Customer Value: knowledge, sustainability, and transformation

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Introduction

Although value is an important concept, many companies often do not know how to define and/or measure value (Anderson and Narus, 1998; Lindgren and Wynstra, 2005). According to Bounds et al (1994; pp. 345), the ability to create superior value to customers requires at least three kinds of knowledge: *customer knowledge* (knowledge of customer needs, desires, and how customers use products or services), *subject matter knowledge* (scientific, engineering, and social knowledge required to be able to produce the product or service), and *self-knowledge* (knowledge regarding the mechanisms and capabilities of an organisational system to deliver value as well as the knowledge to improve the system).

Customer knowledge can be gained through identifying customer needs, goals, or desires using a *hierarchical value map* or the *means-ends model* (in e.g. Bounds et al, 1993). Value to customers is then related to the degree of compatibility (match) between the *consequences* of using the product and customer needs. Within TQM (and Six Sigma), the *subject matter knowledge* seems to be the dominating knowledge for value creation and delivery if we take *Quality Function Deployment* (QFD) as an example. Thus, customer value is related with the existence or performance of product/service attributes. Meanwhile, the Lean Production methodology seems to rely more on *self-knowledge* to create and deliver value to customers, meaning that creating customer value is about driving away the wastes from a system.

As a value-creating system, an organisation also needs to focus on *customer knowledge* (besides *subject matter knowledge* and *self-knowledge*) to understand to whom is the system creating value for. Therefore, the purpose of this paper is to propose a method to identify customer value based on *customer knowledge*, which can be transformed by the producer into value that can flow along the value stream.

Theoretical review on methods to map customer value

Hierarchical value map (means-ends model)

The means-ends model is a qualitative market research tool to better understand the customers by identifying the values behind the customer's opinions (Edvardsson and Gustafsson, 1999). The means-ends model suggests that customers buy and use products with an intention that the *consequences* of using the product will enable them to accomplish what they value, such as needs, wants, or goals (Bounds et al, 1993; Edvardsson and Gustafsson, 1999).

The means-ends model simply describes that product attributes will have consequences that enable the fulfilment of needs or goals. In fact, the consequences can be further stated as *functional* and *psychosocial utilities* (figure 1). However, the term "consequences" focuses mainly on the benefit-side and less on the sacrifice-side, which seems to be a shortcoming of the means-ends model because the customers (of e.g. wood-flooring products) do consider life cycle costs.

<Take in figure 1>

Figure 1. The means-ends model

The "conventional" customer value map

The customer value map (Gale, 1994) is a (quantitative) tool to analyse whether a product or a company has provided superior customer value (relative to its competitors) by plotting *market perceived quality* (MPQ) against *market perceived price* (MPP) (see figure 2). MPQ may be estimated by the sum of multiplications between *performance scores ratio* and *importance weight* [usually collected using surveys or interviews] on each quality attribute, for example safety, durability, and availability (Gale, 1994). MPP is calculated in the same way as MPQ; the difference is that MPP is applicable on price attributes such as purchase price, trade-in allowance, resale price, and interest rates.

<Take in figure 2>

Figure 2. The "old" customer value map

Gale (1994, pp. 83) illustrates the *fair value zone* as the area where the ratio between MPQ and MPP is approximately 1, meaning that customers perceive a product with a certain quality level worth to be bought at its current price level. Outside this zone, a product (or firm) provides more or less value (depending on the location of the point) than the competitors.

Sustainable customer value

Doyle (1995) and Maklan and Knox (1997) discuss about sustainable customer value over time, which is about focusing more on the customers themselves and the fulfilment of their needs/goals and less on competition in the market (Johnson and Weinstein, 2004; pp. 272). Thus, sustainable customer value implicitly acknowledges the necessity of "continuous" measurement and monitoring. Although Gale (1994) does not discuss sustainable customer value, the value map can be re-engineered so it becomes a useful tool to continuously measure and monitor customer value.

Customer value from the perspective of system thinking

To understand customer value, the producer needs to view customer value from the perspective of system thinking, which consider the variation regarding: 1) people's thinking or perception, and 2) producers' and customers' view of customer value (Womack and Jones, 2003; p. 6).

Variation in customers' thinking (perception)

The existence of variation in customer needs and use of products or services make the fulfilment of customer needs or wants an uneasy task (Bounds et al, 1993) because the causes of customer variation are impossible to control or to eliminate. However, customer-related variation can be managed through *segmentation*. Here, we adapt the *art* of system thinking (Senge, 1990) to simplify the complex *idiosyncratic* reality of customer value by assuming that variations exist significantly between segments.

Variation in producers' and customers way of defining value

Womack and Jones (2003) and Möller (2006) highlight the dilemma regarding the interpretation of value. Suppliers and customers do not always agree on what constitutes "value" (the *value paradox*) because producers and customers view value from opposite directions. Value from the customers' perspective is about the fulfilment of needs or wants as the consequences of using or consuming products, while value from the producer's perspective is about creating products or services with attributes to fulfil customer needs. Therefore, it is necessary to find a "compromise" definition of value.

A compromised customer value definition is about finding the right "level" in the *hierarchical value map* where value is perceivable by the customers but still can be influenced by the producer. Hence, the author suggests that *functional utilities*, i.e. the usefulness or the outcomes as the consequences of using a product (Hermann and Huber, 2000; Reynolds and Olson, 2001) seem to be the most suitable "surrogate" for values. This compromised definition of values is consistent with the *principle* of system thinking in the sense that it takes into account the interrelationship between producers and customers.

A four-step algorithm to determine the critical values

In Six Sigma, *critical to quality* (product characteristics that must be "perfect") is mostly determined subjectively. Considering customer value, the *critical to quality* should be truly *critical for creating value to customers*.

Identifying the *critical to quality* that is *critical to value* requires a transformation of customer value, from a *cognitive-individual* matter into a *tangible-organisational* matter, which will be useful for producers to define the values that must flow along the value stream. The following algorithm suggests the transformation process.

Step 1: Construct the hierarchical value map (means-ends model)

The means-ends model is a useful tool to identify the *functional utilities* to represent the "benefits" (nominator) of the customer value equation, which are identified using a hierarchical value map (see figure 3 as an example). The "sacrifices" (denominator) are the product's life cycle costs.

<Take in figure 3>

Figure 3. Means-ends model of customer value

Figure 3 indicates that the product attributes (A) give benefits to the customers in terms of functional utilities (U) and psychosocial utilities (P). These utilities enable customers to achieve what they value (V), i.e. goals, needs, or wants.

Step 2: Measure customer value

The "new" customer value map departs from the individual "voice" of ($n*k$) customers, meaning that the perceptions of n customers are identified each period for k periods. Let's assume that n=9 and k=20. Then, at sampling period t, the individual customer judgments about the value of a product can be calculated as:

$$CV_i = \frac{U_i}{C_i} = \frac{\sum_{j=1}^{m} w(u_j) * u_j}{\sum_{h=1}^{g} w(c_h) * c_h} \qquad (1)$$

Where:

CV_i : Individual customer value of customer i (i = 1, 2, …., n)
U_i : Customer's individual cognitive judgement on the product's functional utilities
C_i : Customer's individual cognitive judgement on the product's life cycle costs
$w(u_j)$: Weight of functional utility j (j = 1, 2, …, m)
u_j : Performance score of functional utility j
$w(c_h)$: Weight of cost component h (h = 1, 2, …, g)
c_h : Performance score of cost components h
m : Number of functional utilities
g : Number of cost components

In this example, U_1, U_2, U_3, and U_4 are the functional utilities of the product, and the costs that occur during the period of ownership (life cycle time) are stated as C_1, C_2, C_3, and C_4. Each customer perceives both the *importance* and *performance* of each variable. Hence, 16 random numbers (between 0 and 1) have been simultaneously generated at one time to represent the "voice" of one customer. The random numbers were then multiplied by the maximum measurement scale (i.e. 7 in this case) and rounded in order to get *integers*. If a zero appeared, it was replaced by a new generated number. The procedure was repeated 180 times (= 9*20). Data 1-9 represent the samples of period 1; data 10-18 represent the samples of period 2, etc.

The next step is to *normalise* the data, meaning that a score is subtracted by the lowest score in the measurement scale and then divided by the range of measurement scale. Table I shows the summary of importance weight and performance score of functional utilities (U_i) and cost components (C_i). The *overall mean* and *standard deviation* of customer value score, calculated as (1), are 1.1597 and 0.5426 respectively.

Table I. Importance weight and average performance score of U and C

<Take in table I>

<u>*Step 3: Value-based segmentation*</u>

Segmenting customers based on value can be done using, for example *K-Means Cluster Analysis* (see e.g. Hair et al, 1998) with the help of statistical software such as SPSS, where the U_i and C_i are the discriminating variables. The purpose of the segmentation is to classify customers into high-, fair-, and low-value segments. Table II shows the descriptive statistics and the normalised importance score of functional utilities in each segment.

Table II. Descriptive statistics and importance scores in each segment

<Take in table II>

<u>*Step 4: Identify critical to value for each customer segment*</u>

Criticality is here associated with how customers judge the importance of a certain functional utility, which is determined by comparing the relative importance of a value in a certain segment with the overall relative importance of this value.

The relative importance ratio of functional utility j in a segment ($RI_{j\_segment}$) is:

$$RI_{j\_segment} = \frac{I_{j\_segment}}{\mathrm{I}_{\max\_segment}}; \quad 0 \le RI_{j\_segment} \le 1 \qquad (2)$$

Where:

$I_{j\_segment}$: The importance score of functional utility j judged by a customer segment

$I_{max\_segment}$: The highest importance score of $I_{j\_segment}$

The calculation of relative importance of functional utilities in different segments is shown in table III.

Table III. The relative importance score

<Take in table III>

The overall relative importance of functional utility j ($RI_{j\_overall}$) is:

$$RI_{j\_overall} = \frac{I_{j\_overall}}{I_{\max\_overall}} = \frac{\frac{1}{r}\sum_{l=1}^{r} I_{jl}}{Max\left(I_{j\_overall}\right)} \quad (3)$$

Where:

$I_{j\_overall}$: The average importance score of functional utility j for all customer segments

$I_{max\_overall}$: The highest importance score of $I_{j\_overall}$

The calculation of the overall relative importance of functional utilities is shown in table IV.

Table IV. The overall relative importance & rank of criticality

<Take in table IV>

Thus, a value is considered critical if:

$$RI_{j\_segment} \geq RI_{j\_overall} \quad (4)$$

The critical functional utilities are written in bold (see table III). Table IV shows that U_1 is the most critical value and U_2 is the least critical value. U_2 is less critical than, e.g. U_3 although U_2 has higher importance weight than U_3. This means that although a functional utility is generally judged as more important than another functional utility, it does not necessarily mean that the first mentioned utility has a higher rank of criticality.

Once the critical values have been identified, the producer could find (with the help of means-ends model) the attributes that are linked or associated with the critical value, these attributes are thus the critical-to-quality or the high-priority value that must "smoothly" flow along the value stream in order to achieve "perfect" quality (*zero defect*, *six sigma* quality).

Customer value monitoring

The fact that customer value changes over time makes the segments dynamic in the sense that the notion of "fair" value may change as well. When the value is below *fair zone*, it is unfair for the customers (due to unfulfilled needs or too costly product), but when the value is above *fair zone*, it delights customers but it may be unfair for the producer due to consumption of resources more than needed. Thus, it is necessary for the producer to approximate customers' "specification" of fair value in order to reach *win-win* situation. Although the "specification" of fair value is basically "unknown", it can be approximated.

According to Berghman et al (2006) and Möller (2006), customer value creation is related to suppliers' competence or capacity; which is in accordance with the Lean principle that value is related with the specific capabilities of the product. Thus, we may adopt the concept of [adjusted] *process capability* (C_{pk}) and *control chart* in order to approximate the "specification" limits of fair customer value.

Using $C_{pk} = 1$ as an indication of capable producer to create/deliver fair value, the specification limits of fair value is equal to the control limits of a control chart, which is defined as:

$$\overline{CV} \pm \frac{3s}{\sqrt{n}} \tag{5}$$

The overall score of customer value ($\overline{CV}$) is defined as:

$$\overline{CV} = \frac{\sum_{t=1}^{k} \sum_{i=1}^{n} CV_{ti}}{k * n} \tag{6}$$

Where:

CV_{it} : Individual customer value from customer i at period t
n : Number of customers sampled in each period
k : Number of sampling periods

While the standard deviation (s) of CV is:

$$s = \sqrt{\frac{\sum_{t=1}^{k} \sum_{i=1}^{n} \left(CV_{it} - CV_{t}\right)^2}{n * (k - 1)}} \tag{7}$$

CV_t is the average customer value at period t, which is calculated as:

$$CV_t = \frac{\sum_{i=1}^{n} CV_i}{n} \tag{8}$$

Thus, the upper limit of the control chart is 1.7156 and the lower limit is 0.6038. Figure 4 shows the plot of weekly customer data and that there are no measurement points outside the control limits. A point above the upper control limit may indicate that: 1) the product best suits customers' use situations, or 2) customers do not perceive the product as costly. Thus, the producer knows the strengths of the product and uses those for e.g. marketing purpose. On the other hand, a point below the lower control limit may indicate that: 1) the product does not really fit to customers' use situations (due to either producer's inadequate understanding or customer's own mistake), or 2) customers perceive the product as too costly. Therefore, the producer can identify the weaknesses of the product and opportunities to improve it.

<Take in figure 4>

Figure 4. Control chart for customer value

Usually, it is necessary to complement the use of the $\overline{X}$-chart with a *s*-chart.

Conclusion

Organisation as a system that creates value to customers should possess three different kinds of knowledge: customer knowledge, subject matter knowledge, and self-knowledge. Among these three types of knowledge, customer knowledge is the least explored and least used by organisations as value-creating systems, which may be caused by the difficulty of managing variation in customer perceptions and the fact that customers and producers view value from two different angles.

In order to enable the producer to create value, there should be a compromising definition of value that considers both producers' and customers' perspectives (interests). Therefore, *functional utility* seems to be appropriate to represent value because it involves customer perceptions and yet allows producer's influence.

Using the "new" customer value measure, the producer would be able to manage variation among customers by segmenting the customers according to their perception of value and then identify the unique values that they appreciate using criticality analysis. Finally, producers can monitor their performance in value creation using control charts.

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FIGURES & TABLES

Figure 1

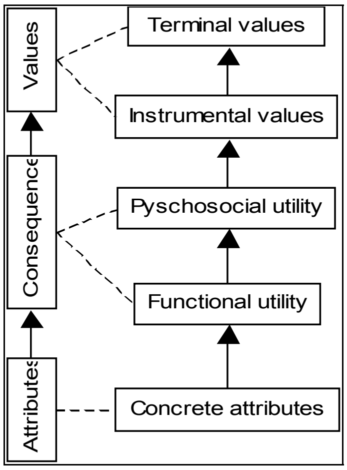

Figure 2

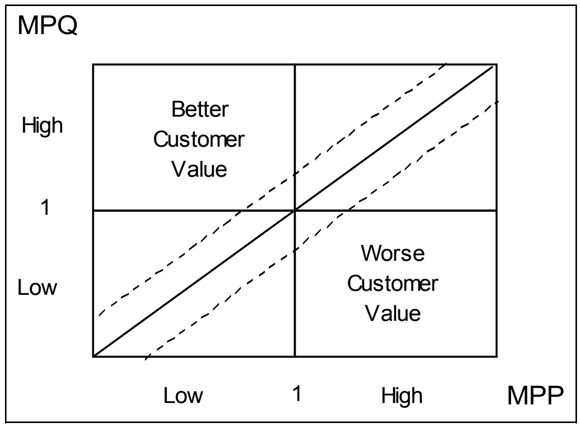

Figure 3

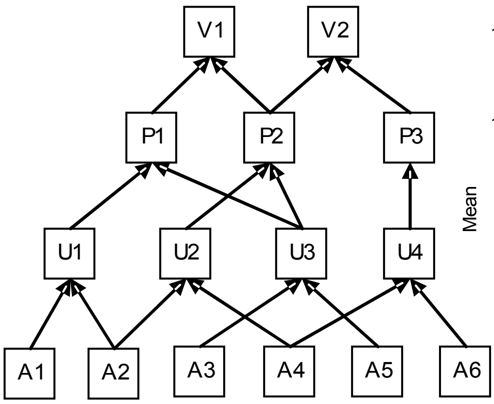

Figure 4

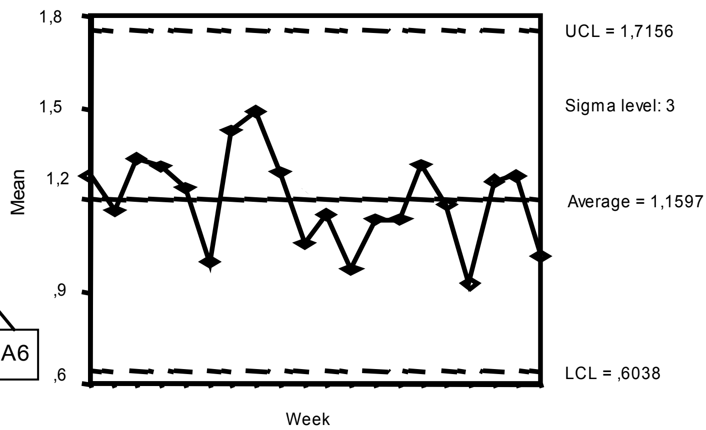

Table I

	Importance weight	Performance		Importance weight	Performance
U_1	0.2811	0.4787	C_1	0.2242	0.4500
U_2	0.2522	0.4407	C_2	0.2412	0.4417
U_3	0.2254	0.4546	C_3	0.2598	0.4333
U_4	0.2413	0.4380	C_4	0.2747	0.4241
	Sum = 1			Sum = 1	

Table II

Segment	N	Mean	Median	St. dev	U_1	U_2	U_3	U_4	Max (U_j)
High-value	50	1.7056	1.6300	0.4501	0.4933	0.4300	0.4300	0.4400	0.4933
Fair-value	54	1.1852	1.0400	0.5313	0.5220	0.4558	0.3865	0.4120	0.5220
Low-value	76	0.7825	0.7900	0.1646	0.4351	0.4069	0.3506	0.3874	0.4351

Table III

	High-value	Fair-value	Low-value
R (U_1)	=0.4933/0.4933 =**1**	**=**0.5220/0.5220 **= 1**	= 0.4351/0.4351 **= 1**
R (U_2)	=0.4300/0.4933 =0.8717	=0.4558/0.5220= 0.8732	**=** 0.4069/0.4351= **0.9352**
R (U_3)	=0.4300/0.4933 **=0.8717**	=0.3865/0.5220= 0.7404	= 0.3506/0.4351= **0.8058**
R (U_4)	=0.4400/0.4933= **0.8920**	=0.4120/0.5220= 0.7893	**=** 0.3874/0.4351= **0.8904**

Table IV

	Mean (U_j)	R(U_j)	Critical for	Criticality rank
U_1	0.4768	0.4768 / 0.4768 = 1	All segments	1
U_2	0.4278	0.4278 / 0.4768 = 0.8972	Low-value	4
U_3	0.3824	0.3824 / 0.4768 = 0.8020	High&low value	2.5
U_4	0.4093	0.4093 / 0.4768 = 0.8584	High&low value	2.5
Max	0.4768			

Note: Max = Max (Mean (U_j)); R(U_j) = [Mean (U_j)]/[Max]