

# USER INVOLVEMENT METHOD IN THE EARLY STAGE OF NEW PRODUCT DEVELOPMENT PROCESS FOR SUCCESSFUL PRODUCT

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## ABSTRACT

*User involvement in the early stage of product development process is often increase the innovative of product ideas and as well as facilitate the product designer to establish the characteristics of a new product. A number of methods were used to incorporate the user knowledge in the early stage of a new product development process. Many new strategies were introduced for a systematic and efficiency planning to deliver a better product outcome. However, the product developers are facing difficulties with developing new strategies for a successful product. Whilst, the successful rate of new products still issues and discussing among them. Thus, this study is proposed to identify an effective user involvement method in the early stage of new product development in which contributed in the success of a product. A structured interview was conducted through face-to-face interview with twenty-seven (27) respondents known as product management specialist. The result given a strong recommendation to the well-organized user involvement in the early stage of product development process and significantly in product definition stage. In addition, the identified and selected method is used to increase the design process performance and support the likelihood of successful a new product.*

**Keywords:** New product development, design method, user involvement and design process

## 1. INTRODUCTION

Globalization of the economy has brought about the tendency in the market to reduce the product cost, decrease time of process and production, increase the product performance and pursue user satisfaction (Bluntzer et al. 2009). Many product developers are under pressure and facing difficulties when developing new products. It causes of an increasingly the product competitor and non-acceptance of product in the market. Several factors were also influenced the successful a product such as technology newness, often marketing, new production method and process, specific demand by user, new laws and regulation, and limited resources. Many strategies were developed and implemented. Unfortunately, the acceptability of products in the market still a vast issue and discussing among the product developers. In particular, this also cause of the development of a new product becomes more complex, in which the new business strategy often requires making the product success and fulfilling the user satisfaction.

User has become directly committed and support the process of creating idea innovation through the market information, and work closely an attempt to achieve the ultimate goals, and meet the user's satisfaction. Involve the user in product development should help the product developers such as to prevent the product risks, reduce of product cost and market failure, and increase company profit (Janhager, 2005; Taha et. al., 2011). Many studies have recommended that the involvement of the user should be at the early of the design process or known as product definition. One of the reason is the users are play an important role through their communicating with the product developers who then transform the information become the product design specification (Taha et al., 2011). Nevertheless, direct with the user does

not guarantee the success of a new product if the product developers do not know how to involve the user in product development. Many methods have been implemented over the years attempt to ensure the product development process more manageable and successful (Thia et al., 2009; Taha et al., 2013). Unfortunately, there are no specific methods that useful focus to increase the success of a new product. In addition, most methods involve the user in product development process has not been properly described and explained of its process. The existing methods are more to engineering driven and related mainly to the manufacturing stage of the development process and not applied appropriately, and used at the wrong stage of the design process (Weber et al., 2010).

The purpose of this study is to identify user involvement method that used in the early stage of new product development process and specifically focus on product definition stage of design process. In addition, this method positively contribute in creating a new product that satisfies user expectation, increase product quality and the probability of success on the market.

## 2. THEORETICAL BACKGROUND

User involvement in new product development is recognized as a good mechanism, which enables both users and product developers' interests to be sought, elicited and reflected for a better decision making process by a company (Awa, 2010). User involvement represents a populous catchphrase in the innovation research academia and design practice, which provides modern and contemporary trends to the community, brings commonalities between users and product developers, and contributes to profitability (Heiskanen & Repo, 2007). Involving the user in product development is the most effective strategy in assisting the product designers to meet information pertaining to their requirements. The requirements of the user of a product often producing better product quality through enhancing the product designer's capability to design, increase the product performance and more competitive in the market. In addition, this is valuable in order to identify the product design specification which the product designer will take into consideration, to establish the characteristics of a new product in the early stage of the design process. According to (Jahanger (2005) and Taha et al., (2011), product definition stage of the design process is attempted to identify the product design requirements, which is known as product design specification.

User information cannot transfer directly to products, where it should be interpreted as user requirements of product design. Better understanding of the user need a systematic process for identifying their requirements and should been done in the early stage of the design process. According to

Ulrich & Eppinger (2016), to increase the successful of a new product, the product developers must have a systematic process for product development. This is often required the collaboration both user and product developer. The collaboration between the product developer and user during this stage is increasingly demand to solve many contemporary issues in the design practice. These provide a framework for supporting the product design activities such as problem definition, establishment of requirement, generation of the solution, evaluation and decision-making.

### 2.1 User Involvement Method in Design Process

Method is important to support coordination and planning of all development activities, and helps to ensure product quality and helps to identify possible problems or improvements (Ulrich & Eppinger, 2016). In the past few years, many methods have been implemented as a process for identifying the product design specification. The in-depth interviews and user visit were most commonly use methods of involving user in collecting product information, followed by face to face interviews, user meeting, brainstorming, observations and feedback, focus group discussion (Alam, 2002) and focus group, customer survey, conjoint analysis and concept test has been used in the early stage of design process (Sawhney et al., 2005). This conventional method has been successful use and helpful tool to increase the product development output. In today's highly competitive and uncertain market environment with short life cycle, product design not only satisfy the quality and speed of production, but must ensure the product themselves have included innovative value.

An effective method for product development process is becoming an increasingly required for improving the quality of a new product. This is also due to the current survival of companies that ensuring. Numerous methods in product development have been developed and implemented to make the product process more manageable and successful, ensure product quality, and assist to identify possible problem or improvements. Some of them have been successfully implemented by the manufacturers. For example: 1) Robust technology development – to ensure new technology and ideas to be robust downstream development, 2) Quality function deployment – ensure new product concept to come up with right functional requirements which satisfy user need, and 3) Taguchi method, Robust design, TRIZ, Axiomatic design, Design for experience, Simulation/ Optimization, Reliability-based design – ensure that the new concept can lead to sound design, free of design vulnerabilities. Therefore, the concurrent engineering method has been proven to be a successful multi-functional team approach to product development, which integrates the user, product designer, engineer and marketer in multiple product development issue. Most were introduced from areas, such as marketing, organization, engineering and operation management.

## **2.2 Successful Method in Product Definition Stage**

The success of new products mostly depends on new product development and management. Involving the user in product development is the most effective strategy in helping the product designers to meet information pertaining to their requirements. It provides better product quality and competitive in the market. The information is essential to develop the product specification in order to establish the characteristics of a new product. According to Kujala (2003) and Taha et al., (2013), user involvement positively effects user satisfaction and increase the probability of product success. However, direct interaction with the user does not guarantee the successful outcome if the product developers do not know how to involve the user in product development. As it has been stated by several researchers, not all of the methods can be implemented of involving users in the early stage of the product design process. Many product developers still face difficulties in developing products that satisfy users, interact with them and meet their expectations. Most methods do not clearly describe in practice how to involve the user in new product development, who should be involved, and what kind of specific knowledge is required. Many methods have been implemented in new product development are actually not applied in the product definition phase. Araujo (2001) identified four reasons any method; 1) lack of reason/interest for a method to support the product development process, 2) lack of understanding of method procedure, 3) lack of resource for the implementation of a new method, and 4) method is difficult to access.

Janhager (2005) and Lettl (2007) suggested that product developers need a new strategy for involving the user and manage the product development processes and working procedures. In order to work with users, the product developers should have systematic process for identifying the requirements of the users. Involving user needs to be thoroughly considered and efficiently applied in order to obtain user information from the real product development contexts. A new product development should be involved a thorough integration of the process of the design component into a complete product design specification and included the characteristics of a new product that satisfy the user requirements. The characteristics of a new product can only be established in the initial stage of the design process, known as the product definition stage (Taha et. al., 2013). The product definition stage is critical stage in which this stage encompasses the upfront product development activities that consider the user understanding and priority decision criteria list of new intended product. There is therefore a need for a scientific approach to systematically involve user in the early stage of the design process namely the product definition phase.

## **3. METHOD**

There are twenty-seven (27) respondents were classified as product management specialist. Product management specialist survey focused capturing in-depth knowledge and experience relating to: 1) justify the importance of involving user in the product design and development stage of product development, 2) identify the successful methods used to involve user in order to establish the characteristics of a new product, 3) find mostly methods use from the three design group. The selected personnel who are currently involved and lead the product design activities in the field of consumer product design, furniture design and automotive design. A structured interview was conducted through face-to-face interview. These personal that were interviewed highly trained designers, prominent executive and people who are well versed in the design process. The criteria are project leader having minimum working experience of 10 years in research and development (R&D) and key decision maker in the final product development stage. The quantitative data was used to gain an in-depth understanding of the issues and problem identified. The data from empirical is analyzed using SPSS software.

## **4. RESULTS**

The respondents selected in this survey consist of those designers who are project leaders in the selected companies. The result indicate that the respondents involved are categorized as senior designer with N=5 (18.5 percent) followed by design manager with N=13 (48.1 percent) and director with N=9 (33.2 percent). The respondents have a great deal of experience in product development where N=8 (29.6 percent) are those who have 10-15 years' experience, N=12 (44.4 percent) are those respondent with 16-20 years' experience, N=2 (7.4 percent) are those respondents who have 21-25 years' experience and N=5 (15.2 percent) are those respondents who have more than 26 years' experience. The category of respondents who are working as consultants in design consultancy firms with 33.3 percent and those who are attached to product manufacturers with 66.7 percent.

### **4.1 The Important of User Involvement**

The increasing demand of users for a specific product has led to an increased interest in those key persons involved in the development of a new product design. Involving the user in the product design and development stage has provided the opportunity to determine and establish the product characteristics that increase the probability of product success. Table 1 shows the importance

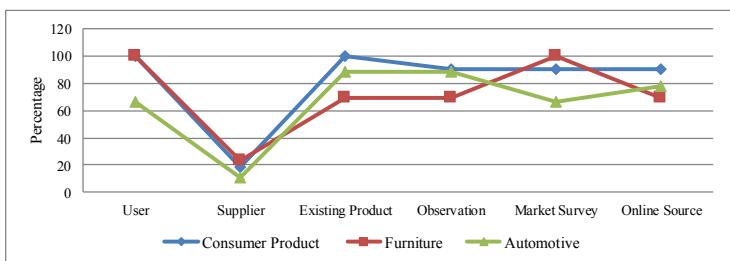
of involving users in the design process from the three design groups. This involving is attempt to identify the specification of a new product and later to establish it on characteristics. The result shows that all the respondents in consumer product group highly require the involvement of the user in the product development, followed by only 77.8 percent of respondents from both furniture and automotive. The overall percentage shows that only 85.2 percent the user important, while 14.8 percent of the respondents do not feel the need to involve the users in the product development.

*Table 1: The importance of involving users in product development*

User Involvement in Product Development	Consumer Product Design	Furniture Design	Automotive Design	Total
Important	100.0%	77.8%	77.8%	85.2%
Not Important	0.0%	22.2%	22.2%	14.8%

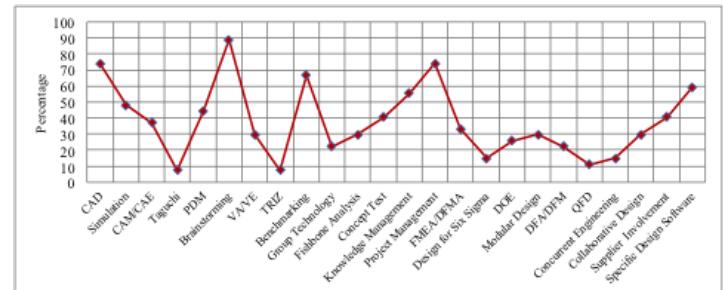
#### 4.2 Establish the Product Characteristics

Many available sources can be used in order to develop and establish the characteristics of a new product. The information is not only meant to provide the new image of a product look but more as an opportunity that contributes to the product's success. Previous literature study showed that most of the product developers often use market survey as their main information resource in order to establish the product characteristics. Figure 1 shows the source of information in product characteristics development from the three design groups. The result indicate that user and existing product were often referred to by respondents in consumer product followed by observation, market survey, online source and supplier. In furniture design, the respondents referred to the user and market survey as the priority source of information followed by existing product, observation, online source and supplier. While, the respondents in automotive design, identified existing product and observation as a priority source of information for product characteristics development followed by online source, user, market survey and supplier.



*Figure 1 : Source of information for product characteristic development*

The product design and development stage or design process stage is most important stage to determine in the success of a new product. To understand what the user really wants and what their actually need and how to satisfy them is needed appropriate method. Figure 2 shows the several methods were employed in the product design and development stage. There are twenty-four (24) methods are identified, the highly use method with involve the user in the design process are brainstorming with 88.9 percent, followed by Computer Aided Design and Project Management (74.1 percent), benchmarking (66.7 percent), specific design software (59.3 percent), and Knowledge Management (55.6 percent), simulation (48.1 percent), project data management (44.4 percent), supplier design involvement and concept test (40.7 percent), CAM/CAE (37.0 percent), FMEA/DFMA (33.3 percent), VA/VE, Fishbone analysis, modular design and collaborative design (29.6 percent), group technology and DFA/DFM (22.2 percent), DOE (25.9 percent), design for six sigma and concurrent engineering (14.8 percent), QFD (11.1 percent), and Taguchi and TRIZ (7.4 percent).



*Figure 2 : Method in product design and development stage*

### 4.3 User Involvement Method in Product Definition Stage

The increasing demand of users for a specific product has led to an increased interest in those key persons involved in the development of a new product. Table 2 shows the six methods that are frequently used by product designer to involve users in product definition stage of the design process. It results indicated that the respondents in consumer product place priorities on brainstorming and benchmarking (66.7%) as highly used method to involve user in product definition stage of the design process, followed by group discussion (55.6%), product data management and lateral thinking (44.4%), and focus group (33.3%). In furniture design, the respondents use brainstorming (100%) as a method to involve users in the product definition stage, followed by lateral thinking and group discussion (88.9%), focus group (77.8%), and product data management and benchmarking (55.6%). The respondents in automotive design frequently use brainstorming and group discussion (88.9%) in the product definition stage, followed by benchmarking (77.8%), product data management (66.7%), lateral thinking (55.6%) and focus group (44.4%). All the respondents are more preferred brainstorming (88.9%) as a method to involve users in the product definition stage of the design process, followed by group discussion (77.8%), benchmarking (66.7%), lateral thinking (63.0%), product data management (55.6%) and focus group (51.9%).

Table 2 : User involvement Method in product definition stage

Method in product definition stage of the design process	Consumer Product Design	Furniture Design	Automotive Design	Total
Brainstorming	66.7%	100.0%	88.9%	85.2%
Focus Group	33.3%	77.8%	44.4%	51.9%
Product Data Management	44.4%	55.6%	66.7%	55.6%
Lateral Thinking	44.4%	88.9%	55.6%	63.0%
Benchmarking	66.7%	55.6%	77.8%	66.7%
Group Discussion	55.6%	88.9%	88.9%	77.8%

## 5. DISCUSSION

The involvement of the user in product development is highly required to produce the perfect new product. They become important as an effective strategy to identify a unique solution for the intended new product. The involvement of the user is more significant in the product definition stage of the design process in order to facilitate the product developers to establish the characteristics of a new product that map all the requirements from the product designer and user. This study showed that the involvement of the

user in product development process is highly important for a new product. The role of user in the product development is recognized as significant. User is valuable as a source of product information for product knowledge. This study shows that theoretical and empirical research supports the view user involvement in the early stages of the design process is needed. To ensure the product specification is more practical, an appropriate method of involving user should be employed during the design process.

The involvement of the user is still more or less a broad concept through various kinds of methods. This study has identified three methods that are frequently used by product designer to involve user in the three design clusters as shown in Figure 3. Brainstorming is used in all the design clusters to gain user knowledge in the product definition phase of the design process. In addition, in consumer product design, benchmarking is also regularly used by product designer, while group discussion is used in automotive design.

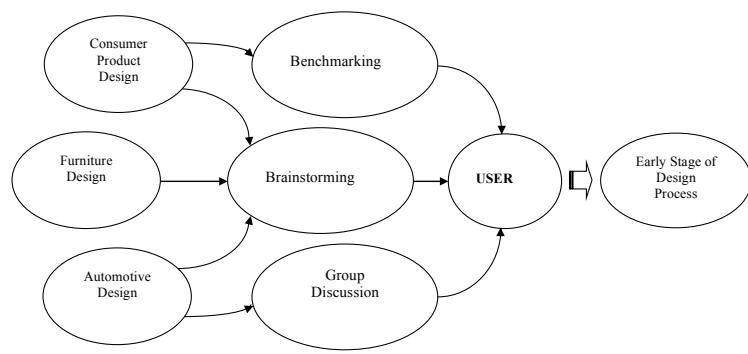


Figure 3 : User involvement method for three design cluster

### 5.1 Conclusion

In conclusion, product innovation is often influenced by market performance and should be developed with proper planning and a systematic process. A systematic and efficient planning of product innovation strategy to involve the users in the early stage of the design process should be employed. It has been found that brainstorming, benchmarking and focus group are commonly used for this purpose. However, these methods do not specifically define the elements that will increase the probability of success of a product. A method is

needed that would be able to extract the elements that will ensure the success of a product based on user input in the product specification. Through this study, the paper provided recommendation for product designer to use an appropriate method for involving user in the product development process specifically in product definition stage. This result also will help the product designer to improve the design process performance, increase product quality and support the likelihood of a new product success.

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