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Value Improvement System of Services toward Long Term Vision

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Abstract: Under today's competitive business situation, it is indispensable for corporations to expedite the value improvement for services and provide fine products satisfying the required function with reasonable costs. In this paper, we provide the management system possessing dynamic variables on the basis of value engineering and the systems approach for the value improvement of services, which is regarded as an ill-defined problem with fuzziness. The distinctive features in this study are to be able to perform the value improvement of services from the long-term viewpoint. Finally, in order to show how the proposed system works, a practical example on the value improvement of services is illustrated and its validity is examined.

Key words: customer satisfaction; function block diagram; services; uncertainty; value improvement
JEL codes: M

1. Introduction

Today's competitive business situations are characterized by globalization, short product life cycles, open systems architecture and diverse customer preferences, so that many managerial innovations have been developed, which include the total quality management, the customer relationship management, the business process reengineering and the supply chain integration, etc. The value improvement of services is also considered as a methodology of managerial innovation. Thus, it is indispensable for corporations to expedite the value improvement for services and provide fine products satisfying the required function with reasonable costs. The performance measurement system dealing with the static variables has been proposed on the basis of the value engineering (Amagasa, 2014; Miles, 1984) as a methodology to improve services in companies.

However, we may provide the value improvement system of services (VISS) with dynamic variables based on the value engineering and the systems approach. The value improvement system possessing dynamic variables is to determine whether or not its value improvement is performed, taking account of future fluctuation of the variables necessary to provide services, while the system with static variables is to only perform the value improvement at that point of time. In addition, the value improvement problems discussing in this paper can be defined as complicated ill-defined problems since uncertainty in the views and experiences of decision makers, so-called "fuzziness" (Zadeh, 1965), appears. The main feature of this paper is to be able to perform the value improvement of services based on long term vision. Under the anticipating prediction of the future fluctuation with respect to service variables, it may be necessary to predict the fluctuation of functions and costs, including

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fluctuations of exchange rate, technical development and change of personnel expenses etc.

A voluminous reference material has been published about the definitions of services in marketing, (Grönroos, 2007; Kotler & Keller, 2006; Lovelock & Wirtz, 2010; Zeithamal et al., 2008). In particular, according to American Marketing Association (AMA 2015), the "customer satisfaction" will be recognized as one of the key terms involving services definition. The purpose of this paper is to perform the improvement of customer satisfaction in the services from the long-term viewpoint. Hence, it is important to determine under a long term vision to improve any one of four resources including human, material, finance and information, which are needed to provide services. In other words, the determination on whether the value improvement for four resources is performed will certainly lead to directly influence to the value improvement of services. The management system has the value improvement of customer satisfaction for its object and confirms whether four resources are examined to be properly used. Thus, it will be natural that such a step may lead to having a good effect on the expansion of market share and the company performance.

Concerning VISS design process we note that the inherent uncertainty in decision making process can be rationally handled on the basis of fuzzy set theory. In consequence, the system we propose may provide decision-makers with a mechanism to incorporate subjective understanding or insight for evaluating the process, and also provide a flexible support such as changes of business environment and/or organizational structure.

In order to show how the proposed system works, a practical problem is illustrated and examined as an empirical study: "Value improvement of services in the electronics company".

2. Value Improvement System with Dynamic Variables

The value of services is performed by the following formula (Amagasa, 2014):

$$\text{Value of services (t)} = U\text{ (Satisfaction of needs (t), Use of resources (t))} \quad (1)$$

Here, U is a kind of a utility function of services depending on the time-t. The value of services (t) indicates the satisfaction of needs achieved by using the resources at time-t.

The satisfaction of needs and the use of resources are, respectively recognized as the functions and the costs of services in the value engineering. Therefore we redefine the value of services (t) as follows:

$$\text{Value of services (t)} = \text{Function (t)/Cost (t)} \ (= F(t)/C(t)) \quad (2)$$

Where $F(t)$ and $C(t)$ show respectively the functions and the costs for services depending on the time (term) "t", so called "dynamic variables". The value improvement process of services is carried out depending on time-t while taking into account of factors such as the fluctuations of personnel expenses and exchange rate, the change of functions by material development etc.

We propose the system to improve the value of services defined. The value improvement system consists of five stages, that is, stages A, B, C, D and E.

At stage A, select the measures by the nominal group techniques (Delbecq et al., 1975) and build a functional block diagram (FBD) (Nagata., Umezawa, Amagasa & Cui, 2009; Tazaki & Amagasa, 1979) under the "means to purpose" relationship, which is based on the system recognition process (Amagasa, 2014) to clarify the essence of ill-defined problem. It's very important to express an image having in a heart of each decision maker relevant to the value improvement of services as a structural model (Nagata et al., 2009) of FBD, because the FBD derives the function evaluation value of services, that plural decision-makers' knowledge is put together and embodied to the structural model.

At stage B, we compute the importance degrees of functions and assign the resources to provide them for services. The importance degrees of functions are computed by making use of the ratio method (Amagasa, 2014) based on the FBD which has been already built in the stage A as shown in Figure 2. The importance degrees of functions for services are computed by using a matrix representing the ratio between the functions. The matrix is determined by a paired comparison among the functions based on a contextual relation "degrees of importance". In it the transitive law should be satisfied.

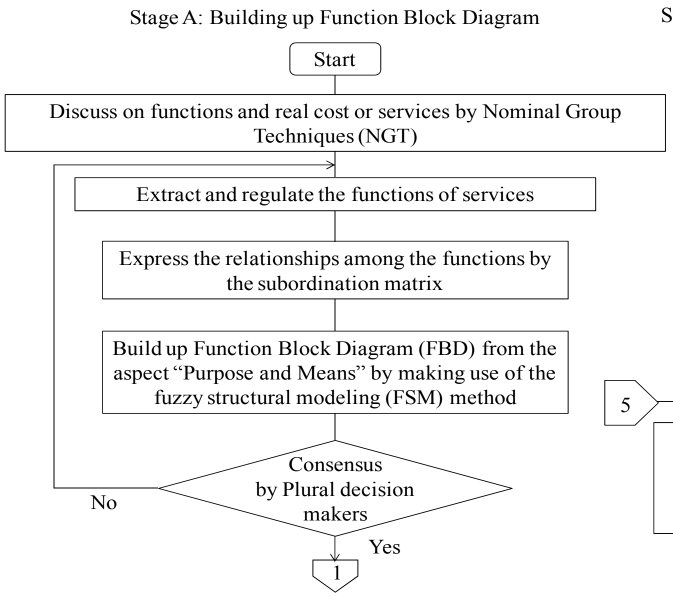

Figure 1 VISS (Stage A)

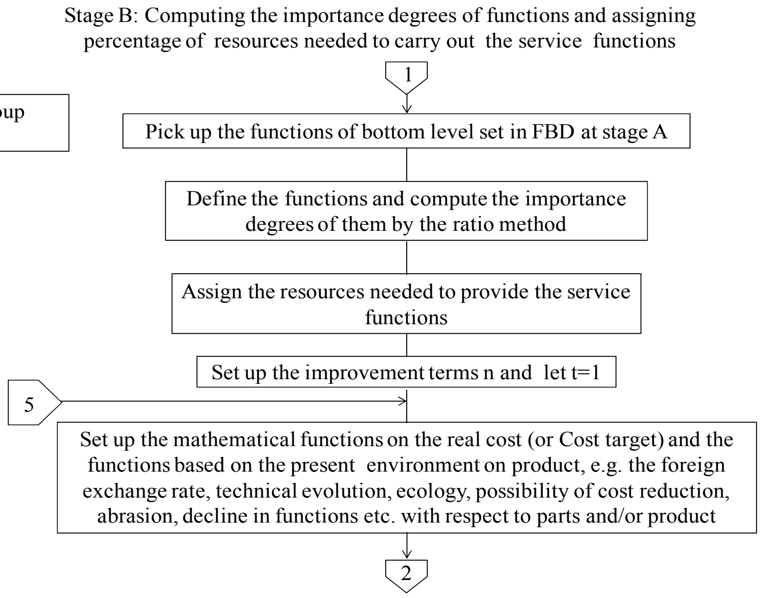

Figure 2 VISS (Stage B)

2.1 Resources Assignment

Since the service function to achieve the customer satisfaction is provided by the resources, we must assign the resources needed to achieve the service functions. From this, we can compute the importance degrees of functions from the aspect of resources. The assignment percentage is subjectively and empirically given on the basis of the cost table and/or the previous learning and knowledge by the decision-makers related to value improvement of services. Here, we explain the details referring to Table 1.

In Table 1, a_{ij} shows the percentage of resources, that is, "how much resources (costs or cost targets) R_i are used to provide service functions F_j, (j = 1,2,…,n)".

$$RF_{ij} = F_i \times a_{ij} \quad (i = 1,2,...,m\,;\, j = 1,2,...,n), \tag{3}$$

$$\sum_{j=1}^{n} a_{ij} = 100\ (\%)\ \ (i = 1,2,...,\ m) \tag{4}$$

F_j, (j = 1,2,…,n) shows how much the resources are used to achieve individual sub-function constituting the service function.

In addition, $RF_i = \sum_{j=1}^{n} RF_{ij},\ (i = 1,2,...,m)$. RF_i, (i = 1,2,…,m) shows the total of resources used in order to achieve all of sub-functions. In other words, it means the importance degrees of functions from the aspect of resources.

Table 1 Resources Assignment

Resources \ Functions		F_1	F_2	.	F_n	Total
R_1	Percentage	a_{11}	a_{12}	.	a_{1n}	RF_1
	Importance	RF_{11}	RF_{12}	.	RF_{1n}	
R_2	Percentage	a_{21}	a_{22}	.	a_{2n}	RF_2
	Importance	RF_{21}	RF_{22}	.	RF_{2n}	
.	Percentage	.		.	.	.
	Importance	.	.	.	.	
R_m	Percentage	a_{m1}	a_{m2}		a_{mn}	RF_m
	Importance	RF_{m1}	RF_{m2}		RF_{mn}	

At stage C, compute the value indexes of resources used to achieve the services. Then the total value index of services is computed by integrating the indexes calculated above.

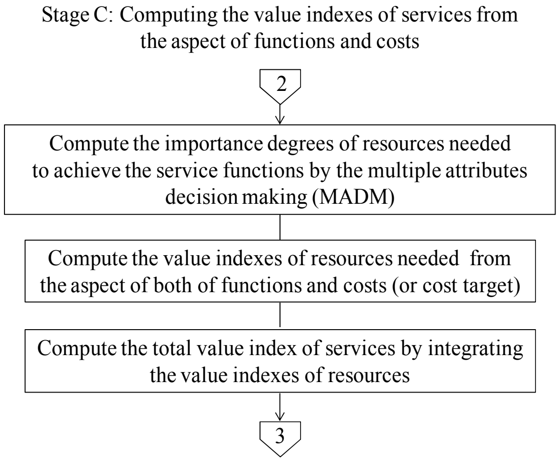

Figure 3 VISS (Stage C)

2.2 Computation of Value Index of Services

The value indexes of services from the aspects of resources shown in Equation 1 are redefined by Equation (5) as follows:

$$V_i = RF_i / C_i\,,\ (i = 1,2,\ldots m) \tag{5}$$

Where C_i is the resources that is costs and/or cost targets determined by the cost table and/or empirically based on the past data used to provide the functions of service. It will be difficult to get the cost table from the company because of the confidentiality and the disclosure of the cost table for services in companies. Here, if we set the limit to management resources, that is the human resource, the material resource, the financial resource and the information resource, Equation (5) can be represented by the following Equations (6), (7), (8) and (9).

(a) Value index of human resource (V_h)

$$= \sum_{j=1}^{n} RF_{1j} \ / \text{ the cost of human resource} \tag{6}$$

(b) Value index of material resource (V_m)

$$= \sum_{j=1}^{n} RF_{2j} \ / \text{ the cost of material resource} \tag{7}$$

(c) Value index of financial resource (V_f)

$$= \sum_{j=1}^{n} RF_{3j} \text{ / the cost of financial resource} \tag{8}$$

(d) Value index of information resource (V_i)

$$= \sum_{j=1}^{n} RF_{4j} \text{ / the cost of information resource} \tag{9}$$

Here, the cost (or cost targets) for each resource of human, material, finance and information is empirically and subjectively determined based on the past data relevant to the costs, and/or by the cost table in advance. By introducing the multi-attribute decision-making method described at stage C (Vlacic, Amagasa, Ishikawa & Tomizawa, 1997), the total value index for services is obtained from all of the aspects of the human, the material, the financial and the information, whose way is based on Choquet integral (Grabisch, 1995).

Total value index

$$= \sum_{i=1}^{4} w_i \cdot v_i \,, \sum_{i=1}^{4} w_i = 1, 0 \le w_i \le 1, \text{ and/or } (c)\int v_i \cdot w_i , \tag{10}$$

Where w_i, (i = 1,2,3,4) is the fuzzy measure.

At stage D, figure out the value control graphic structure based on the value indices in Figure 4, obtaining Figure 5. Further, discuss on the value improvement of resources and/or services based on the results of the value indexes and the value control graphic structure at term t. This time, VISS design process at term t finishes. As for the next, term *t+1* begins at stage B and repeats the same process as term t if term *t+1* doesn't exceed term-n given in advance. Otherwise we proceed to stage E.

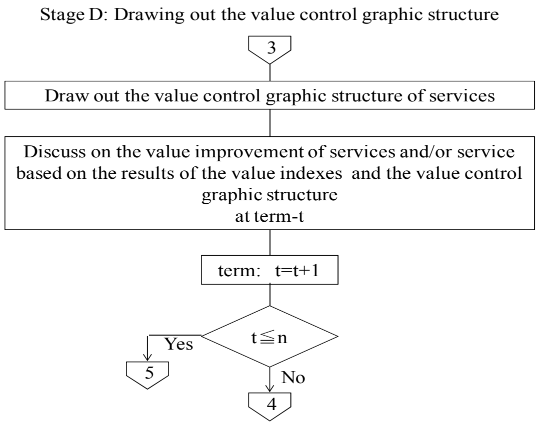

Figure 4 VISS (Stage D)

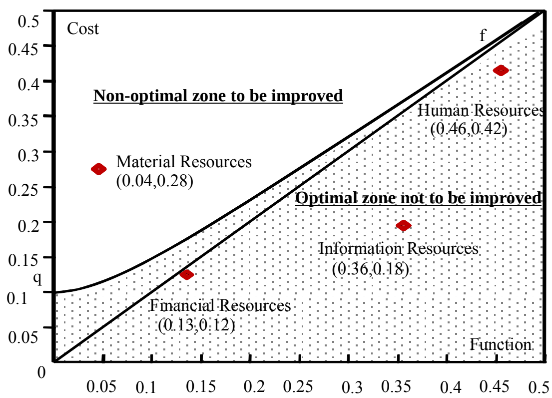

Figure 5 An Example of Value Control Graphic Structure for Services

In x-y plane of Figure 5, x-axis shows the degrees of functions and y-axis the costs. The curved line with the origin q on the y-axis makes distinction between the optimal zone and the non-optimal zone and is expressed as follows:

$$y=(x^2+q^2)^{1/2}, \text{ where } 0 \le q < 1. \quad (11)$$

Here the q shows the admissible level of maximum cost, and is empirically given by the decision makers. Namely, when it can be done with too low cost, the necessity to improve the factor is not required. In Figure 5, for example, we have to improve the value of the material resources because the value of resource is in the non-optimal zone.

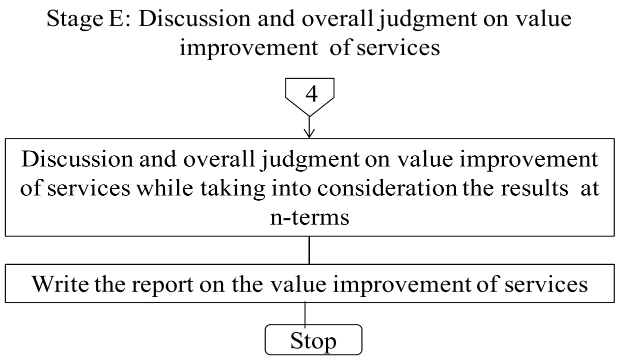

Figure 6 VISS (Stage E)

At stage E, we discuss and make an overall judgment on value improvement of resources while taking into consideration the results at n terms. At the same time, we write the report on the value improvement of resources and/or services.

Through the design process constituting of the stages A, B, C, D and E described above, we are able to perform the improvement of the value of services from the aspects of the resources.

3. Conclusion

We proposed the management system with dynamic variables for the value improvement of services, in addition, we discussed the value improvement of services from the long-term viewpoint. This system has the following advantage, in other words, it enables us to point out that even if it is resources without the need of the improvement at an early stage, there might exist the necessity of the improvement in the long term. As a result, it has been confirmed that the proposed system is effective to perform the value improvement for services under the dynamical changing business environments. As for the result this paper provided, it contributes to future prediction on services, expansion of market share and improvement of customer satisfaction. Further it also contributes to the value improvement in various fields such as value improvement of inner process in companies, value improvement on planning and development etc. However, it will be necessary to use the real cost table in our analysis to keep high accuracy of the value improvement of services. In general, the real cost table in the relevant company is hard to obtain but we may include that information, implementing the necessary simulation to examine the appropriateness of the methodology we proposed. This is left as a subject to be solved in the future.

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