ESTIMATION OF QUALITY CHARACTERISTICS IN SERVICE INDUSTRIES

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Abstract

The importance of quality control in service industries has increased recently. Visual manual (VM) is proposed to improve quality of service. VM is useful to simply explain work process using pictures or animations. In order to improve quality of service, it is very important to define and measure quality characteristics. As quality characteristics of service usually depend on Kansei of customers, it is difficult to measure quality characteristics. Kansei engineering is proposed to develop Kansei models for estimating Kansei of customers based on the design features. One of our main aims is to propose a method to develop Kansei models to estimate quality characteristics in service industries. We developed models to estimate degree of uncomfortable voice and degree of smile, and confirm the validity of the models to estimate quality characteristics suitable for Kansei of customers. We also demonstrate new VM using the models to estimate quality characteristics.

The importance of quality control in service industries has increased recently. The competitions in service industries have intensified and then it is necessary to improve quality of service. Since service is intangible, it is difficult to standardize quality of service (Hatayama, 1987). Kaneko (2002) pointed out the importance of visualization in service industries. Kaneko (2006) proposed Visual Manual (VM) to improve quality of service and to step up visualization in service industries. VM is useful to simply explain work process using pictures or animations. We show an example of VM in Figure 1 and Making VM process in Figure 2. The present research of VM put emphasis on Step 4 to Step 6, and the research of Step 1 to Step 3 is not enough. In Figure 2, defining quality characteristics in Step 3 is unclear in present VM. Defining quality characteristics is useful for the staffs to understand the degree of quality and for managers to educate the staffs about their works. It is necessary to measure the degree of quality characteristics of the staffs' works. Measuring the degree of quality characteristics helps the staffs to understand how to improve their works. And, the appropriate degrees of the quality characteristics often change according to the situations of service. Actually, since the degree of smile in service often changes according to the situations, the managers have to educate staffs about appropriate degree of smile according to the situations.

Figure 1: Example of VM

Based on the above discussion, we focus on the following points in order to improve present VM in service industries.

1. Defining quality characteristics
2. Measuring or estimating the degree of quality characteristics
3. Using estimates of quality characteristics for VM

Step 1. Decide a service process for making VM.
Step 2. Prepare a work process table.
Step 3. Prepare each required quality and **quality characteristics** in the critical service process.
Step 4. Extract business-related risks in the service process (complaints and failures).
Step 5. Prepare outline story and scenes (photo) with "do's" and "don't s".
Step 6. Make the slides.
1. Take and upload photos of actual scenes.
2. Make image files for editing on the screen.
3. Describe and edit the key element of each service scenes.

Quality Table

quality characteristics / required quality	degree of smile	degree of speaking	manner Level	degree of accurate	degree of knowledge	Importance
Receiving with good language	○	○	△	△		5
Speaking in a kind manner	○	○	◎			4
Responding cheerfully	◎	◎	△			5
Responding promptly			△	○	○	3
Making no mistake			○	◎		2
Directing the customer in aprofessional manner	△				◎	2

Figure 2: Process of Making VM

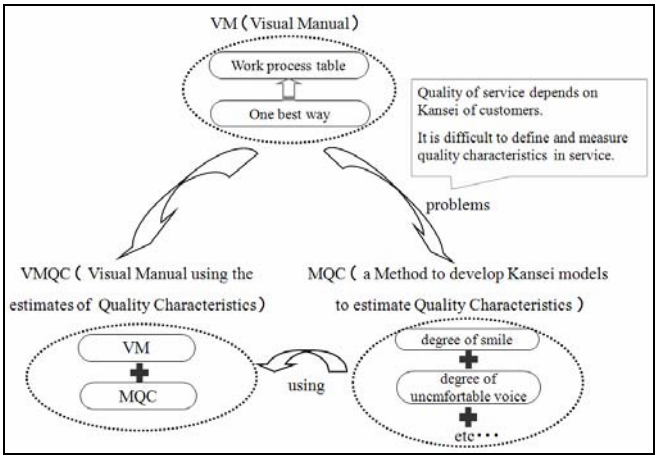

Figure 3: Relation among VM, MQC and VMQC

Quality characteristics of service usually depend on Kansei of customers which is defined as emotional aspect of customer's perception. Fujita (2003) proposed Kansei models for estimating Kansei of customers based on the design features. We use physical features instead of design features, since we think that developing Kansei models using physical features enable us to objectively measure the degree of quality characteristics in service industries. We propose Kansei models to estimate the Kansei of customers using physical features.

To solve the problems in present VM, we propose MQC which is a Method to develop Kansei models to estimate Quality Characteristics in service industries. We show two MQC applications, i.e., the methods to estimate degree of uncomfortable voice and degree of smile. The former does not use criteria sample and the latter uses criteria sample. We use the MPEG-7 descriptors (Manjunath, 2003) which are designed for describing physical features of voice and smile. We also demonstrated VMQC which is Visual Manual using MQC to step up visualization in service industries. We show the relation among VM, MQC and VMQC in Figure 3.

Method

MQC enable us to define and measure quality characteristics by physical features. We show MQC process in Figure 4.

Step 1: Decide quality characteristics which we want to measure from quality table.

Step 2-1: Extract Kansei of customers by the questionnaire survey.

Step 2-2: Decide the physical features.

Step 3: Develop the model by multiple linear regression analysis to estimate Kansei of customers from the physical features.

Step 4: Estimate quality characteristics using the Kansei model.

We can obtain estimates of degree of uncomfortable voice and smile using this method.

Results

The costumers evaluate degrees of quality characteristics with criteria sample or not. We show two applications as follows.

Degree of uncomfortable voice （no criteria sample）

As the voice of receptionists largely affects customer satisfaction, we developed Kansei models. For Step 1, we decided to use five quality characteristics in Table 2: A1 to A5. For

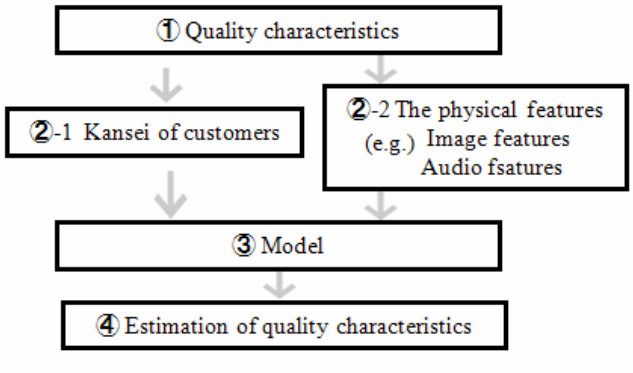

Figure 4: MQC process

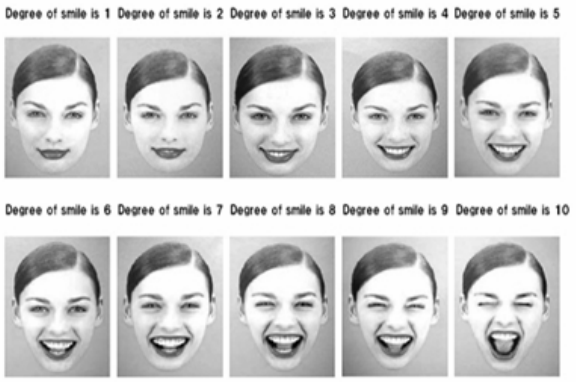

Figure 5：Criteria sample
for the degree of smile (Kaneko, 2006)

Step 2-1, we collected 44 samples of the voice and extracted Kansei of customers by questionnaire survey. For Step 2-2, we show the names of MPEG-7 audio features which we decided to use and the number of independent variables of Kansei models in Table 1: A1 to A11. For Step 3, we developed Kansei models by multiple linear regression analysis. The adjusted coefficient of determination in Kansei models appear in Table 2: A1 to A5. In order to verify the models, we show correlation coefficients between evaluation values of the questionnaire and estimates of the models using new samples in Table 3: A1 to A5. We found that all correlation coefficients are more than 0.750. These results show that using MQC enable us to estimate quality characteristics with no criteria sample.

Degree of smile （criteria sample）

For Step 1, as the smile of receptionist largely affects customer satisfaction, we developed Kansei models for degree of smile. For Step 2-1, we collected 100 samples of the smile and extracted Kansei of customers using criteria sample which is shown in Figure 5 by questionnaire survey. For Step 2-2, we show the names of MPEG-7 image features which we decided to use and the number of independent variables of Kansei models in Table 1: B1 to B4. For Step 3, we developed a Kansei model by multiple linear regression analysis. The adjusted coefficient of determination in a Kansei model appears in Table 2: B1. In order to verify the model, we show a correlation coefficient between evaluation values of the questionnaire and estimates of the models using new samples in Table 3: B1. To investigate the effect of backgrounds of images in estimating quality characteristics, we collected new samples with various backgrounds of images and show a correlation coefficient in Table 3: B2. We found that two correlation coefficients are more than 0.750. These results show that using MQC enable us to estimate quality characteristics with criteria sample.

Table 1: Physical features

	Physical features	# of Variable
A1.	Audio Fundamental Frequency	3 (Max, Min, Ave)
A2.	Audio Harmonicity	3 (Max, Min, Ave)
A3.	Audio Power	3 (Max, Min, Ave)
A4.	Audio Spectrum Centroid	3 (Max, Min, Ave)
A5.	Audio Spectrum Spread	3 (Max, Min, Ave)
A6.	Audio Wave Form	3 (Max, Min, Ave)
A7.	Harmonic Spectral Centroid	1 (Max)
A8.	Harmonic Spectral Deviation	1 (Max)
A9.	Harmonic Spectral Spread	1 (Max)
A10.	Harmonic Spectral Variation	1 (Max)
A11.	File Size	1
B1.	Edge Histogram	80
B2.	Homogeneous Texture	60
B3.	Region Shape	35
B4.	degree of similarity	3

Table2: Adjusted coefficient of in Kansei models using MQC

A1.	degree of uncomfortable	0.673
A2.	volume	0.930
A3.	interval	0.939
A4.	speaking speed	0.825
A5.	speaking distincity	0.506
B1.	degree of smile	0.871

Table 3: Correlation coefficient between Values of the questionnaire and estimates

A1.	degree of uncomfortable	0.977
A2.	volume	0.965
A3.	interval	0.836
A4.	speaking speed	0.834
A5.	speaking distincity	0.765
B1.	degree of smile	0.915
B2.	degree of smile	0.758

VMQC (visual manual using the estimates of quality characteristics)

According to making VM process in Figure 2, we proposed VMQC which is Visual Manual using the estimates of Quality Characteristics in Figure 6. To demonstrate the effectiveness of VMQC, we collected questionnaires about VMQC from staffs and managers of receptionists. We show the evaluation values of the questionnaire in Table 4. For Q1 to Q6, the lowest rating is assigned a value of 1: strongly disagree. The highest rating is assigned a value of 5: strongly agree. In the same way, for Q7 and Q8 the lowest rating is assigned a value of 1: poor. The highest rating is assigned a value of 5: excellent. The evaluation values in Q1, Q2 and Q3 are more than 4.30. We supposed that defining quality characteristics makes unclear service comprehensible. The evaluation values in Q4, Q5 and Q6 are more than 3.80. We supposed that measuring quality characteristics is useful to improve unclear service. From the results of

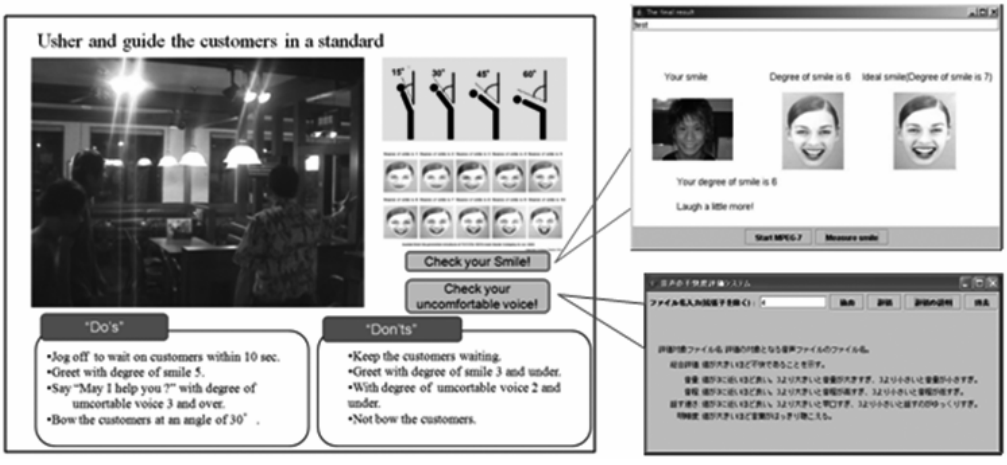

Figure6：Example of VMQC

Table 4 : The result of questionnaires about VMQC (the number of valid answers: 9)

	Question	Average
Q1	Is VMQC more comprehensible than VM?	4.44
Q2	Does the unclear service become comprehensible by the criteria samples?	4.33
Q3	Is the criteria sample useful?	4.56
Q4	Do you understand the levels of your service by the estimates of MQC?	4.00
Q5	Do you improve your work easily by the estimates of MQC?	3.89
Q6	Do you need t more quality characteristics to measure in your service?	4.11
Q7	Please score previous VM.	2.89
Q8	Please score VMQC.	3.89

Q7 and Q8, we found that VMQC is better than VM in comprehensible. We also collected some affirmative opinions of staffs and managers, e.g., “I consider quality of service more than before using quality characteristics,” etc. We found that defining and measuring quality characteristics are useful to step up visualization in the service industries.

Discussion

In order to standardize quality of service, it is very important to define and measure quality characteristics. Therefore we proposed MQC which is a method to develop Kansei models to estimate quality characteristics. We defined and measured quality characteristics from the physical features using MQC, and confirm the validity of the developed Kansei models. We also demonstrated VMQC to step up visualization in the service industries. We found that MQC and VMQC are useful to improve the quality of service in the service industries.

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