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HOW CAN WE SATISFY OUR CREATIVE CUSTOMERS?

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1. Introduction

Our traditional product development has been very much product-oriented and one way from the producer to the customer. Most of our discussion has been how good quality products we can produce and how creative we can be in our design. We failed to notice that our customers are very creative and active. We have regarded them as mere passive consumers.

But as behaviour economics recently pointed out customer's experience is very important in creating value. But they talk about how our customers can enjoy experience through a variety of usage. This is indeed one way of satisfying the expectations of our creative customers. But we, engineers, can create and provide experience to them not only through usage but throughout the whole product lifecycle from design, manufacture, use and repair.

This is not only important for increasing value, but this is necessary for coping with the globaling society with great changes. In an open world today, problem formulation becomes more important than problem solving, and withour customer involvement, we can not formulate a problem or we cannot fix our goal properly. In a closed world, designers could foresee the operating conditions, but in an open world, only users know what is happening now. Therefore, design is quickly changing from designer-centric to user-centric. Thus, lifecycle customer involvement is a prerequisite for product development today and tomorrow.

If we can get our customers involved in design and manufacturing, it also satisfies their highet human needs of self actualization and challenge and our engineering will be more consultation than product delivery and it will be service. Therefore, we could establish win-win relation more easily than delivering goods.

2. Product development is changing

Our society has been a closed world with clearly defined boundaries. Therefore, designers can foresee the operating conditions. But our society is quickly changing into an open world where boundaries disappear and it is continuously expanding. It is only the user who understands what is happening right now and what actions he/she should take. Thus, we are witnessing a transformation 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 tends to focus on solving problems better and faster. But in an open world, the first 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 (Figure 1). A full fledge of desired functions are provided from the first. But when situations change, then the whole hardware may have been redone. In short, most hardware is inflexible.
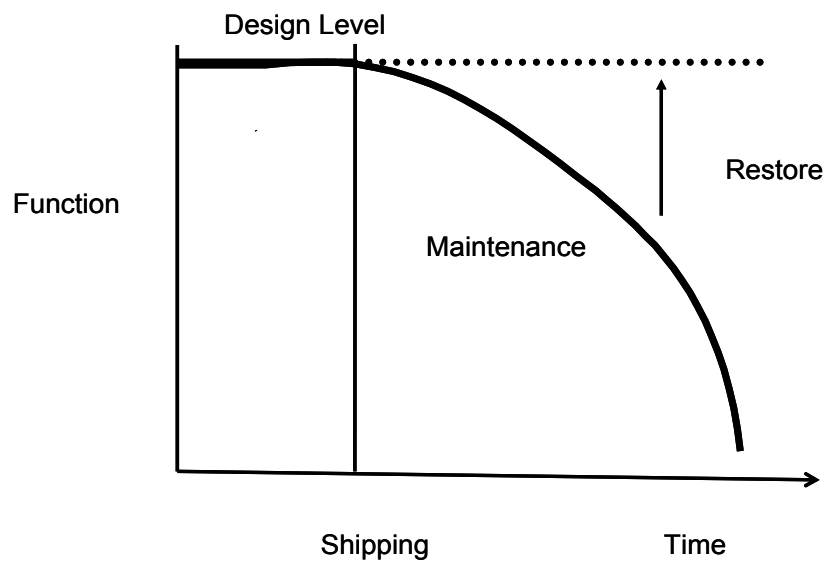

Figure 1. Hardware development

Since the Industrial Revolution, hardware has been developed sequentially (Figure 2). And Information is processed sequentially from process to process from one expert group of specialized role to another.
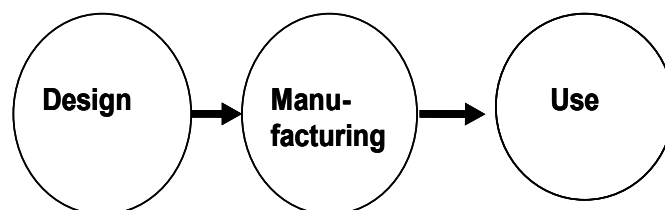

Figure 2. Linear product development

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

Value= Performance/Cost

But "performance" has been interpreted as functions of a final product. But as quality improves, it becomes more and more difficult for our customers to perceive improvement, as 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 – both for sequential and concurrent 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. In other words, products generally neglect to consider all perspectives from users.

3.3 Creative customers

In general 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 products to their own needs and to their own tastes.

Figure 3 and Figure 4 illustrate for example 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 (Figure 3). They are indeed genius of play.

Next time, going backward

Figure 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 (Figure 4).

Oh, no.
You got holes there!

It's the fashion,
Grandma

Figure 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. Artificial Intelligence introduced continual prototyping, and changed software development as shown in Figure 5. Now functions grow or evolve with time.
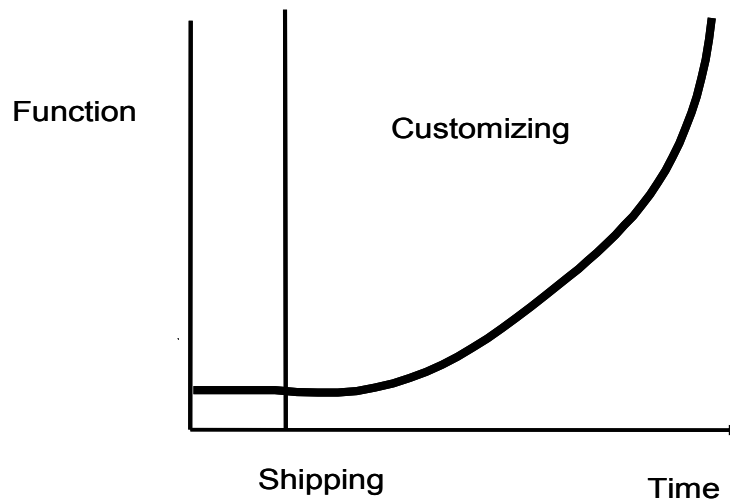

Figure 5. Software development

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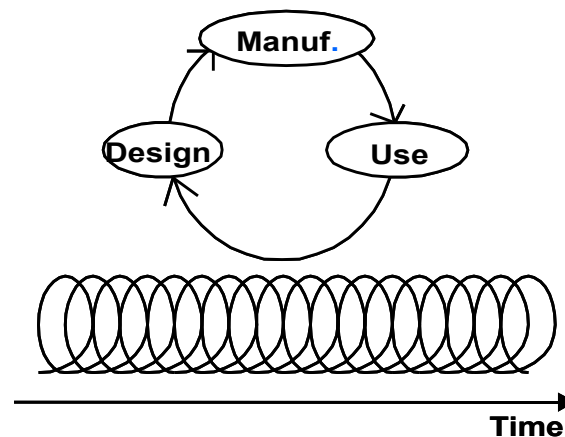

Figure 6. Cyclic product development

3.5 Learn more and increase confidence

Very basic functions are provided first and as users get accustomed to it, gain confidence and know what to expect, software engineers provide further 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 Figure 5 is very similar to our learning curve. So the more we learn, the more confident we become.

3.6 Trust building

More and more never-experienced products are emerging. 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

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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 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 Ramasawamy, for example, proposed value co-creation [Prahalad and Ramaswamy 2004] . The poducer 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 recently, there has been asymmetry of information between the producer and the customer as shown in Figure 7.
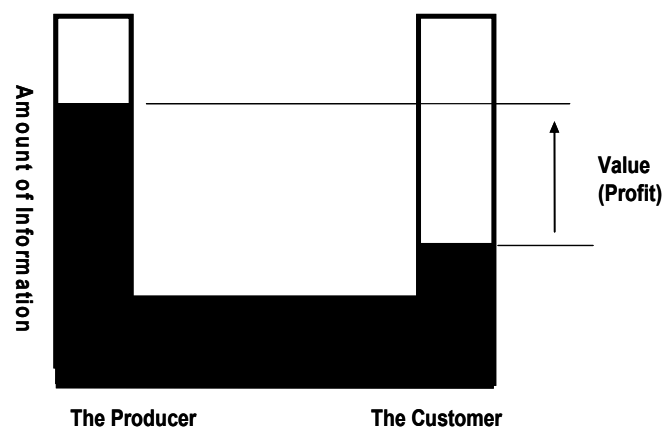
Figure 7. Asymmetry of information

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 producers, 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 Figure 8. 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 really taken into account.
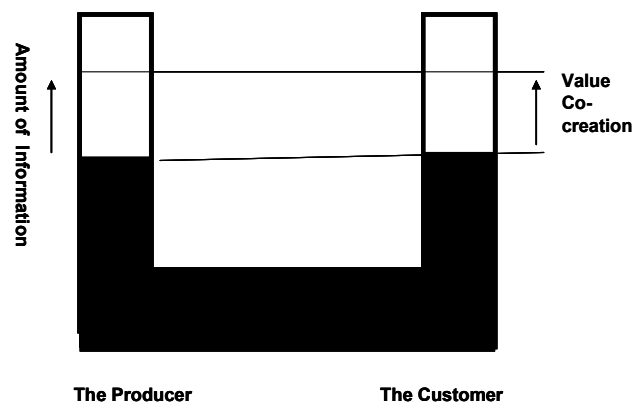
Figure 8. Value co-creation

The idea of team working of the producer and the customer was proposed earlier by [Toffler 1984]. But as his coined 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 regards process itself as a value generator. They understand the value of processes.

To hardware people, processes mean just cost increasing factors. If you pay too much time and efforts in the processes, it means too much cost and thus decreases value. But if we note that value is defined as

Value=Performance/Cost

Then, if processes increases performance instead of increasing cost, then value will grow. So Let us now get back to the basic problem of what is human.

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 (Figure 9) [Maslow 1987].
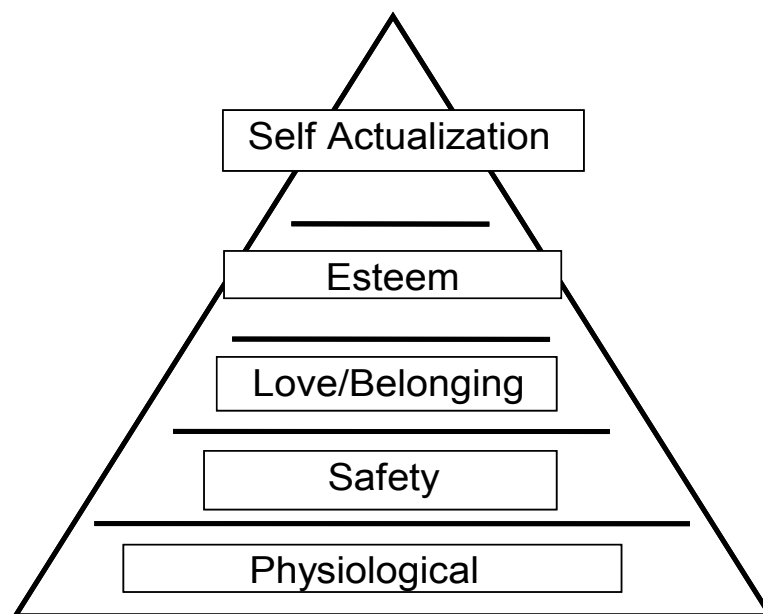
Figure 9. Maslow's hierarchy of human needs

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. *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 more 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.

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 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 prefer repair to maintenance. 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. Future Works

The importance of satisfying our creative customers is discussed. To achieve that goal, we have a long way to go.

There may be many ways to get there. One possibility would be to introduce pattern classification . For example, if we introduce Mahalanobis-Taguchi System [Taguchi, Chowdhury and Wu 2000], we could possibly clarify the customizing or creativity profile for a group of customers. Then, we can classify our customers into groups based upon their expectations for customization and based upon their creativity abilities so we can develop products and services that would cater to their needs and preferences more adequately.

6. Concluding remarks

We should move hardware development toward a continual prototyping paradigm, where products should be able to evolve over time. We can repeat the history in shorter time by changing our design and manufacturing in order to get our customers involved and to make them really reflective and cyclic.

Design, manufacturing and repair will provide our customers with rich experience and will satisfy their needs of self actualization and challenge. What we, engineers, should develop now is services. Engineering tomorrow will be more consultation than production. The sale of hardware yields win-lose relation, but service is non-physical so that it is by far easier to yield win-win relation.

We fail to understand that our customers are creative too and, given the opportunity, they would like to participate in product development to be more creative and to get richer experience. We have to

change our design and manufacturing paradigm to satisfy their expectations and to establish lifelong relations with our customers. We engineers can *create their experience.*

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