Product development: A trend towards co-creation
A review of the literature concerning co-creation methods in product development

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Abstract
This paper studies product development and different methods for involving customers in this process. The product development process is described and divided into six phases. The most prominent customer involvement methods in product development are described and linked to the different phases in the product development process. Different opportunities and drawbacks are given for every customer involvement method. To conclude there is produced a table that shows the results from these analyses.

Keywords: product development, co-creation, innovation framework, customer involvement

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1. Introduction

“For over hundred years the dominant though unspoken assumption is that firms create value. For example, all the internal activities of the firm are captured in the so called ‘value chain.’" (Prahalad 2004)

This idea of value creation solely by companies is slowly fading away. The old fashioned way of innovation and product development within their own value chain is being challenged by a new perception, value creation together with your customers. In this paper the concept of creating value together with the customers is called “co-creation” (Prahalad 2003).

In the past few years, companies have involved the customer more and more in their product development process. It started with companies that put together focus groups to improve their products. This trend evolved into companies like Dell, who let their customers customize their products through the web, to companies who use open source software to give the customer the opportunity to improve the products themselves.

In the present there are some companies who use their own website to create value together with the customer. At NikeID customers can design their own shoes and Converse lets their customers create their own video advertisements on the internet.

It is also possible to form communities with people who share the same interest through the internet (Füller, Bartl et al. 2006). These thematic consumer communities are not location bound and can be a big help in adding value to the products of all sorts of companies.

Third, the technology to gather information directly from the use of products has taken a big leap in the past years. If this information would be gathered and processed by companies, they could improve their products without even bothering their clients. For example, a car tire producer puts sensors in his tires from which he gets information about temperature, pressure and the wearing of the tire. The customer leases the tires, until he needs new ones. The producer gathers and processes the information from the old tires and improves his products with it. Many more possibilities for co-creation in product development can be created.

All these consumer involvement strategies can be very promising for companies that want to innovate up to the standards of their customers, but there are also several drawbacks to every strategy.

In this paper, literature on co-creation in product development will be reviewed. In chapter 2 the product development process will be divided into several phases. In chapter 3 different methods for customer involvement in product development will be explained. The opportunities of co-creation will be examined, but also the drawbacks of different methods will be explained in chapter 4. The paper concludes with a table in which the results of the study are shown.
2. Phases in product development

In the literature concerning product development several phases in the product development process are described. Sometimes this division counts up to thirteen phases (Cooper and Kleinschmidt 1986).

A choice from this range in phases is made in this paper to describe the process. This choice was based on the frequency the phases are discussed in important literature and the scope of this paper. This paper describes the product development process in six phases. Results found in studies that describe a different number of stages can still be adopted in this six stage process. In this chapter these six phases will be discussed: Specification, conceptual development, detailed design, prototyping, product launch and evaluation.

**Specification** is the first phase in product development. In this phase the problems or wishes are specified and translated into requirements for the product. This way, ideas for a product are generated.

**Conceptual development** is the second phase, in which the product will be positioned in the market. Also the scope will be determined and further specifications for the product have to be made.

**Detailed design**, the concept will be described in more detail. All the technical, ergonomic, functional and other details will be discussed and documented in this phase.

**Prototyping** is the most common way of testing a product before it is launched. Errors that become clear from experimenting with the prototype can be recognized and solved to optimize the product for the product launch.

**Product launch**, the product is set into the market. Important factors are; marketing, retail price, sales outlets etc.

**Evaluation** is the last phase of this product development cycle. Information is gathered about the performance of the product. This phase can also contribute to a next product development cycle.

As mentioned in the introduction of this paper, customer involvement can be very useful throughout the product development process. Companies need to decide in which phases, customer involvement is preferable for their product and the product developers. They also need to make a choice in methods for customer involvement. In all these six phases, the customer can be involved in the development processes in different ways. These different methods will be discussed in the following chapter.

The complete product development cycle is shown in figure 1 below.
3. Customer involvement methods

User-oriented Product Development refers to innovations developed by customers rather than companies. Many products are actually developed by end users, who passed on their ideas to manufacturers (von Hippel 2005). Users are willing to pass on their ideas, for entirely new products or modifications to existing ones, to companies for free. They hope this way the company produces their idea and their issues will be solved. Companies often are interested in the ideas of their customers or users. Nevertheless, little of these companies take full use of their customer’s ideas. This is a result of the lack in customer involvement techniques integrated in the product development cycle.

In this chapter the most discussed and used methods for customer involvement will be described.

Methods for involving consumers in product development:

**Quality Function Deployment (QFD)**

QFD is described in literature as “a method to transform user demands into design quality, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process.” (Akao 1994)

The technique uses graphs and matrices and exists of three steps:
- Identify customer needs and wants
- Identify the engineering characteristics of products that meet these needs
- Setting development targets and test methods for the products or services

This method is widely used in product development processes. Although the customer is only involved in the first phase of the product development process, the quantitative results of the method can be used throughout all the phases (Sivaloganathan and Evbuomwan 1997).

**Consumer Idealized Design**

Consumer Idealized Design involves actual or potential consumers in an unconstrained design of their ideal product or service. The participants are told not to be concerned with the feasibility of the designs they create, only with their desirability. In proposing the design, consumer participants are free of all constraints except two (Ciccantelli and Magidson 1993):

- The product or service cannot involve any technology that does not currently exist
- The product or service must conform to the law

**Focus Groups**

A focus group is a form of qualitative research which a group of people are asked about their attitude towards a product. Questions are asked in an interactive group setting where participants are free to talk with other group members (Brockhoff 2003).

There could be argued that Consumer Idealized Design sessions are very much like focus groups. The big difference between these two methods is that focus groups generally begin and end with the product developers' concept for a new or improved product or service and the output of consumer design sessions is treated as a point of departure for the remainder of the product development process.
**Lead User Method**

Lead users are users of a product that currently experience needs still unknown to the public and who also benefit greatly if they obtain a solution to these needs (von Hippel 1986). The aim is to gather specific solution data from lead users. The method consists of four steps:

- specifying lead user indicators
- identifying lead user groups
- generating concepts with lead users
- testing lead user concepts on ordinary users

This method can be used throughout the whole product development process.

**Participatory Ergonomics**

The basic idea of this method is that the users actively partake as designers, generate ideas and design their environment or living space. The key element in participatory ergonomics is the participation of end-users in small group activities (Hignett, Wilson et al. 2005). This method requires for the group activities to take place in the environment that will be developed, this is the reason why it is mostly used for companies and workplaces.

**3.1 Testing with the customer**

Different tests with customers are used in product development. The three most frequently discussed tests are described in this paragraph.

**Concept Testing**

Concept testing is an approach that aims to involve customers in the conceptual design phase, preferably known as the concept evaluation phase (Moore 1982).

**Usability Testing**

Usability tests are used to evaluate a product design by watching the intended users of the product try it (or a prototype of it) for its proposed use, and seeing what problems are found. (Miller 2005)

**Beta Testing**

Beta tests are when almost-complete products are sent to customers, and they are asked to report problems (Smilowitz, Darnell et al. 1994). Beta testing can be described as pre-release testing and is mostly used for software testing.

**3.2 Information gathering techniques**

**Contextual inquiries**

Contextual inquiries are field researches that focus on work environments of customers. It is a technique that gathers information about how customers do their work and what problems they encounter. This data is used to formulate what steps are needed to solve these problems.

**Interviews**

Interviews are structured one-on-one question and answer sessions. They are investigative in nature so the intent is to gain understanding in areas that are unclear (Miller 2005).

**Surveys**

Surveys are strict sets of questions that are delivered to a large number of people in order to gather quantitative data.
4. Opportunities and drawbacks

In this chapter the pro's and con's of every method for customer involvement in the product development process will be described.

**Quality Function Deployment (QFD)**
In the QFD-method all the customers’ wishes are made quantitative, this gives the developers the opportunity to calculate with the data. This can only be justified if correct data is used and this implicates that flawless data collection methods were used correctly. This seldom is the case. Also, this method is not very useful for completely new products. QFD is more suitable for next generation products.

**Consumer Idealized Design**
This method stimulates thinking ‘out of the box’, therefore it can create really innovative ideas. These ideas will always be limited to existing technology due to the first constraint, this limits the innovativeness. A negative point of this method is that it only generates qualitative output, derived from local thoughts from a relatively small group of customers.

**Focus Groups**
Focus groups generally begin and end with the product developers’ concept for a new or improved product, so the involvement of the customer in the development process is limited. The gathered data is mostly qualitative and derived from a small group of customers. The method is frequently used by large companies.

**Lead User Method**
The ideas of lead users can be very valuable to a firm, because they are often well considered and state of the art. It is however very difficult to determine who the lead users are and on what criteria they need to be selected. Companies also need to be careful with this method, because the designers can feel dominated by the lead users in the process.

**Participatory Ergonomics**
This method only applies for certain location bound products. The outcome of participatory ergonomics is often very worthy, because it uses highly committed customers. There are however no real precedents in the field of mass production for participatory ergonomics.

**Concept Testing**
This method is involving the customer in a very late stadium of the process, not until there is a complete concept for the product. It can however produce valuable information if the concept offers a realistic description of the proposed product.

**Usability Testing**
This method is also involving the customer in a very late stadium of the process. Usability tests are good for discovering issues with learning, discoverability, error rates, and speed of use. Usability tests can uncover missing features. This method cannot verify that a product is solving the right problems for specific users.

**Beta Testing**
This method is also called pre-release testing, which means the customer involvement takes place in the last stages of the process. Beta tests are good at finding bugs. They are also good at determining if the product solves the customer's problems and if it works in their specific environment. Beta tests do not show if the product is easy to use.

**Contextual inquiries**
This method is generates very reliable information on what problems customers encounter in their natural environment. Contextual inquiry cannot determine how well a product will work in an
environment or how easy to use or easy to learn a product will be.  

**Interviews**

Interviews are good for understanding the problems which customers encounter and what they like or do not like about a product. Interviews will seldom help identify new market opportunities.

**Surveys**

Surveys are good for getting simple factual data, priorities, and confirmation of information that was gathered in an exploratory session. There is no explanation with the answers and no room for discussion with the participants.

In table 2 all these opportunities and drawbacks are shown, together with the usability of every method per phase in the product development process.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Method</th>
<th>Pro’s</th>
<th>Con’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specification</td>
<td>Quality Function Deployment</td>
<td>- quantitative data collection methods</td>
<td>- not useful for new product (more useful for next generation products)</td>
</tr>
<tr>
<td>Conceptual development</td>
<td>Consumer Idealized Design</td>
<td>- ‘out of the box’ thinking</td>
<td>- qualitative output</td>
</tr>
<tr>
<td>Detailed design</td>
<td>Focus Groups</td>
<td>- customer involved in first phases</td>
<td>- small group of customers</td>
</tr>
<tr>
<td>Prototyping</td>
<td>Lead User Method</td>
<td>- small group of customers</td>
<td>- easy to select lead users</td>
</tr>
<tr>
<td>Product launch</td>
<td>Participatory Ergonomics</td>
<td>- highly committed customers</td>
<td>- no useful precedents</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Concept Testing</td>
<td>- valuable information if concept is realistic</td>
<td>- late stadium involvement</td>
</tr>
<tr>
<td></td>
<td>Usability Testing</td>
<td>- can discover many different issues</td>
<td>- need for a realistic concept</td>
</tr>
<tr>
<td></td>
<td>Beta Testing</td>
<td>- good at finding bugs</td>
<td>- last stadium involvement</td>
</tr>
<tr>
<td></td>
<td>Contextual inquiries</td>
<td>- very reliable information</td>
<td>- cannot determine ease of use</td>
</tr>
<tr>
<td></td>
<td>Interviews</td>
<td>- good for understanding customers’ problems</td>
<td>- do not identify new market opportunities</td>
</tr>
<tr>
<td></td>
<td>Surveys</td>
<td>- good for simple factual data</td>
<td>- no answers to ‘why’</td>
</tr>
</tbody>
</table>

Method is useful in this phase of the product development process
Method is not useful in this phase of the product development process

Table 2: Use and characteristics of customer involvement methods
5. Conclusion

In this paper the most prominent customer involvement methods in product development are reviewed. These eleven methods are linked to six different phases in the product development process. The opportunities and drawbacks of every method are described. This information is captured in table 2, which gives companies an overview of their possibilities in customer involvement. The table must be seen as a starting point for companies, merely than a solution for their innovation problems. The methods can be combined or customized to set out an innovation strategy that involves customers in the desirable way. The overview given in this paper can be a big help for future research on customer involvement in product development.

6. Further research

Further research must uncover the specific wishes from developers in different product branches. The willingness of customers to fulfill a certain role in the process is another important factor for success of these methods in an innovation strategy. Also the possibilities for implementation of the methods in existing product development processes needs to be researched.
References


