

Managing Service System Requirements for Korean Medical Tourism

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Abstract. In order to keep pace with the changing environment and business requirements, organizations are focusing on services. Service requirements management is one of the core activities in developing service systems such as medical tourism service system. To identify proper requirements, business requirements and business change factors should be correctly analyzed since the ultimate aim of a medical service system is to meet the needs of its stakeholders. Moreover, appropriate service requirements should be elicited from both the service providers and service consumers. In this paper, we propose a service requirements management method for value co-creation among the stakeholders for a medical tourism service system.

Keywords: Value Co-Creation, KANO Model, AHP, Service Requirements Management, Customer Feedback, Medical Tourism Service System.

1. Introduction

To deal with the fast changing environment, businesses are interested in service based systems to stay competitive. Many organizations, including the ones in medical services, are focusing on service dominant logic [4] [15]. The main focus of service dominant logic is “value co-creation through activities between service provider and service consumer” [13]. To provide the expected value to customers, medical services should meet their expectations. Hence, the requirements for medical tourism service system should be in sync with what customers want from the medical tourism service system. Therefore, it is important to not only collect the right requirements from customers but also include the service provider’s requirements in designing service systems.

A service identification process with value co-creation has been discussed by Lee et al. [11]. However, this approach has some limitations in that the value analysis process needs further development. The value co-creation process requires a suitable methodology to elicit and manage requirements appropriately. Hence, in this research, we develop an approach for requirements management for the medical tourism service system based on existing literature for value analysis.

Bayraktaroglu and Ozgen [2] and Yanlai et al. [16] have used the KANO model and Analytic Hierarchy Process (AHP) for eliciting requirements. However, they have not incorporated the value co-creation aspect their approach. In addition, they have dealt with only simple applications such as library service and automatic dishwasher. In our research, we integrate existing methods for value co-creation in the service requirements management process and apply it to the medical tourism service system. Thus, the objectives of this research are to: a) develop a framework for the service requirements management using KANO Model and AHP for value co-creation, and b) apply this framework to the medical tourism service system to demonstrate the proof of concept. The contributions of this research are the integrated service requirements management process, especially, the value co-creation part using the KANO model and AHP. In addition,

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our approach makes a concrete contribution to the service systems literature and the healthcare service system domain.

2. Background

2.1. KANO Model

The KANO model provides an effective tool to categorize needs [12]. It tries to explain how customer satisfaction will change as requirements are met by the provider [7]. In addition, KANO groups requirements into the following five categories: a) Attractive – dream requirements, but their absence does not cause any problems to customers, b) One dimensional – these requirements improve performance and if met, customer satisfaction will increase, c) Must be – necessary requirements, very significant for customer, d) Indifferent - customer is not concerned with this requirement whether it is present or not, and e) Reverse - the customer satisfaction will be decreased [9].

2.2. Analytic Hierarchy Process (AHP)

AHP is a multi-criteria decision making (MCDM) method that helps a decision maker facing a complex problem with multiple conflicting and subjective criteria [1]. This approach can be used to rank requirements, with three different levels of importance: a) Absolute importance - evaluated on an interval scale, for example, from “1= not important at all” to “5=very important,” the mean value gives “the absolute importance” level of each requirement [3], b) Ordinal importance – rank ordering of requirements, highest number indicating the most important requirement for the customer [3], and c) Relative importance – pair-wise comparison of requirements. AHP helps decompose unstructured problem into a reasonable decision hierarchy [8] and provides accurate inputs for multi-criteria for right decision making [14].

3. Proposed Methodology

It is essential that all requirements are extracted and well understood in order to identify appropriate requirements for a service system. Our proposed methodology (adapted from [11]) contains three levels or stages, namely, Business level, Service level, and Interaction level. However, in this paper, we are focusing on value co-creation. This activity, shown in Figure 1, is based on the KANO model and AHP. It helps us to investigate the needs of existing and future customers to be able to provide them effective services.

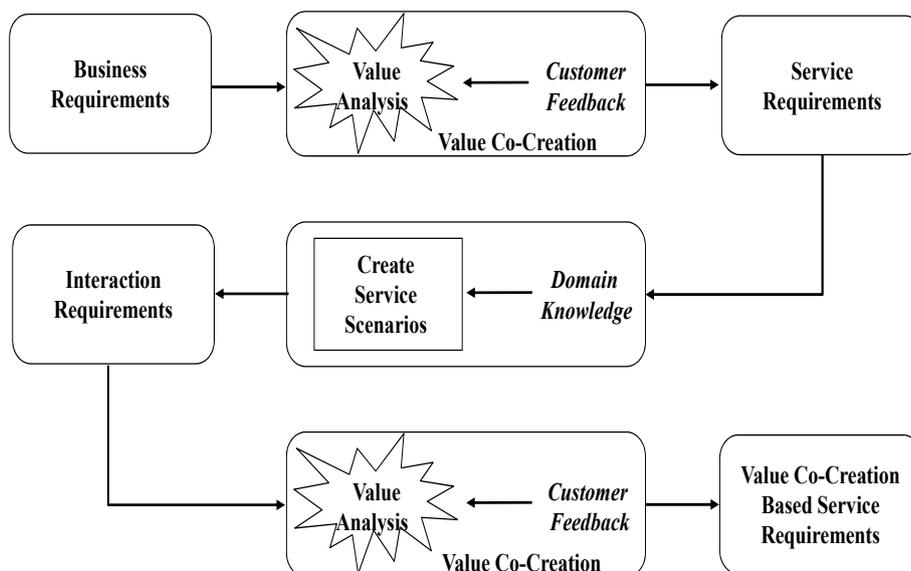


Fig. 1: Proposed methodology (adapted from [11]).

The value analysis of the requirements is carried out as described below. First, we use the KANO model to divide the requirements into the five groups based on customer feedback. Among these groups, we focus on the first three groups (“Attractive,” “One dimensional,” and “Must be”) and not worry about the rest since they are not very crucial. Then, we calculate the relative importance of the selected requirements using AHP.

We ask the users to assign an importance value for each requirement on a scale of 1 (some importance) to 9 (extremely important). Then, a pair-wise comparison between all the requirements is carried out. For the sake of discussion, let us consider four requirements, and their pair-wise comparison, as shown in Table 1.

Table 1. Sample Pair-wise Matrix

Requirements	Requirement 1	Requirement 2	Requirement 3	Requirement 4
Requirement 1	1	1/4	1/9	5
Requirement 2	4	1	1/6	7
Requirement 3	9	6	1	1/3
Requirement 4	1/5	1/7	3	1

Based on the pair-wise comparison in Table 1, we calculate the weights among four requirements using the following formula: $AB_{yij} = \sum A_{ik} * B_{kj}$

The weights of the requirements are computed as follows:

- Step 1 - Get the product of the pair-wise matrix

$$\begin{bmatrix} 1 & 1/4 & 1/9 & 5 \\ 4 & 1 & 1/6 & 7 \\ 9 & 6 & 1 & 1/3 \\ 1/5 & 1/7 & 3 & 1 \end{bmatrix} * \begin{bmatrix} 1 & 1/4 & 1/9 & 5 \\ 4 & 1 & 1/6 & 7 \\ 9 & 6 & 1 & 1/3 \\ 1/5 & 1/7 & 3 & 1 \end{bmatrix} = \begin{bmatrix} 4.00 & 1.88 & 15.26 & 11.79 \\ 10.90 & 4.00 & 21.78 & 34.06 \\ 42.07 & 14.30 & 4.00 & 87.67 \\ 27.97 & 18.34 & 6.05 & 4.00 \end{bmatrix}$$

- Step 2 - Add the numbers in each row
- Step 3 - Get the ratio based on the matrix total

$$\begin{bmatrix} 4.00 & 1.88 & 15.26 & 11.79 \\ 10.90 & 4.00 & 21.78 & 34.06 \\ 42.07 & 14.30 & 4.00 & 87.67 \\ 27.97 & 18.34 & 6.05 & 4.00 \end{bmatrix} \rightarrow \begin{bmatrix} 32.93 \\ 70.73 \\ 143.03 \\ 56.35 \end{bmatrix} / 308.05 = \begin{bmatrix} 0.11 \\ 0.23 \\ 0.48 \\ 0.18 \end{bmatrix}$$

In step 3, the weight of each requirement is calculated as 0.11, 0.23, 0.48, and 0.18. From these values, requirement 3 is considered the highest priority requirement among the four. Thus, AHP can be used to determine the highest priority requirements based on the input from both service consumers and providers.

4. Application to Medical Tourism Service System

A sample application of our proposed methodology is described in this section. Medical tourism is an emerging field in Korea. We are developing an interactive medical tourism service system that allows customized information to be available to the medical travellers as well as the healthcare professionals regarding medical and tourism industry. For the effective design of this system, we have to consider the requirements of each stakeholder. To elicit requirements, we use the goal and scenario approach [5] [6] [10] and prioritize them using our value based requirement engineering methodology. We describe our application with respect to three levels of operation, namely, the business level, service level and the interaction level.

There are four major stakeholders at the business level, namely, the Ministry of Health and Welfare, Korea Tourism Organization (KTO), health care providers (hospitals) and the customers seeking treatment. The business goals provided by each of these stakeholders need to be evaluated to see which ones are the most important to be included in the first iteration of the system design. Lee et al. [11] have captured all the requirements and due to lack of space they are not included here. The next step is to find a set of refined business goals. We modify the existing goals using KANO and AHP, which will result in identifying the highest valued business goals. As an example, we show how one stakeholder's requirements are revised based on the value co-creation associated with these requirements. For instance, consider the business goals from the Ministry of Health and Welfare. Based on the customers' feedback, we can suggest changes to these business goals. These changes are extracted through value co-creation process using KANO and AHP. Based on the original goals from the Ministry of Health and Welfare, to implement the medical tourism service system, some requirements may be added, or removed through the value co-creation process. In addition, according to the weights of requirements, the priority for implementation can be changed. As the first step, based on the KANO model, we grouped the requirements as follows:

- BGM1: Incentive information for the hospitals' participation \rightarrow *reverse* or *indifferent* group

- BGM2: Publicize and advertise the services offered in Korea → *must be* group
- BGM4: Insurance information → *one dimensional* group
- BGM6: Success rate of medical procedures → *one dimensional* group
- BGM7: Capacity of hospital → *one dimensional* group

Here, we use only the suitable groups, namely, “one dimensional,” and “must be.” Therefore, in this step, we do not consider BGM1 (Incentive information for hospitals’ participation) since this information is unnecessary for customers and need not be provided. Thus, we can remove this goal from the list of requirements. Then, we apply the AHP computation for the remaining four business requirements. They are assigned the importance value and the pair-wise comparison matrix is set up as shown below.

Table 2. Pair-wise Matrix

Requirements	BGM2	BGM4	BGM6	BGM7
BGM 2	1	1/4	1/8	1/2
BGM 4	4	1	1/6	1/3
BGM 6	8	6	1	2
BGM 7	2	3	1/2	1

Based on the pair-wise comparison above, calculate the weights of the four requirements as given below.

$$\begin{bmatrix} 1 & 1/4 & 1/8 & 1/2 \\ 4 & 1 & 1/6 & 1/3 \\ 8 & 6 & 1 & 2 \\ 2 & 3 & 1/2 & 1 \end{bmatrix} * \begin{bmatrix} 1 & 1/4 & 1/8 & 1/2 \\ 4 & 1 & 1/6 & 1/3 \\ 8 & 6 & 1 & 2 \\ 2 & 3 & 1/2 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 8.63 \\ 18.00 \\ 78.00 \\ 25.25 \end{bmatrix} / 139.88 = \begin{bmatrix} 0.06 \\ 0.13 \\ 0.56 \\ 0.25 \end{bmatrix}$$

From the above, it can be seen that the weighted order of the requirements are as follows: BGM 6, BGM 7, BGM 4, and BGM 2. At the service level, based on the four goals, the following scenarios are created:

- Scenarios for providing the success rate of medical procedures information
- Scenarios for providing information about the capacity of hospital
- Scenarios for providing the insurance information
- Scenarios to publicize and advertise the services offered in Korea

For further discussion, let us consider the “must be” requirement, namely, publicize and advertise the services offered in Korea. We can define the following scenarios to satisfy the service goal (publicize and advertise the offered services) from the Ministry of Health and Welfare’s point of view.

- SGM1-S1 (Service Goal Ministry of health and welfare 1-Scenario 1): Collect the information about services offered from each relevant hospital
- SGM1-S2 Classify the offered services according to the specialized hospital service
- SGM1-S3 Make web space and tabs for posting advertisements
- SGM1-S4 Post advertisements

At the next level, we can add the domain knowledge about hospitals or the system operation. If we obtain knowledge about the location, it should be added together when posting the specialized hospitals’ information. Thus, we can add more requirements to the interaction level goals. At the interaction level, we can use the output from the previous level to define interaction goal. These goals, for the Ministry of Health and Welfare, are given below:

- IGM1 (Interaction Goal Ministry of health and welfare 1): Collect the information about offered services from each relevant hospital
- IGM2: Classify the offered services according to the specialized hospital service
- IGM3: Make web spaces and tabs for posting advertisements
- IGM4: Adding location information about hospitals based on specialty of services.
- IGM5: Post advertisements

The assessing process is applied after determining the interaction level goals. Inputs for this process come from two sources: results from previous step and customer feedback. If the customer and stakeholder agree on previous results, we can achieve the value co-creation based service requirements, which can be used to create a more concrete and efficient service system. We have described our approach using only one business requirement. However, in reality, we should consider more than one group of business requirements.

5. Conclusion

We have developed an approach for requirements management for the medical tourism service system. Using our approach, we can begin with the high level business requirements and apply value co-creation using KANO model and AHP to determine the most important requirements and use those requirements to identify service requirements through scenario modelling. From the scenarios, interaction requirements can be identified. Our approach can be extended to different domains because of the emphasis on value, customer feedback, and the efficiency that can be assured. Moreover, if we use Unified Modelling Language (UML) for the design, it will lead to easy understanding of the design compared to simply describing the system. The implications of this approach extend to all aspects of systems development where customer input helps improve services. As part of our future work, we plan to further refine the proposed approach and apply it to other domains. We will also apply UML to design the requirement elicitation process that helps in service identification and undertake an empirical validation of the approach to ensure that unexpected changes in businesses can be dealt with care.

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7. References

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