

Creative Customers and How We Can Meet their Expectations

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Abstract. Engineering is to create product/service to meet the expectations of our customers. The importance of creativity is increasing very rapidly to respond to their quickly diversifying expectations. But we often forget that our customers are very active and creative and they would like their creativities satisfied as well.

Keywords: expectation management, creative customers, process value, customer involvement, hardware development, software development, continuous prototyping

1 Introduction

Creativity is getting wide attention in engineering these days. But most of these discussions are about how designers or engineers can be creative. But it has to be remembered that they have been creative ever since engineering started, because engineering is an activity of creation.

Why the importance of creativity is increasing is because our customers' requirements are quickly and extensively diversifying and designers and engineers have to cope with them. Thus, although designers and engineers have been creative ever since the beginning of engineering, the width and depth of creativity are increasing very rapidly. Therefore, the main issue of design creativity is how designers and engineers can expand their creativity beyond their traditional limits.

As pointed out in the above, engineering is creative in itself and what is important is that it is creative to meet our customers' expectations. In the old days when we made a tool (homo faber) for ourselves, it is to meet our desire or our expectation. At that time, we are both producer and customer at the same time. Even animals can use a tool. But our desires or expectations are far much complicated and extensive so we have to create a tool to meet our expectations. Expectation management, which is a process for capturing, documenting, and maintaining expectations of people involved in any project, is gaining considerable momentum in the business world today.

However, it is rarely practiced in the engineering profession.

The role of engineering is to satisfy our expectations. And that is why creativity is needed. But the Industrial Revolution brought about expertization and the producer and the customer are divided.

Until very recently, our customers' expectations are very much limited, so producers could predict what their customers expected and in addition what customers expected were products with better functions in the 20th century. But as we enter the 21st century, customers' expectations diversified very quickly and extensively. Their expectations shifted from products to satisfactions. How their expectations can be satisfied becomes their major concern.

In the 20th century, customers are more passive consumers than active customers. They received and used the products which producers developed and delivered, because their products satisfied their expectations. But in the 21st century, their expectations have diversified very quickly and extensively and they would like to customize their products to their own needs and to their own tastes. Our customers now become "customers" in the true sense of the word. Our customers are very much creative. Therefore, one of the most pressing issue today is how we can satisfy these creative customers. This is the issue discussed in this paper.

2 Product Development is Changing

Our society has been a closed world with clearly defined boundaries in the 20th century. Therefore, designers can foresee the operating conditions. But as we enter the 21st century, our society is quickly changing into an open world where boundaries disappear and it is continuously expanding. Thus, only the user understands what is happening now and what actions he or she should take. Thus, we are witnessing a transition of design from designer-centric to user-centric.

The role of machines is changing. In a designer-centric design, machines are just tools. But in a user-centric design, they have to work together with their users to identify what is the problem and to solve it together. These machines have to sense the necessary information and to respond to the user's requests flexibly and adaptively.

In a closed world, the problem is clear so that problem solving is important, which leads us to focus on solving problems better and faster. But in an open world, the most important task is to define the problem. We have to share our goals before stepping forward. Thus, problem formulation becomes the highest priority. In other words, strategy becomes more important than tactics.

The primary goal of engineering is to satisfy our customers' expectations. So customers' participation in product development becomes a prerequisite. As situations change very frequently and extensively, we will not be able to know what our customers want without their involvement.

3 Hardware and Software Development: What is the Difference?

3.1 Hardware Development

Most hardware is developed with fixed functions (Fig. 1). A full fledge of desired functions are provided from the first. But when situations change, then the whole hardware may have to be redone. In short, most hardware is inflexible.

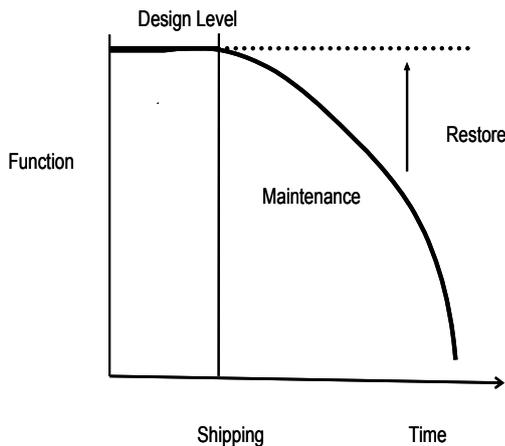


Fig. 1. Hardware development

Since the Industrial Revolution, hardware has been developed sequentially (Fig. 2). And Information is processed sequentially from process to process, i.e., from one expert group to another.

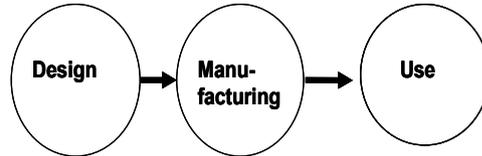


Fig. 2. Linear product development

Such an approach sometimes resulted in decreased quality and increased costs as errors are not rectified until too late in the process. Concurrent engineering addressed this by enabling close collaboration among experts of different backgrounds.

3.2 Value in the Traditional Sense

Traditional value engineering defines value as

$$\text{Value} = \text{Performance} / \text{Cost}$$

But "performance" has been interpreted as functions of a final product. But it should be noted that as quality improves, it becomes more and more difficult for our customers to recognize its improvement. That is what Weber-Fechner law teaches us. Thus, industries head for cost reduction, because it can be easily evaluated and can increase value. It should be noted that value here is nothing other than profit to the producer and customers' value is not considered.

This traditional view of product development is based on the idea that users are consumers and if good quality products are delivered to them, they will be happy. It does not give much consideration to the expectations of users.

3.3 Creative Customers

Users are, however, not mere consumers. They are customers. As the word "customer" originated from the word "customize", they are very active and creative and would like to customize their products to their own needs and to their own tastes.

Fig. 3 and Fig.4 illustrate how creative our customers are. Kids slip the slide as told for the first

several times. But soon they invent new ways of sliding down (Fig. 3). They are indeed genius of play.

Next time, going backward



Fig. 3. Creative kids

Youngsters drill holes into their jeans and wear them. They know jeans are not simply a wear but it has stories. Stories are important to develop feeling of attachment (Fig. 4).



Oh, no.
You got holes
there!

It's the fashion,
Grandma

Fig. 4. Creative youngsters

Although creativity is recently drawing wide attention in engineering, most of them discuss only how designers can be creative. We fail to understand that our users would also like to be creative and how we can satisfy their desire of creativity.

3.4 Software Development

Software used to be developed in the same manner as hardware. Artificial Intelligence introduced continual prototyping, and changed software development as shown in Fig. 5. Now functions grow or evolve with time.

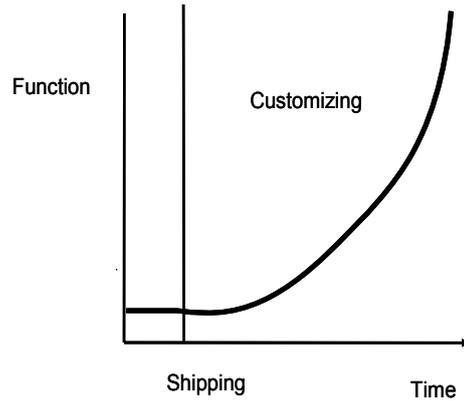


Fig. 5. Software development

It reduced the burden of software engineers. But what's more important is it introduced reflective and cyclic product development (Fig. 6).

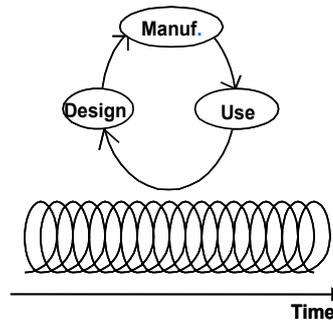


Fig. 6. Cyclic product development

3.5 Learn More and Increase Confidence

Very basic functions are provided first and as users get accustomed to it, they gain confidence and know what to expect. Then, software engineers provide them with higher functions. The more users get experienced, the more confident they become and the more trust they put in the system. Interestingly enough, confidence and trust are expressed by the same word "Vertrauen"

in German. It must be noted the curve in Fig. 5 is very similar to our learning curve. So the more we learn, the more confident we become.

3.6 Trust Building

Never-experienced products are emerging more and more. And what makes the matter worse, their product lifecycles are getting shorter and shorter. Our customers are feeling uneasy and cannot put trust in them, because they are too sophisticated, right from the beginning. But if we provide our customers with simple products first and then move on to the more complex and the more sophisticated ones, step by step, our customers would feel easier and put more trust in our system and at the same time they will be happier because their expectations for customization will be satisfied.

3.7 Value Co-creation

It should be noted that software development is not one way from the producer to the customer as hardware. It is developed by a producer-customer team.

(Prahalad and Ramaswamy 2004) for example, proposed value co-creation. The producer and the customer work together to create unique value; unique in the sense that the same value means profit to the producer and satisfaction of expectation to the customer. Thus customers' value is really taken into account. But, value co-creation approach is still very much product-oriented.

Until very recently, there has been asymmetry of information between the producer and the customer as shown in Fig. 6.

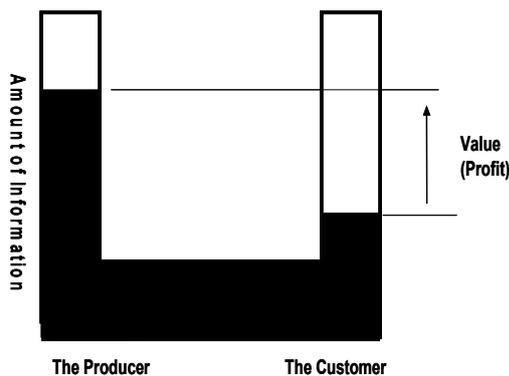


Fig. 6. Asymmetry of information

If the producer fills the difference of the water level, it means profit to them. Value in the traditional

sense of value engineering is nothing other than value to the producer, i.e., profit to them. But as our society becomes more and more information rich, the difference of water level quickly disappears. So what Prahalad and Ramaswamy proposed is, to put it simply, that the producer and the customer work together to raise the water level as shown in Fig. 7. The increase of water level means profit to the customer, but what is very important is that it means value to the customer. Customer's value is now explicitly taken into account.

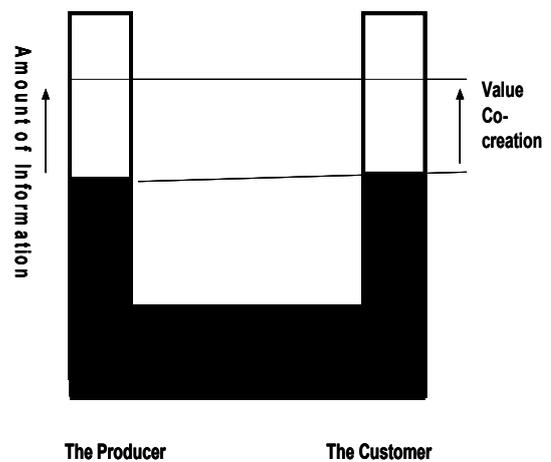


Fig. 7. Value co-creation

The idea of the producer and the customer working together as a team was proposed earlier by (Toffler 1984). But as the fact that he coined the word "prosumer system" indicates, he was thinking in the traditional framework of the producer and the consumer. He did not pay too much attention to how creative our customers are. And although Prahalad and Ramaswamy took customer's value into consideration quite explicitly, they do not discuss too much about how our customers would like to be creative. All of these discussions are product-oriented and they only consider product value.

4 Value in the New Interpretation

Software today is developed by a team work of producers and customers. The process is very much interactive, cyclic and reflective. Although it is not expressed explicitly, software development is based upon the idea that processes themselves are value

generators. Software engineers understand the value of processes.

On the other hand, processes mean just cost increasing factors to hardware engineers. They think if you pay too much time and efforts in the processes, it means too much cost and thus decreases value. But if we note again that value is defined as

$$\text{Value} = \text{Performance} / \text{Cost}$$

Then, if processes increases performance, then value will grow. Getting back to the basic problem of what is human would validate this argument.

4.1 Homo Faber: Why Human Makes a Tool?

One definition of human is Homo Faber. Why does human make a tool? If it is just to use a tool, even animals can do that. Human takes the trouble to make a tool to meet his/her requirements. Our world in the old times was very much open. Situations changed frequently and widely. We could not make our tools in a straightforward manner. We achieved this in a trial and error manner.

Why did we take so much trouble for just making a tool? It is because it is nothing other than self actualization or challenge. Self actualization or challenge is the highest human need in Maslow's hierarchy (Fig. 8) (Maslow 1987).

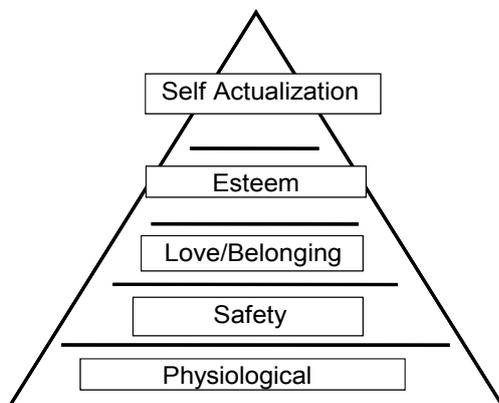


Fig. 8. Maslow's hierarchy of human needs

4.2 Homo ludens: Why Human Plays?

(Huizinga 1971) Dutch philosopher defined a human as Homo Ludens. Why does a human play? That is also because we would like to challenge. We would like to find a new goal for a challenge. Kids invent many new ways of slipping down the slide, although the slide itself is the same. Kids are genius of play and

they are very inventive and creative. So are our customers.

4.3 Process Value

The above discussion reminds us of the importance of processes. Up to now, we focused our chief attention upon product value alone. But if we come to think that humans like to challenge, and would like to customize, processes yield value, too.

Behavior economics emphasizes the importance of experience as customer value. But economists can discuss only about the experience when our customers use our products. Yet, we, engineers, can provide experience throughout the whole product lifecycle from design to manufacturing and to use and reuse.

Let us consider, welding, for example. We have a problem of shortage of welders in factories and so we introduce robots. But artists learn welding because outdoor sculptures need welding. Why do we lose welders while welding becomes increasingly popular in art area? Industrial welders view welding as a job, but artists do it for joy. Welding a sculpture is a challenge because conditions change from sculpture to sculpture.

We could change our automobile design so that our customers can become a part of the product realization team. For example, our customers can enjoy combining or assembly parts and realizing a car, tailoring to their own preferences and to their own needs. That would change the whole scene and would satisfy our customers desire for creativity.

4.4 Repair

Hardware is physical so that it deteriorates once shipped. But if we turn the deteriorating curve upside down, it also looks similar to the learning curve.

Current maintenance aims primarily to restore the degrading functions back to the original design level. But customers would like to be creative and would like to customize our products. This is self actualization. Customers prefer to use products in the condition tailored to their own needs and preferences. In other words, they would like to repair their products. The word "repair" comes from "pare", which is associated with "prepare". Namely, repair means to remodel or remake products so that they fit to the current environment and situation.

If we can get our customers involved in repair, their sense of involvement increases and their feelings of attachment will grow. We should move toward such service development beyond mere product delivery.

5 Concluding Remarks

We should note that our customers are very active and creative and would like their desire for creativity satisfied. To meet such expectations from our customers, we should free ourselves from the traditional idea that better products will satisfy our customers' expectations. We should note that processes will yield value not only to us, producers but also to our customers and if we can get our customers involved in the processes, it will not only provide value through experience, but it will also satisfy our customers' desire for creativity. Software development provides such an example.

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