews with designers, engineers, managers, understand their comment and record note to fill in answers.
There are 136 electronic questionnaires, 50 printed (field research) and 15 interview notes. The involved companies come from Zhejiang, Guangdong, Jiangsu, Shaanxi and Shandong Province in China. Invalid 20 questionnaires are excluded. The valid copy is 181.

3 Survey result
3.1 Customer involving rate in NPD stages
Products of enterprises in this survey are household appliances, furniture, toys, daily necessities, etc. Majority is small and medium enterprises. Survey shows that typical NPD stages includes: market research (customer needs), concept generation, concept selection, concept test and trial production stage. Literature research shows that not all the NPD stages are suitable for all consumers to involve in. And the involving degree is different. For example, in consumer need identification stage, the more consumers involved in, the more idea, innovation points, advice, and product defect, hope could be obtained, more specific demand enterprise can get. Customer involved in this stage has great reference on later market positioning. In the concept generation stage, based on the different background of the consumer, number of customer who can effectively participate in is small, usually lead users take part in this stage. Through overall analysis of questionnaires data, the results show that consumers involving rate in each stage is as shown in Form 1.

Results show that consumers do involve in the stages more with less, but there's plenty of scope to increase cooperation. From Form 1, China's SMs are relatively weak in cooperation with customer in stages of need identification, concept generation, and concept selection. This will be unfavorable to grasp the consumers' consumption psychology and consumption trend. Both consumers and employees (managers and designers), agree that consumer involving is very necessary upon stages of need identification, concept selection, concept test.

For the question of main problems SM enterprises facing to consumer cooperation, lack of management ability, human resources shortage is major concern.

3.2 The cooperation source in each NPD stage
In different stages of NPD, acquiring phase achievements needs the help of some external force. However, the result shows that companies mainly depend on the internal staff.

Upon identification of customer need stage, the enterprise obtain the information of products through products expo, dealers and suppliers. Many enterprises respondents thought, the design trend of the product, including information of materials, colors, new technology, structure, etc, can be grasped through these channels. The demand of real buyers and users for the products, consumers, is researched by only a few enterprises. And the extent of the research is very limited.

In the concept generation stage, the enterprise mainly depends on internal team for new product design. In the design process the team will seek external expert to help. They will also search the patent for help. But enterprise rarely seeks originality from consumers. In fact, at this stage, many lead users have already get some good ideas of products. And because of interest in the product for long, the feasibility of the idea is better also. Companies still need to work for close and long contact with these users. Survey also found that some enterprises have adopted the crowdsourcing model, which enables a large number of consumers to participate NPD based on web2.0 environment. In the 21 survey companies, there are 3 in the form of design competition to collect product ideas publicly. The company released the competition information through website and got submission ideas through emails. And they all received good results, not only gaining the extraordinary creativity, but also improving the social popularity. That is also very good marketing strategy.

Concept selection stage, the majority of enterprises is through internal discussion to select which concept can be further refined. In the end it is by the manager to decide the final selection. Designers, engineers, sales department will participate in the discussion, but few consumers are invited to provide advice. Now in the age of web2.0, new Medias provide a variety of channels for consumers to participate in. As long as the enterprise provides the opportunity, there will be customers interested in it. In this survey, there are two enterprises which design new product online display platform for consumer to choose. The customers’ suggestion provides important reference for the final decision.

In solution test stage, most of enterprises carried technique testing. The performance product won the technical guarantee. As for the product's aesthetic features, style and other subjective attribute are not tested. And this test should be done on customers.

In market trial phase, the enterprise carried on small scope marketing through the entity stores, E-stores and so on. A certain sales data was obtained. E-stores also provided certain consumer feedback. So at this stage the participation of consumers is more than that in other stages. But participation modes should to be rich to get more specific feasible suggestion.

### Form2 The main channels for each NPD stage to cooperate

<table>
<thead>
<tr>
<th>Stages</th>
<th>Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Customer need identif</td>
<td>Customer, Product expo, dealers, supplier</td>
</tr>
<tr>
<td>2 concept generation</td>
<td>Customer, Inner team, expert, patent</td>
</tr>
<tr>
<td>3 concept selection</td>
<td>Customer, Inner team, manager</td>
</tr>
<tr>
<td>4 concept test</td>
<td>Customer, Technique test</td>
</tr>
<tr>
<td>5 Trial production</td>
<td>Customer, Dealer</td>
</tr>
</tbody>
</table>

#### 3.3 Customer involving mode in each NPD stage

Research also explores on consumer involving modes at every stage of the enterprise NPD. The results showed that consumers involving mode in different stages varies according to the different tasks of each stage. The involving channel can be divided into online and offline. Consumer type is different. On the basis of involving time length, involving number and quality of proposal, consumer can be divided into three categories, respectively leading the user, regular users and potential users. Below is the summary of consumer involving mode in every stage, combining with the research results.

Stage of Customer need identification: Both enterprise and the consumer think that this stage should be integrated into consumer participation. Views, suggestions, and hope proposed by consumers in the early stage of NPD are an important source for enterprise to determine the design direction. Design information from the channel such as dealers, suppliers and products expo can get further verification and correction by customers. Survey shows some ways eliciting customer to participate: electronic questionnaire, printed
questionnaire, interview (lead users, users and potential users may be involved in general). Online need collection is used in recent years.

Stage of concept generation: Observation method (the average user), focus group method (lead users) can be used to collect consumer advice and solutions for product design. Besides traditional methods such as focus groups, online idea submission, design competitions are good ways to collect design concept.

Stage of concept selection: Concept selection from the angle of consumers, who consider the various properties, better represents the direction of the market. Common used method is inviting customers (lead users, users and potential users may be involved in general) to participate in the discussion and score. Concept selection based on new Media in web2.0 age is more convenient.

Stage of concept test is to test whether the concepts are consistent with consumer demand. Enterprise provides consumers (lead users, general users) with prototypes or real products to experience. Product simulation, multimedia interaction, prototype, working model and other forms can be used to test. Users will propose specific proposals, such as form, function, operation, etc. Test result together with the technique test result constitutes the product test reports for enterprises to further refine the product design. New Media in Web2.0 provides a great convenience on concept testing.

Trial production stage: small amount of sales leads to consumers' evaluation. Evaluation is the consumer (lead users, general users) feedback on product performance. It is advantageous to the product improvement and perfect. The method includes questionnaire (email and post mail), sampling survey method to collect consumer information. In network era E-store can bring more quickly, specific user feedback. Through analyzing the content of the user evaluation improvement for product design information can be obtained, including color, material, structure, surface texture, man-machine interface design, operation and function properties, etc.

The last two questions of the investigation want to know about perceptions on new media application under Web2.0. The results show that the respondents hold hopes on consumers involvement in NPD based on new Media. They hope that interactive communication with customers through various media platforms could improve the efficiency of cooperation so as to improve enterprise innovation ability.

4 Application
The author provided the investigate report to company. The company adopted some of the suggestions. Consumers are involved in some critical stages to refine NPD design. The related product was wardrobe. In addition to the traditional offline involving mode, the company integrated consumer participating section in its portal web, through the crowdsourcing to expand the involving scope.

![Figure2 Customer involving mode in each stage](image)

In the stage of the customer needs identification, the company added the customer interview to know customer demand for the wardrobe. Besides, company website designed "online customer requirements gathering", "Fancier" (lead users) and "Communication Bar" (general users) online section. More widely customer comments and Suggestions are collected. In this stage, problem found in original product is wardrobe assemble difficult and its internal layout too single.

The concept generation mainly made use of the online mode. Enterprise website opened "creativity" section to invite customer put forward design concept. At the same time, in view of the previous problems, designer team with five leading users also developed a large number of solutions.

Concept selection also used internet platform. Online users entered "I choose" section to choose product color scheme, the optimal structure or prefer design. They have chosen one wardrobe design which
conforms to most of consumers. The design is shown in figure 3. The design is for small households and young employees just graduated. It can transform from a small cupboard to a big cabinet. Small cupboard can be used as bookcase or storage cabinet, saving interior layout. When needed, it can be fully open into a multi-function cabinet. The storage space is increased and the storage function is better implemented. This design has realized the experience of the same type with different functions, increasing the pleasure to use.

Concept test stage, the enterprise developed trial prototype according to consumer feedback. The website “experience plan” section asked consumers (lead user, regular users and potential users) to register. After screening, some consumers were chosen to participate in prototype trial. The experience report was feedback. The whole process of new development gives full consideration to customer function needs and psychological needs and has received good effect.

![Figure 3: Selected wardrobe design by customers](image)

### 4 Conclusion

This article uses field experience, questionnaire to survey the condition of Chinese consumers involving in NPD of Chinese enterprises. Customer involving stages, each stage creative idea sources, and involving modes in each stage are analysis. The study result was applied in wardrobe design cycle in one China furniture design company. Each stage was integrated consumer's participation. The involving mode is priority to online consumer innovation platform based on the company's website. The paper proposed that the crowdsourcing model based on various new Media platforms will be advantageous way of cooperation with consumers under the web2.0 age. Several online sections corresponding to NPD stages can be integrated in one innovation network system, which can not only strengthen the interaction between users and companies, but also improve the efficiency of new product development.

### References: