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Classification of Companion Animal Clinic Medical Service Quality Factors Using a Multidimensional Evaluation Model

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ABSTRACT

The rapid growth of the companion animal healthcare sector has heightened the need for high-quality veterinary services. This study aimed to identify and prioritize medical service quality attributes in animal clinics using a multidimensional evaluation model integrating science and technology concepts. A structured online survey was conducted with pet owners to classify service elements based on the Kano model, followed by statistical analyses using Timko's coefficients. Results showed that veterinary expertise and interpersonal communication skills were consistently valued more than physical infrastructure. These attributes enhance satisfaction because pet owners trust professionals who demonstrate technical skill and empathy. The findings suggest that focusing on human-centered competencies and diagnostic precision—reflecting advances in clinical technology—is critical for improving customer loyalty. The model can be adopted by animal hospitals to optimize their services through science-based prioritization, supporting sustainable competitiveness in the veterinary field.

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1. INTRODUCTION

The increasing social emphasis on animal welfare has led to a significant expansion of the companion animal industry. Many reports regarding animals have been well-documented [1-6]. According to the American Veterinary Medical Association, animal welfare encompasses comprehensive care including clean living conditions, nutrition, disease prevention and treatment, and humane euthanasia only when necessary. In Korea, this growing awareness is reflected in the rise of companion animal hospitals, with 3,567 hospitals and 6,377 veterinarians documented in 2020 to provide care for pets. This growth sig-nifies a shift from animals being seen merely as pets to their recognition as family members, requiring specialized, humane healthcare services.

As the number of animal clinics increases, competition intensifies, compelling clinics to focus not only on basic care but also on enhancing customer experience through high-quality, patient-centered services. To maintain sustainability, animal hospitals must identify and prioritize service attributes that influence customer satisfaction and loyalty. These studies have explored these aspects used regression analysis to examine how service quality affects satisfaction, alongside qualitative methods to highlight the challenges pet owners face in accessing veterinary services. However, these studies largely adopt a unidimensional perspective, which may overlook the complexity of how pet owners evaluate veterinary care.

To address this gap, this study applies the Kano model—a dual-perspective customer satisfaction framework that considers both subjective satisfaction and objective service sufficiency—along with Timko's satisfaction coefficients, to classify and prioritize quality attributes in companion animal hospitals. These models enable the analysis of customer needs through a multidimensional lens that incorporates the technological, interpersonal, and structural elements of veterinary services.

The purpose of this study is to categorize and prioritize medical service quality factors in companion animal hospitals using an integrated approach based on the Kano model and Timko's coefficients. The novelty lies in being one of the first studies to apply these dual-frameworks to the veterinary service do-main, offering a structured, science-and-technology-informed model that can help animal hospitals enhance service quality and customer trust in a competitive healthcare environment.

2. LITERATURE REVIEW

2.1. Animal Hospital

Animal hospitals provide veterinary services to diagnose, treat, and prevent various diseases in companion animals. It is a generic term for a place where the focal service provider, the vet, practices medical activities on diseased animals and provides a general explanation of the disease to the customer, which is the owner of the companion animal.

Animal hospitals are categorized into three types: companion animal hospitals that treat dogs, cats, and types of rodents; industrial animal hospitals that treat cows, pigs, horses, and chickens; and mixed-animal hospitals that treat companion animals and industrial animals. In this study, "animal hospital" refers to companion animal hospitals only.

2.1.1. Medical Service

Typically, service is defined as an action, process, and result as performance and quality reflects customers' various needs from a consumer-oriented, subjective perspective. The most widely accepted definition of service quality is the perceived quality of service that

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described as "the degree and direction of a discrepancy between consumer ex-pectations and perceptions of services" [7].

On the other hand, healthcare service is a conceptualization of medical and non-medical activities that are additionally generated due to the performance of medical practices as well as medical treatment and diagnosis (prescription and administration), which are essential actions of medical care; it has more advanced and specialized features than general services [8]. Therefore, in this study, animal hospital medical services are defined as the feeling that the medical service users of the animal hospital leave with after receiving medical services related to companion animals.

2.2. Kano Model

The Kano Model is a customer satisfaction measurement model researched by Kano et al. [6] and is based on Herzberg's motivation–hygiene theory. The difference it has with the former model in regard to service quality is that it provides a dualistic quality recognition process in explaining how consumers' satisfaction level and quality factor satisfaction level per quality factor differ in relation. In other words, it points out that there is a limit to interpreting the concept of quality in the Kano Model in a one-dimensional method, and thereby provides a dual recognition method that considers both the subjective dimension of service satisfaction and dissatisfaction as well as physical sufficiency and insufficiency, which is the ob-jective dimension. Illustrating the quality factor of the Kano Model results in **Figure 1**, the horizontal axis indicates the functional satisfaction of the quality factor, and the vertical axis indicates the users' satis-faction [9].

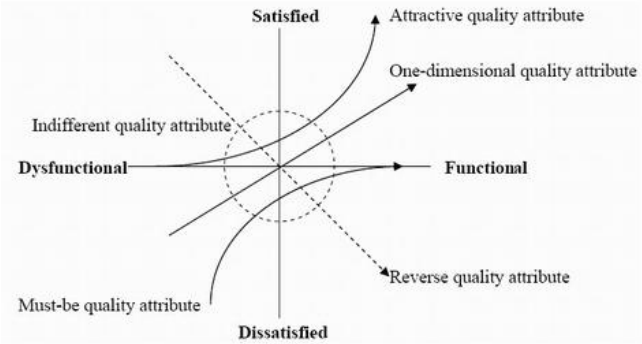

Figure 1. Kano model.

In the Kano Model, to classify the quality factor elements, a survey research method consisting of two questions, positive and negative, was proposed. The response combinations were classified into six main quality factors by incorporating the answers to the positive and negative questions in **Table 1** into the two-way evaluation table, as shown in **Table 2** [10].

The specific details of the quality factors O, A, M, I, and R from **Table 1** are: (i) O (one-dimensional quality): If the service is sufficient, it is satisfactory. If the service is insufficient, it is considered unsatisfactory; (ii) A (attractive quality): If the service is sufficient, it is considered satisfactory. If the service was insufficient, then there was no dissatisfaction; (iii) M (must-be quality): If the service is sufficient, then it is a must-be. If the service is insufficient, it is con-sidered unsatisfactory; (iv) I (indifferent quality): Whether there is sufficient or insufficient service is indifferent; (v) R (reverse quality): If the service is sufficient, it is dissatisfactory. If the service is insufficient, it is satis-factory; (vi) Q (questionable result quality): Cannot be considered a general assessment. Questionable result quality is applicable in the case of the surveyor's incomprehension of the survey, thereby having a low understanding of the quality factor, in the case of failing to understand, or in the case of error.

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Table 1. Example of positive and negative questions in the Kano model survey.

Example of questions	Answer choice
How would you feel if your veterinarian had a high level of medical knowledge and skills?	1. like 2. must-be 3. neutral 4. live-with 5. dislike
How would you feel if your veterinarian's medical knowledge and skills were not at a high level?	1. like 2. must-be 3. neutral 4. live-with 5. dislike

Table 2. Two-way table of Kano model quality factor evaluation.

Attributes		Negative evaluation				
		Like (1)	must-be (2)	Neutral (3)	live-with (4)	Dislike (5)
Positive evaluation	Like (1)	Q	A	A	A	O
	must-be (2)	R	I	I	I	M
	Neutral (3)	R	I	I	I	M
	live-with (4)	R	I	I	I	M
	Dislike (5)	R	R	R	R	Q

After receiving all the participants' responses, the method of classifying the arbitrary participant's answer into five quality factors is as follows: if the respondent's answer to the first positive question is number 1 and the answer to the first negative question is number 5, then the quality factor of that respondent is classified as O. In this way, all respondents' answers are classified per quality factor, and the quality factor that indicates the mode can be classified as the quality factor for the relevant quality attribute.

However, the Kano Model determines the quality factor using only the mode value, which limits its capacity to explain the differences in various distributions. To solve this problem, the customer satisfaction coefficient for Equation (1) and proposed customer dissatisfaction coefficients for Equation (2). Here, a better coefficient illustrates how much customer satisfaction increases when a product's specific quality factor is satisfied. On the other hand, a worse coefficient illustrates how much customer dissatis-faction increases when a product's specific quality factor is not satisfied. The reason for the negative symbol on the worse coefficient implies a negative meaning.

$$\text{Satisfaction (better)coefficient} = \frac{A+O}{A+O+M+I} \quad (1)$$

$$\text{Dissatisfaction (worse)coefficient} = \frac{O+M}{A+O+M+I} * (-1) \quad (2)$$

3. METHODS

The research questions are set as follows:

(i) Research question 1. We seek to categorize animal hospitals' service quality factors using Kano model, which evaluates quality using a dual recognition method. This dual recognition method for quality measures the subjective dimension of satisfaction-dissatisfaction with the service as well as the objective dimension of physical sufficient-insufficiency together in the process.

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(ii) Research question 2. Using Timko's Customer Service Coefficient Satisfaction Index, we analyzed in what attributes the respondents felt greater satisfaction or dissatisfaction. Since the Customer Service Coefficient Satisfaction Index only determines the quality factor using the most frequent value of the response, it is used as an alternative to overcome the Kano Model's shortcoming of not being able to explain the difference of various dispersion of responses.

(iii) Research question 3. We analyzed a variety of satisfaction levels with the animal hospitals' service quality by applying additional statistical analyses, including descriptive statistics and correlation analysis.

Recently, hospitals for human patients have strategically developed medical services to gain a com-petitive edge, and there have been many changes in customers' perceptions of service via quality improvement activities. This point has been verified in various studies on medical consumers, and it is expected that such findings will not differ greatly for animal hospitals. We believe that the results of this study, which includes the service quality element classification of animal hospitals using the Kano Model, will be useful in prioritizing animal hospitals' services and contribute to the improvement of their service quality for customers in times of infinite competition.

This study proceeded in four steps, as shown in **Figure 2**. First, we assigned the quality properties of animal hospital medical services based on previous research on companion animals' medical diagnoses and treatment-centric animal hospital user satisfaction. Second, the individual attributes were classified into five quality properties through a survey after the selected main properties were constructed in the survey questions applicable to the Kano Model framework. Third, we investigated which property respondents felt even greater satisfaction by calculating Timko's customer satisfaction coefficients. Lastly, we performed an additional statistical analysis of a descriptive statistical analysis and a correlation analysis using the respondents' current companion animal hospital service quality standard information.

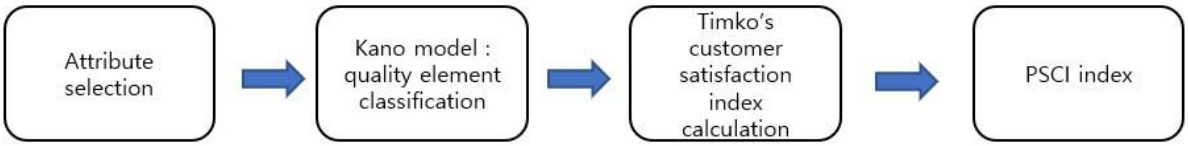

Figure 2. Research process.

We assigned the animal hospital medical service quality properties by considering the animal hospital development trend and animal hospital users' satisfaction factors on the back of the increased social interest in animal welfare and the pet-related industry's growth. First, as for properties, we revised and complemented the preceding research, which secured validity and categorized it into five factors: expertise factor, veterinarian factor, staff factor, physical factor, and pet factor. In this process, the groomer-related factor was excluded, as it was deemed not directly relevant to medical services. Afterwards, revision work on terminology was done after the pre-test, and a final survey was conducted, consisting of 17 factors shown in **Table 3** for each category.

Survey questions were constructed using the traditional Kano Model method. The five types of details of response selectable from the survey questions were assigned to be "Like (1)," "Must-be (2)," "Neutral (3)," "Live-with (4)," "Dislike (5)." It is a frequently mentioned criticism that the Kano Model's dualistic questions come with an extensive number of survey questions, possibly causing confusion to the re-spondents. To remedy this weakness, this

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study constructed positive and negative question formats, as in other study [11] in the survey composition. To check the potential customer satisfaction improvement index, we added a question to determine the current level of satisfaction at the end of the survey.

Table 3. Classification of animal hospital medical service properties.

Classification		Description
Expertise factor	1	The level of medical knowledge and technical skills of the veterinarian in charge
	2	The accuracy of the diagnosis by the veterinarian in charge
	3	The effectiveness of the treatment by the veterinarian in charge
Veterinarian factor	4	The veterinarian in charge listens actively to the pet guardian's explanations and is sympathetic
	5	The veterinarian in charge explains the treatment process in detail
	6	The veterinarian in charge is considerate of the pet
Staff factor	7	Patient services are prompt and accurate
	8	The animal caretaker or the nurse is well-groomed
	9	Medical knowledge of the animal caretaker or the nurse
Physical factor	10	State-of-the-art medical facilities at the animal hospital
	11	The animal hospital is spacious inside with a clean environment
	12	The animal hospital parking facility is convenient
Pet factor	13	The pet seems to like the veterinarian surgeon
	14	The pet consultation is pleasant
	15	The cost of pet consultation or vaccination is reasonable
	16	Regular SMS service sent regarding pet's essential preventive management
	17	The usefulness of the pet-related goods sold in the animal hospital

This research classified animal hospital users' medical service quality properties by elements and sought to aid the prioritization decision in the animal hospital service implementation. Therefore, only those who had companion animals or had experience raising companion animals were selected as subjects of this study. The survey was conducted from 1 July to 30 August 2024, using a convenience sampling method, in which only individuals who voluntarily agreed to participate were included. A self-administered questionnaire was used for data collection. Considering the increasing preference for online surveys over face-to-face methods in the post-COVID-19 era, the survey was conducted entirely online.

To achieve this, we conducted our survey using Google Forms and utilized our network of pet owners and pet meet-up groups on social media. We analyzed the data of the final 130 respondents using the Kano Model. There is no general method to determine the optimum sample size in the analysis using the Kano Model. Considering the difficulty in selecting the target respondents, the sample size differs from a minimum of 26 individuals to 162 individuals [12]. Since this research pertains to target individuals with companion animals only, a sample size of 130 respondents should be deemed appropriate.

The online survey results collected through Google Forms were compiled in Microsoft Excel. Basic mathematical calculations involved Excel, and statistical analyses, including descriptive statistics analysis, reliability analysis, and correlation analysis, were performed using IBM SPSS 27. Detailed information regarding the statistical analysis is reported elsewhere [13,14].

This study was exempt from ethical review in accordance with the institutional guidelines and the collaboration protocol approved by Jeonju University. The study was conducted according to the guidelines of the Decla-ration of Helsinki.

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4. RESULTS AND DISCUSSION

4.1. Reliability Analysis

We calculated Cronbach's, which identifies the internal consistency to validate the reliability of the survey in Table 3, drawn up for data collection. Cronbach's is generally deemed to have high reliability if it is greater than 0.6. The results of the analysis of the survey questionnaire used in this re-search, as shown in **Table 4**, scored greater than 0.8 in Cronbach's for the reliability coefficient of the four factors. The pet factor was 0.752, which is greater than the reference value of 0.6. Furthermore, Cronbach's for the remaining 17 questions was 0.905, which is very high.

Table 4. Reliability coefficient values.

Factors	Cronbach's α
Expertise factor	0.819
Veterinarian factor	0.802
Staff factor	0.831
Physical factor	0.814
Pet factor	0.752
Total	0.905

4.1.1. Kano model classification of quality factors

Based on the survey respondents' results, the five quality factors were classified following the Kano Model's quality factor evaluation two-way table, as shown in **Table 5**.

Table 5. Classification of quality factors using the Kano model.

Factors	Question	A	M	O	I	R	Q
Expertise factor	The level of medical knowledge and technical skills of the veterinarian in charge	6	13	103	3	1	3
	The accuracy of the diagnosis by the veterinarian in charge	3	14	105	3	0	4
	The effectiveness of the treatment by the veterinarian in charge	11	10	101	2	1	3
Veterinarian factor	The veterinarian in charge listens actively to the pet guardian's explanations and is sympathetic	8	6	107	4	1	3
	The veterinarian in charge explains the treatment process in detail	13	13	93	6	0	4
	The veterinarian in charge is considerate of the pet	9	8	105	2	1	4
Staff factor	Patient services are prompt and accurate	29	13	73	9	0	5
	The animal caretaker or the nurse is well-groomed	20	10	78	18	0	3
	Medical knowledge of the animal caretaker or the nurse.	28	5	78	14	1	3
Physical factor	State-of-the-art medical facilities at the animal hospital	45	3	64	12	2	3
	The animal hospital is spacious inside with a clean environment	21	5	91	8	1	3
	The animal hospital is spacious inside with a clean environment	21	5	91	8	1	3
	The animal hospital parking facility is convenient	44	8	64	10	0	3
Pet factor	The pet seems to like the veterinarian surgeon	41	4	66	14	1	3
	The pet consultation is pleasant	21	6	93	6	1	2
	The cost of pet consultation or vaccination is reasonable	15	12	93	6	1	2

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Table 5 (continue). Classification of quality factors using the Kano model.

Factors	Question	A	M	O	I	R	Q
Pet factor	The pet seems to like the veterinarian surgeon	41	4	66	14	1	3
	The pet consultation is pleasant	21	6	93	6	1	2
	The cost of pet consultation or vaccination is reasonable	15	12	93	6	1	2
	Regular SMS service sent regarding pet's essential preventive management	38	8	55	25	0	3
	The usefulness of the pet-related goods sold in the animal hospital	27	8	59	32	0	3

As shown in **Table 5**, all 17 categories were classified as one-dimensional quality. A one-dimensional quality factor is a quality factor that is deemed satisfactory when it is met, but unsatisfactory when it is unmet. The more this quality factor is met, the more customer satisfaction also increases as an attribute, so it is the users' always-wanted quality factor. This research targets only individuals currently owning companion animals, so we can infer from the research result that their level of affection towards their companion animals is very high.

4.1.2. Timko's quality factor-specific customer satisfaction index

To overcome the shortcomings of the Kano Model, which cannot explain the difference in the varied distribution of the responses, we used Timko's customer satisfaction index to identify the degree of difference per 17 categories (see **Table 6**). It is evident that there are certain positive aspects to overcoming the limitations of the Kano Model by using Timko's customer satisfaction index, but the customer satisfaction coefficient also depends on the survey results based on the dual recognition method of the Kano Model; thus, there is a limit to identifying the degree of current customer satisfaction level. Therefore, caution must be exercised when interpreting the satisfaction coefficients.

Table 6. Timko's quality factor-specific customer satisfaction coefficient.

Factor	Question	Satisfaction coefficient	Dissatisfaction coefficient
Expertise factor	The level of medical knowledge and technical skills of the veterinarian in charge	0.872	-0.928
	The accuracy of the diagnosis by the veterinarian in charge	0.864	-0.952
	The effectiveness of the treatment by the veterinarian in charge	0.903	-0.895
Veterinarian factor	The veterinarian in charge listens actively to the pet guardian's explanations and is sympathetic	0.920	-0.904
	The veterinarian in charge explains the treatment process in detail	0.848	-0.848
	The veterinarian in charge is considerate of the pet	0.919	-0.911
Staff factor	Patient services are prompt and accurate	0.822	-0.693
	The animal caretaker or the nurse is well-groomed	0.777	-0.698
	Medical knowledge of the animal caretaker or the nurse.	0.848	-0.664
Physical factor	State-of-the-art medical facilities at the animal hospital	0.879	-0.540
	The animal hospital is spacious inside with a clean environment	0.896	-0.768
	The animal hospital parking facility is convenient	0.857	-0.571

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Table 6 (continue). Timko's quality factor-specific customer satisfaction coefficient.

Factor	Question	Satisfaction coefficient	Dissatisfaction coefficient
Pet factor	The pet seems to like the veterinarian surgeon	0.856	-0.560
	The pet consultation is pleasant	0.904	-0.785
	The cost of pet consultation or vaccination is reasonable	0.857	-0.833
	Regular SMS service sent regarding pet's essential preventive management	0.738	-0.500
	The usefulness of the pet-related goods sold in the animal hospital	0.682	-0.531

Figure 3 shows a two-dimensional graph illustrating the satisfaction and dissatisfaction coefficients shown in Table 6. We confirm the following three findings: First, out of the questions in the first quadrant, animal hospitals' customers consider the expertise factor and the veterinarian factor as extremely important. Second, customers consider the animal hospitals' pleasant environment and comfortable consultation, as well as reasonable costs, extremely important. Third, it can be induced by looking at the third quadrant, including the appearance of the animal caretaker, the text messaging service, and the usefulness of pet products, is relatively less important to customers.

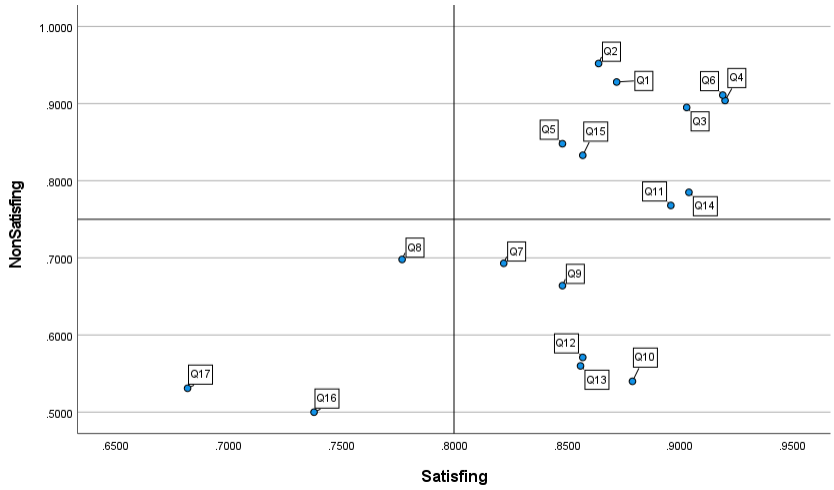

Figure 3. Timko's two-dimensional graph on customer satisfaction coefficient.

4.2. Descriptive Statistics and Correlation Analysis

The reference value by the users of the animal hospitals on the current service quality is close to "must-be" from looking at the results of the descriptive statistics in **Table 7** of the 17 positive and negative questions in **Table 3** that were measured for the Kano Model analysis.

Table 7. Descriptive statistical analysis.

	Average	Standard Deviation
Current sentiment on service quality	2.09	1.182
Positive question	1.20	0.334
Negative question	4.54	0.703

Next, the result of the Pearson correlation coefficient that was sought to understand the correlation between the above three variables is presented in Table 8. As shown in Table 8, the current service quality of animal hospital users and positive questions was statistically

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significant at a significance level of 5%. In other words, it can be deduced that there is a relationship between the higher quality of service provided, which increases the level of service quality sentiment by the users.

Table 8. Bivariate correlation coefficient.

	Current service quality sentiment	Positive question	Negative question
Current service quality sentiment	-	0.214*	0.040
Positive question	0.214*	-	-0.286*
Negative question	0.040	-0.286*	-

4.3. Discussion

The term "companion animal" was used to describe "pet" for the first time at an international symposium held to commemorate a renowned animal behaviorist K. Lorenz's 80th birthday. It is a more respectful expression than "pets," for it recognizes that animals are living with humans and sharing emotional connection and acknowledges animals as partners rather than objects to be played with [15]. According to previous studies, several positive effects of companion animals were identified, and a "pet effect," which refers to the positive effects that animals had on human physical and psychological health [16]. The domestic and foreign markets for companion animals are expanding significantly due to changes in social structures such as "nuclearization" of the family, the rise of one-person households, and woman's increased active social participation. In line with this trend, the companion animal hospital market has also grown significantly. To become a successful companion animal hospital in this environment, animal hospitals also need to have a market-centric managerial sense and knowledge [17].

Furthermore, it is necessary to introduce a new, differentiated management system that strengthens customer-centric services. These days, intensifying competition for companion animal hospitals, customer respect, customer-centric value creation, premium-level service for companion animals' health and happiness, and the principle of pet life are becoming the commonplace bedrock of management goals for many animal hospitals to earn customers' respect and trust. However, the first success factor for customer satisfaction management at companion animal hospitals was differentiated high-quality medical services [18]. Meanwhile, a big data analysis of the pet industry, 34% of the respondents answered "how comfortable they are in handling the companion animals" when asked, "What do you think is the most important element when choosing an animal hospital for the first time?" and 13% answered "Expertise factor of the veterinarian." However, "hospital interior decoration" and "parking facility convenience" were not high at 0%. These results are consistent with those of this study.

While there are few studies looking for user satisfaction factors for medical services at companion animal hospitals is noteworthy. According to this, the factors influencing customers' companion animal hospital satisfaction and revisit intention were veterinarian and expertise factors, such as the medical staff's familiarity and reliability. The excellence of companion animal hospital facilities and provision of additional services were not significantly important factors.The expertise, efficiency, and physical environment of the human components of companion animal hospitals influenced consumer usage satisfaction; in particular, personnel expertise was the most important factor in the research results. In this vein, these results are the same as those of this study, which classified the quality of medical services in companion animal hospitals using the Kano Model. Accordingly, it can be seen

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from this study that companion animal hospitals must be interested in the expertise and communication skills of the veterinarians to raise their competitive advantage to improve the quality of medical services. This study aimed to classify the service quality factors of companion animal hospitals and to prioritize the improvement of those services using the Kano model. Based on previous studies, a questionnaire consisting of 17 attributes was developed. The reliability analysis confirmed high internal consistency across all items. All 17 attributes were classified as one-dimensional quality factors, indicating that these factors simultaneously drive both satisfaction when met and dissatisfaction when unmet.

Despite all attributes being classified as one-dimensional, additional analysis using Timko's satisfaction and dissatisfaction coefficients revealed that veterinarian expertise and communication skills should be prioritized in service improvement strategies. This finding suggests that focusing on the human aspects of veterinary services is key to enhancing customer satisfaction and loyalty. Furthermore, the perceived current service quality among companion animal hospital users was rated as 'must-be,' and a positive correlation was found between the provided quality level and the perceived service quality by users. It should be noted that this study targeted only individuals currently raising companion animals, which may have led to a strong emphasis on one-dimensional quality factors due to their high levels of emotional attachment. This is a limitation of the study. Nevertheless, this study is one of the first to apply the Kano model to the veterinary service sector, providing a useful framework for prioritizing service quality improvements in companion animal hospitals. Future research should include respondents who do not currently own companion animals to validate and extend the findings of this study.

5. CONCLUSION

This study confirmed that veterinarian expertise and communication skills are key priorities for improving customer satisfaction in companion animal hospitals. The Kano model and Timko's coefficients provided a multidimensional evaluation of service quality attributes. These results offer actionable insights for enhancing service strategies in a competitive environment.

6. ACKNOWLEDGMENT

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7. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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