

## Optimizing the Design Process in New Product Introduction

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**Abstract:** The main objective of this paper is to achieve the simplicity and optimization of the design process in NPI. This paper undertakes an academic review, supplemented by a case study with essential managerial implications. It analyzes the dynamics in NPI from a historical perspective. It concerns about the changes happening in business models influenced by high-technology and customer satisfaction. The academic review finds the Kano Model and the toolkit composed by co-creation, co-design, user-centered design, and design thinking diagnostic and pragmatic as far as the simplicity and optimization in NPI is concerned. The paper explores the strengths of the methodologies and their individual weaknesses as well and proposes suggestions for their improvement. The case study finds the successful application of the methodologies in an advanced smart-phone company. To conclude, internet-based design thinking should be integrated into lean thinking and innovation thinking in NPI for optimal results in the contexts of innovation-driven development. Its value is its advocacy in the establishment of a design community with product users, representing important priorities for scholars, managers, regulators and policy makers.

### 1. Introduction

New Product Introduction (NPI) is a part of business routine proposition theoretically and practically. Introducing new product is to create new values, to improve profitability and to satisfy customers more accurately. The process generally includes different stages including new product design. Traditionally, designing new products is exclusive to those privileged intracompany designers. It makes sense during the planned economy period. However, in the market economy period, the previous firm-centered structure has been transformed into a consumer-centered structure. With the application of 5G network, the voices of customers have been valued unprecedentedly and implemented accordingly worldwide. Equally, considering the lean principles, NPI and the design process should be customer-centered or user-centered.

Although there is now a substantial body of research on NPI, much of the work focuses on the process, phases, toolkit, templates, team management, technological application in general and theoretical approaches. The optimization of the design process in NPI and its managerial implications behind have been given little attention.

In this context, this paper argues that the Kano Model, co-creation together with the co-design, user-centered design and design thinking can be regarded as the diagnosis. Beyond a conceptual and theoretical stage, it offers a pragmatic perspective. The theories have been tested and proved by their successful applications in Xiaomi Technology Company. In conclusion, internet-based thinking should incorporate lean thinking, innovation thinking in the design process. It confirms that to achieve NPI optimization is to strengthen internet-based design thinking and build a design community with users.

### 2. Academic Review

First and foremost, NPI is a process involving a series of activities within a business to define,

screen, design, develop, prototype, validate, implement, evaluate, launch, review and market. The process can be complex and inefficient or simplified and optimized. The determinant is the management level of the programme and the teams. In essence, NPI is a programme including programme managers and members for individual tasks from initial concept to marketing and management. To generate the optimal trade-offs among time, cost and quality is a priority for the NPI programme team. A strong NPI is supposed to be lean with minimized investment, maximized profits and prolonged product life cycle. To make NPI successful, the design process should be the locus of powerful forces for innovation, creativity, value-adding and collaboration.

The design process encompasses a sequence of steps and activities with creative and innovative initiatives. It consists of three phases: the pre-design phase, the design phase and the post-design phase. The designing might be cross-divisions activities or occasionally exclusive tasks for one team or one individual. Traditionally, the design process starts from discovering and recognizing customers' needs, defining and developing the possibilities to meet the customer requirements and finalizes by materializing the selected prototypes. Nowadays, the design process has been transformed with the growth of "fuzzy front end". In the front end of the design process, the focus is to determine what could (should) be or could (should) not be designed by capturing customers' requirements. The design process should be joint efforts from target customers and professionals with collective perspectives on the new products. In this context, the simplicity and optimization of the design process in NPI can be achieved with the Kano Model, co-creation and three traditions of design (co-design, user-centered design and design thinking) as tools and techniques, approaches and a mindset.

## **2.1. Kano Model**

In the Times of Consumers, "Customers First" has been a propaganda slogan widely accepted in the business circle. Indeed the satisfactions or dissatisfaction of customers are vital to the survival and growth of the company in the dramatically competitive market. The satisfactions of the target customers are the real targets when new products are to be introduced to the marketplace especially in the design process. Customers' satisfaction comes from the fulfillment of their implicit and explicit needs for particular new products or services. Among all the frameworks and models formulated in the research of customer satisfaction, Kano Model can be found as a methodology in a wide range of industries: in marketing research, airline service, health-care industry, ergonomic design, Quality Function Deployment(QFD), engineering service, food and beverage industry, library service, logistics service, home delivery, agriculture machine, and the like.

### **2.1.1 Introduction of Kano Model**

Based on Hertzberg's theory of motivation (Qingliang Meng, Jing Dong, 2018) from a psychological point of view, Professor Noriaki Kano first proposed and developed the Kano Model in 1984, named as the theory of 'attractive quality' and 'must-be quality'. It now has evolved into one of the most popular quality models since its introduction. It serves as a methodological approach in broad industries concerning quality management, product and service innovation, product design and development management. The Kano Model assumes the performance of products/services attributes is closely related to the achievement of customer satisfaction. The relationship between the two is non-linear and asymmetric. According to Kano Model, customer satisfaction ranges from very satisfied, fully satisfied, very dissatisfied and not at all. The quality attributes of products and services are classified into five categories, namely: attractive, one-dimensional, neutral, must-be and reverse attributes. Kano suggests the existence or absence and the performance level of the individual quality attributes determines the degree of achievement in customer satisfaction. In nature, the Kano model adopts a qualitative analysis. However, the quality attributes are researched and identified by using the traditional Kano Model questionnaire. Multiple versions of its interpretations, practical applications and integration about the Kano Model can be found in the literature.

### **2.1.2 Review of Kano Model**

As one of the most influential quality models nowadays, the Kano Model has not only been probed, researched, interpreted and reviewed theoretically but also employed and improved in practice. In the NPI context, the design process is likely to be simplified and optimized if the effective classification of customer needs are acquired. For better understanding, the five dimensions of the quality attributes of products/services are supposed to be revisited in detail.

Attractive attributes can be taken as delighters making customers extremely excited. They generally reflect the uniqueness and attractiveness of the products and services. The originally unexpected attributes are actually pleasant surprise for customers who respond with high satisfaction to their presence and no dissatisfaction to their absence. In today's personalized and high end market environment, the NPI design process is expected to offer more attractive attributes through innovation initiatives to impress and attract customers.

One-dimensional attributes category represents a proportional and linear relationship between the customer satisfaction and the attributes performance. Among the five dimensions, it is the most visible and easiest to capture. It shows the higher the performance is, the more satisfaction incurs and vice versa. For the design team in the NPI programme, they should bear in mind that more explicitly articulated and expressed quality requirements from customers are met, more satisfied the customers are. More interactions and surveys with potential customers will be helpful for the design team to implement their action plans.

Neutral attributes can be understood from the implications from the name. It implies an attitude of being indifferent for the majority of the customers who do not really care about its offering or not. The quality is unnoticed and unappreciated as it could not delight or disappoint the customers. It's up to the company to retain or eliminate the attributes based on the lean principles.

Must-be attributes are equivalent to the basic requirements from customers for the products or services. The attributes refer to the bottom-line functions of the products or services, in other words, those implicitly expressed but obviously self-evident quality expectations. The basic requirements might be common sense knowledge regarding specific products or services obtained from the industry standards and regulations, product specifications, service rules or customer complaints. However, the absence of the attributes incurs strong customer dissatisfaction and the fulfillment of the fundamentals does not improve the degree of customer satisfaction. Hence, in the design process, the efforts should be primarily in the sufficiency of the must-be quality attributes.

Reverse attributes are opposites to the must-be attributes as the majority of the customers do not appreciate their presence. The customers prefer to reject or abandon the products with certain features. It might be influenced by the local customs or religions or laws. When being supplied, they trigger dissatisfaction; when not being furnished, they bring satisfaction. Designers in NPI should be cautious enough and exclude the must-not-be attributes from the products or services.

In short, the attractive attributes are to create new values; the one-dimensional attributes and the must-be attributes are to add values; and the neutral attributes and reverse attributes are to detract values. Now it seems more clear for the design team in NPI to choose what should be designed into their new products or services and what should be resolutely avoided.

From the detailed and virtual analysis, the Kano Model has close links to practical and real scenarios in the quality management and programme management. It has been widely accepted and explored in practice and frequently cited and expanded in the literature. However, it has both advantages and disadvantages.

Advantages:

The Kano Model serves all businesses who are engaged to improve their products or services quality. It provides a perspective and a solution contributing to customer satisfaction and market shares.

The Kano Model suggests a customer-centered structure. It actually equals the quality attributes of products and services with the interests of the company and the benefits of customers.

The Kano Model is of great significance for management decision-makers from the perspective of programme management.

Disadvantages:

The Kano Model is rather descriptive and qualitative although the research results are approached with quantitative research instruments. Thus, it seems hard for Kano to fully satisfy the research requirements of the quantitative-oriented researchers.

The Kano Model is not a perfect quality model suitable for all occasions and catering to all businesses and individuals. Customers are different and their satisfactions are not the same and also in change.

The Kano Model challenges the programme management and the design team with regard to the feasibility in application. For instance, the customer segmentation is a real challenge in the design process.

Looking into the future, the Kano Model will be advanced further and a portion of the the current research has contributed to the improvement of the methodology. Suggestions for future work are to be presented as follows:

Further focuses on the integration of the Kano Model with QFD and into the new product design process.

Further researches into the quantitative features of the Kano Model.

Further expands application of the Kano Model and enrich the model from the perspective of enabling it to be more practical and accurate.

## **2.2. Co-creation, Co-design, User-centered Design & Design Thinking**

The Kano Model mentioned above highlights customer satisfaction, and the following discussions are based on the assumptions of incorporating the concepts of co-creation, co-design, user-centered design and design thinking into the NPI design process considering the complexity of NPI and the optional solutions to the maximized fulfillment of business profitability and customer satisfaction.

### **2.2.1 Co-creation**

Co-creation is to create values for products or services in a collaborative manner. Co-creation is a mindset for the programme management. In the NPI context, the stakeholders, the company staff and the target customers are convened for a shared value creation. It specially emphasizes collective creativity, real interactions and effective collaborations. It strongly requires wide participation and appreciates all contributions from individual participants. It's a process of discovering the most amazing user experience out of a new product or service with the joint efforts by all present. In the process, the parties involved have created alliance similar to partners. Co-creation is an approach and a tool as well. According to Kano Model, in the new product design process, the customer satisfaction can be highly achieved through co-creating value process between the company and the prospective customers. Co-creation can take place at any phase of the design process. All participants are engaged emotionally by recurring participation. In the context, co-design can be a form of co-creation.

### **2.2.2 Co-design**

Co-design is an act of designing together in the design process characterized by joint endeavors and contributions by stakeholders, customers and businesses aiming to satisfy potential customers and target markets. Co-design is often used interchangeably with "participatory design". Co-design brings together the amateur consumer designers with lived user experience and professional designers with expertise to make joint decisions. The design process is to integrate specialities of all participants. It is a practice of collective creativity same with co-creation. The co-design practitioners are the programme facilitators with a shared purpose and success in the customization of the products or services. The establishment of a friendly and amicable relationship based on reciprocity and mutual trust between all professional and non-professional designers is expected. Through the justified Kano model methodology, co-creative paradigm and programme management, co-design could be empowered with values and benefits in terms of risk-reducing, time-saving and quality guarantee. In NPI process, co-design can start from the fuzzy front end. The earlier it starts, the better the outcomes will be.

### 2.2.3 User-centered Design

The user-centered design approach is transforming customers or stakeholders into end-users. It is also a mindset in line with the core principles of Kano model, focusing on the users and their satisfaction. Hereby, the product/service users are invited to be the subject of the creative activities. Throughout the design process in NPI, the users are expected to be actively involved especially in the post-design phase. The positive impact is on the boost of bilateral collaborations and business innovation opportunities. However, in the pre-design phase and the design process phase it not encouraged to make users in the center, as it might undermine the professional designers creativity and endanger the design industry as a whole in the long run. In practice, it demands powerful management in the programme to explore the viability and utility of the user-centered design. Meanwhile an user experience-oriented approach is gradually adopted and adapted into the new product design. Users' perception of the design experience should be given sufficient considerations for the sake of ensuring users commitment in the design work.

### 2.2.4 Design Thinking

Design thinking is researched as both an ideology and a process. It is extremely user-centric concerning users' feelings, thinking and behaviours. It is a solution-based approach to problem-solving. It fosters creativity, collaboration and innovation, challenging existing structures and assumptions. It puts humans in the first place. It helps to build creative confidence. In the current design thinking landscape, it is used not only in designing products or services (objects) but also in designing ideas (mindset). Design thinking starts from building empathy, defining the problems, encouraging ideation and prototype, and ends with fostering active problem solving. It's a non-linear process. The biggest advantage of design thinking is it provides users not just a opportunity to experience but to think. Users obtain beyond an experience but a toolkit to tackle other challenges. It seems to bring the most and the best for users and customers. However, the most obvious disadvantage for design thinking is being time-consuming and demanding in view of the development cycle of new products, the design team qualifications, and users selections and their cooperation.

In essence, design thinking aligns with co-creation, co-design and user-centered design with strong focus on customers satisfaction. With a solid understanding of users and strong empathy for their requirements, design thinking can be merged with lean thinking and innovation thinking in NPI process by conducting co-creation, co-design and user-centered design in practice.

Overall, co-design, user-centered design and design thinking are three traditions of design. As far as the optimization of the design process in NPI is concerned, those three design approaches plus co-creation can be utilized under the condition of giving full play to their advantages and minimizing the role of their disadvantages.

Advantages:

Co-creation, co-design, user-centered design and design thinking consists of a toolkit for design programme management. It offers valuable insights into the extraction of values. It is helpful for the growth of the programme and the company as well. Using the toolkit in a flexible manner will result more positive consequences.

Co-creation, co-design, user-centered design and design thinking value the voice of customers, customer satisfaction, customer loyalty and user experience by apt access to all phases of the design process.

Co-creation, co-design, user-centered design and design thinking is of great help in advancing company competitiveness, business profitability and company reputation by establishing and strengthening the benign interactions and relationships between companies and their customers through co-work.

Disadvantages:

In theory, the distinction among co-creation, co-design, user-centered design and design thinking seems to be rather vague in certain aspects. On some occasions, the co-design, user-centered design and design thinking are confusingly interchange. The theoretical descriptions of the four

approaches should be more accurate, precise and pragmatical in the hope of guiding programme managers more efficiently.

In practice, the approaches are really difficult to operate. Uncertainties are actual risks in the real design process. Originally using the toolkit is to better understand the future customers and capitalize their values, however, the nature of customer voices and user experience is differentiated, personal and capricious.

Moreover, theoretical descriptions of the methods are conditioned to be in rather ideal situations. Building perfect relationships with customers and users requires much time, energy, resources and techniques, but to break the harmony is too easy by poor participation and bad communication. In the case of the NPI programme and the design process, time-consuming, non-value adding and high-cost actions should be avoided as far as possible, since they are against the original business intentions.

In a sense, the processes and outcomes of co-creation, co-design, user-centered design and design thinking are labeled collectivity. As a consequence, the ownership of Intellectual Property Rights in the design process in NPI is a bit tough to tackle.

In order to justify the operational efficiency of the perceived approaches, mindsets, tools and techniques, the paper is to present detailed illustrations in the following part.

### **3. Case Study**

In this part, this paper will illustrate the magic powers of the methodologies of Kano model and co-creation, co-design, user-centered design and design thinking in action by a living example in the business world.

#### **3.1. A Profile of Xiaomi Technology Company (hereafter referred to as 'Xiaomi')**

Established in April 2010, Xiaomi is a Chinese internet company with smart-phones and smart hardware connected by an IoT platform at its core. It is reputed hardware plus internet innovator in China. Xiaomi upholds the principle of building amazing products at honest prices and the mission of sharing a better life for everyone in the globe through innovative technology. According to the data from its official website, Xiaomi's MIUI operating system has over 190 million active MIUI users. Mr. Lei Haobo, the director of China Industrial Design Association mentions in the Xiaomi official publicity video that Xiaomi has received the Good Design Gold Award showing that Xiaomi has now successfully established its own unique design style also called MI LOOK. According to a research institute, International Data Corporation (IDC), its Worldwide Quarterly Mobile Phone Tracker issued on January 27th, 2021, shows that Xiaomi, as one of the Top 5 worldwide smart-phone company, has climbed to the third position with 11.2% market share & 43.3million shipment volumes in the fourth quarter of 2020, following behind Apple and Samsung.

#### **3.2. Business Model of MI**

According to the co-founder of Xiaomi, Mr. Li Wanqiang, Xiaomi's invincible global market position results from three elements: a superb relationship with users, amazing products at honest pricing, far-reaching social media.

Firstly, user-centric structure. The superb relationship with users suggests a customer-centric performance within the company. Xiaomi's top management reiterates in publish that the company vision is to make friends with users and create the coolest company on the planet. It is believed that good companies are seeking profits, and excellent companies are winning people's hearts. Xiaomi is one of the unusual companies who have formed a Fans Culture within the company. Every year, Xiaomi celebrates a Mi Fans Festival on April 6th for its massive loyal customers. Xiaomi is a typical customer-centric company.

User experience is valued. Xiaomi adopts word-of-mouth marketing. Users are the fans of the company by using Xiaomi products and services. To some extent, users are transformed into the spokespersons of the company and its products without advertising costs.

Customer participation is valued. Xiaomi is a company where users can participate in the

introduction, development, design, improvement and marketing of the products and services. At the moment, Xiaomi is recruiting fans to join its advisory group. Xiaomi is actually practicing co-creation, co-design with its customers.

Customers are friends. Xiaomi values customers voice, frequently interacts with the users through the company Fans Home online or offline, responds timely to users' feedback and resolves users problems accordingly. Users are treated as friends and always invited for community activities and fans club events.

Users are connected in one community. Xiaomi provides attractive quality products or services beyond customers imagination and expectations. It has generally achieved high degree of customer satisfaction by making users feel that Xiaomi's relationship with its users extends way beyond a one-off deal. Thus, Xiaomi has won extensive customer fidelity. Now it boasts of millions of hardcore Mi fans in over 80 countries.

Secondly, pursuit of perfection in product design. Xiaomi has a highest standard in products/services quality. Amazing products at honest pricing are the engines supporting the company development. Xiaomi is virtually implementing design thinking and the Kano model methodology in its quality management. During its product development, Xiaomi makes great efforts in making the key components perfect without flaws or issues as they are visible to the users. And for the features that are not visible to the users, the design team spends just as much effort. Most of the customers of Xiaomi products believe that they are purchasing the best products with the lowest cost. The highest performance cost ratio makes Xiaomi rebound after a big decline in sales against the economic depression influenced by the pandemic since January 2020. In the past decade, delighting products and services from Xiaomi have changed over 100 industries and changed how hundreds of millions of people live.

Thirdly, internet-based thinking. Far-reaching social media accelerates Xiaomi's Online Direct Sales and increases its interactions with its customers. It is reported that the first 500,000 users come from the company internet forums, and the next 500,000 to 1,000,000 users are generated from the social media in China such as Weibo. Xiaomi invites its fans and customers to design its products through weibo, wechat, QQ, facebook, twitter, Tik Tok, linkedin, etc. It has constructed a successful and amazing design community with its Mi fans and users with the shared purpose of continuously perfecting the products. They are doing internet-based designs together as fans, partners, collaborators and contributors. They are committed and crazy for their products and services believing that something wonderful is about to happen in the near future.

#### **4. Conclusion**

From the theoretical discussion and Xiaomi's case in real scenarios, we can now understand the strengths and weaknesses of the Kano Model, co-creation, co-design, user-centered design and design-thinking as approaches, tools and techniques, and mindset. From the perspective of the programme design team, the managerial implications are apparent. To conclude, in the contexts of innovation-driven development, the optimization of the NPI process requires an integration of the internet-based design thinking, lean thinking and innovation thinking for optimal results. For product managers and design managers, the establishment and development of a "design community" with users and customers in NPI process is strongly recommended. And it should be a community of obeying lean principles, innovation thinking and design thinking with effective and timely communication, sincere collaboration, and loyal engagement among the community members.

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