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Telecommunication service quality analysis using integration of SIPA and modified Kano

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This article investigates the integrated approach of the Simultaneous Importance-Performance Analysis (SIPA) model and the modified Kano model to evaluate and prioritize service attributes for telecommunication companies in Indonesia. The study is based on the demographic profiles and usage patterns of 74 respondents. The results demonstrate that the SIPA and Kano models can provide valuable insights for identifying priority areas and effective strategies for improving service quality. Specifically, the SIPA model helps to compare competitor performance and identify important service attributes. In contrast, the modified Kano model facilitates a dynamic cycle of service attribute evaluation to inform managerial strategies. This article contributes by highlighting the potential of the proposed approach to offer valuable insights to telecommunication companies seeking to enhance their service offerings and remain competitive in a constantly evolving market .

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1. INTRODUCTION

The digital revolution in the twenty-first century has significantly impacted various aspects of social life, the economy, and politics [1]. The power of digitalization has led to an exponential increase in global internet users. According to the International Telecommunication Union (ITU), the global internet user population reached a staggering 4.9 billion in 2021, representing a 63% increase from the previous year, which was 4.1 billion or 54% of the world's population in 2019 [2]. In Indonesia, the number of Internet users has increased substantially from 171.2 million in 2019 to 196.7 million in 2020, according to the Association of Indonesian Internet Service Providers (APJII) [3]. Moreover, almost all internet users in Indonesia rely on home internet services, creating intense competition among telecommunications providers, who must prioritize customer satisfaction to remain competitive. Service quality is critical in expanding market share, reducing costs, and enhancing company profit margin [4]–[6].

The importance of providing excellent service cannot overstate, as it plays a significant role in shaping customers' perception of a product or service's value [7], [8]. In today's highly competitive telecommunications market, improving individual service attributes is crucial for overall service performance, customer satisfaction, and enhancing company image. By identifying valued service attributes and implementing an efficient management strategy, companies can thrive in competitive industries and create new business opportunities [9].

The Importance Performance Analysis (IPA) model is useful for evaluating management and

marketing strategies as it simultaneously considers attribute importance and performance [10]. The IPA is a powerful technique employed to assess and enhance various attributes of products or services [11]. The IPA model provides a structured approach for evaluating and prioritizing product or service attributes based on their importance and performance. Importance refers to the level of significance customers assign to a particular attribute, while performance measures the organization's ability to deliver on that attribute [12].

IPA model enables companies to make informed decisions and strategically allocate resources, focusing on attributes that are highly important but may be underperforming. By employing the IPA model, organizations can identify areas that require improvement and prioritize resources to achieve better customer satisfaction [13]. Researchers have used IPA to identify the strengths and weaknesses of higher education service quality [14], to evaluate the quality of e-government web portals [15], [16], and to measure tourist satisfaction [17]. This model also has been effectively utilized in several studies to identify priority areas for enhancement and assist in determining how resources should be allocated [18]–[20]. However, the conventional IPA model only considers service attributes in one dimension [9], which can mislead service and marketing strategies by ignoring the factor of competition [21]. Therefore, Burns [22] proposed the Simultaneous Importance-Performance Analysis (SIPA) model. This model analyzes the focus company's performance and that of its competitors, thereby revealing competitive advantages and disadvantages for the focus company [9]. Several researchers have applied SIPA in various service areas, such as electronic government systems [23], distributors [24], [25], and manufacturing process improvement [26].

The IPA and SIPA methodologies measure service quality linearly, while the Kano model considers possible nonlinear correlations between satisfaction and importance. Kano *et al.* [27] suggested that to expand the customer base, management teams should pursue innovative product and service attributes that attract customers, not just satisfy their current demands. The Kano model offers a perspective that transcends the conventional linear relationship between service quality and customer satisfaction [28]. The Kano model introduces a systematic classification of quality traits, organizing them into five distinct categories: must-be factors, one-dimensional factors, attractive factors, indifference factors, and reverse factors [29]. Additionally, the Kano model recognizes that individual preferences may lead to the reversal of certain factors, meaning that the presence of a particular attribute can cause dissatisfaction, while its absence can result in satisfaction [30].

Several researchers have studied the Kano model, exploring its application in different contexts. Chen *et al.* [31] investigated the categorization of quality items of home delivery service based on the Kano model, wherein the customers' gender is taken into account. Another study by Hartono and Chuan [32] integrated the Kano model, which categorizes service attribute quality into must-be, one-dimensional, and attractive groups, with Kansei engineering (KE) focusing on translating customer emotions into actual products and services. In a more recent study, Yılmaz Kaya [33] applied different tools of the Kano model to examine the effects of COVID-19 pandemic on the accommodation industry.

The Kano model categorizes customer needs into Attractive, One-Dimensional, and Must-Be, while Indifferent, Reverse, and Questionable should not be prioritized for improvement. However, the model has limitations, with many quality attributes classified as indifference factors [29]. Moreover, the Kano model has many quality attributes that tend to be classified as indifference factors, which can result in misclassifying some meaningful attributes. Therefore, Kim [29] modified the Kano model by reducing the indifference factor to tackle this problem. Thus, the modified Kano model is more robust for survey responses and can accurately classify customer requirements [25], [29], [34].

Various studies have explored service quality in the telecommunications industry using diverse approaches. Kuo *et al.* [35] conducted a study in the telecommunication industry and proposed the IPA-Kano model as a tool for categorizing and diagnosing service quality attributes, providing specific strategies for each category. The model addresses the limitations of the Kano model in neglecting attribute performance and importance and the weaknesses of the IPA model in considering only one-dimensional qualities. Similarly, Yang *et al.* [36] researched the service quality of mobile application stores in Taiwan using the IPA. Lubinski and Oppitz [37] conducted a study using the Kano model. The Kano were conducted at different stages of the service delivery lifecycle to probe customer satisfaction and to focus efforts on service

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design, development, and verification stages.

Telecommunication service quality refers to the satisfaction and reliability of the communication services provided by telecommunication service providers. The quality of telecommunication services is evaluated based on various parameters, such as network coverage, call quality, data transfer speed, customer service, and billing accuracy. The literature highlights the significance of process aspects, including tangible (referring to the physical evidence in the form of facilities or equipment), reliability (referring to accurate and timely service performance), responsiveness (referring to the ability to respond to customer needs quickly), assurance (referring to the trust and confidence that the company can provide to customers), and empathy (referring to the attitude of attention and understanding towards customers) [38], [39]. Johnson and Sirikit [40] observed that customers gave high ratings to the tangibles dimension, which included factors such as the appearance of customer service staff, while the empathy dimension received low ratings. The study recommended using the service quality scale for evaluating service quality. Similarly, Olatokun and Ojo [41] researched the factors influencing users' selection of mobile phone providers in the Nigerian telecommunication industry and discovered that customers' perceptions varied widely depending on factors such as service quality.

Talukdar and Chowdhury [42] studied Indian customers' perception of service quality in-network providers. They observed that reliability, responseveness, assurance, tangibility, perceived network quality, and empathy were crucial in determining service quality. Similarly, Dhingra *et al.* [43] emphasized the importance of parameters that contribute to service quality, such as solid network connectivity, timely service delivery, high-end network coverage, high internet speed, a customer-oriented mentality, prompt response to requests, addressing customer queries, providing personalized attention, and exhibiting staff courtesy.

Despite numerous studies on service quality within the telecommunication industry, no comprehensive attempts have been made to adequately assess service quality and make meaningful comparisons with competitors. Thus, a notable gap remains in the ability to effectively measure and prioritize service attributes, particularly within highly competitive industries such as telecommunications. Additionally, integrating SIPA and the modified Kano model can provide a comprehensive framework for evaluating service attributes while considering the competition. Based on the investigation, only one study was found to have utilized the SIPA and modified Kano model proposed by Masudin *et al.* [25]. Their results demonstrated that the SIPA and modified Kano models are more effective at identifying critical strategies for maintaining superior quality over competitors based on essential attributes. Therefore, it can be concluded that adopting SIPA and modified Kano models among researchers is still uncommon, particularly within the telecommunication service industry.

This present study proposes the integrated SIPA and modified Kano model to assess and prioritize service attributes to assist telecommunication companies in enhancing their service performance, customer satisfaction, and overall market competitiveness. The integrated approach is expected to be more effective and comprehensive than only individual IPA, Kano, or SIPA models. The SIPA method is utilized to compare the performance of two telecommunication providers and identify critical service attributes. The modified–Kano method determines essential customer requirements and managerial strategies to maintain superior quality and outperform competitors. This article also contributes to the ability of companies to improve their competitiveness by prioritizing investment in innovative service attributes that can attract new customers. In summary, the proposed approach can offer valuable insights to telecommunication companies seeking to enhance their service offerings and remain competitive in a constantly evolving market. Furthermore, this research endeavors to enrich the existing knowledge of telecommunications service quality.

2. RESEARCH METHODS

The modified Kano model was selected because it emphasizes categorizing service attributes that considerably impact customer satisfaction compared to the conventional Kano model. This state is supported by Kim [29] assertion that the modified Kano model can accommodate responses in three primary categories: Attractive, One-dimensional, and Must-be. It is based on the idea that customers' satisfaction with a service depends on the attributes most important to them. According to Kano *et al.* [27], there is a dynamic cycle in which a service attribute initially does not affect the customer (Indifferent), then progresses to the introduction stage and becomes interesting and can bring immense satisfaction (Attractive).

As the cycle continues, it becomes a service evaluated as One-dimensional, where the more this attribute is fulfilled, the more satisfied the customer becomes. Finally, the attribute becomes a Must-be, meaning the service provider must fulfil it to ensure customer satisfaction. This dynamic cycle of service attributes is relevant to Lin *et al*. [44], who demonstrated a shift in service attributes from being considered indifferent to becoming a must-have over time. This cycle presents a valuable strategy for managing changes that align with evolving customer expectations throughout the service's life cycle. By estimating the duration of this cycle up to the last phase, management can implement suitable strategies to address customers changing preferences for service.

2.1. Demographic profile of respondents

The present study reports on 74 respondents who provided data on their demographic characteristics and usage patterns of telecommunication services. The minimum sample size for this study was determined based on the Bernoulli formula [45]. A significance level of 5% and a confidence level of 95% were used, resulting in a Z-value of 1.96. The margin of error (e) was also set at 5%. The proportion of correct questionnaires was assumed to be p = 95%, and the proportion of incorrect questionnaires was q = 5%. Therefore, the minimum required sample size for this study is 74 respondents. Most respondents identified as female (53%); the most common age group was 21-25 years (53%). Approximately half of the respondents reported a senior high school education level (50%). In addition, most respondents reported a service provider experience of one to two years (Table 1).

Table 1. Respondent Group

Respondent Group	Classification	Percentage
Gender	Male	47%
	Female	53%
Age	Over 25 years	38%
	21-25 years	53%
	Under 21 years	9%
Education	Bachelor's degree or higher	40%
	High school	50%
	Middle school or lower	10%
Service provider experience	Over Two years	11%
	1 – 2 years	46%
	Under 1 year	43%

2.2. Research instruments

This study focuses on the services of the telecommunications industry and uses the SERVQUAL framework to assess service quality. The service attributes used in this study were sourced from several previous studies that discussed telecommunication service providers, specifically [46], [47]. These attributes were categorized into five dimensions of SERVQUAL: tangible, reliability, responsiveness, assurance, and empathy. This approach provides a comprehensive assessment of service quality in the telecommunications industry and valuable insights for improving customer satisfaction and loyalty.

The data was obtained through observation, interviews, questionnaires, and examination of documentation. This study uses a questionnaire to collect the data and a Likert scale of 1-5 (1 = low, 5 = high). The sampling technique used in this study is purposive sampling, and the number of samples is calculated using the Bernoulli formula [45]. The study's sample comprised 74 respondents who use the telecommunication services provided by Company X and its competitors (Y) as their home internet service. The distribution of the questionnaire was performed in 2 steps. The first step is to conduct the validity and reliability test; if the $r_{value} > r_{table}$, the attribute is valid [48]. Then, if Cronbach's Alpha value is more than 0.70, the attribute is stated as reliable. The first step of the questionnaire was distributed to 30 respondents, while the second was distributed to 44 respondents.

2.3. Simultaneous importance performance analysis

The IPA method has limitations as it does not consider competitors' performance on various service attributes and may not comprehensively evaluate a company's competitive strengths and weaknesses [22]. An effective approach to evaluating a company's performance is conducting a comparative analysis with other companies or brands rather than solely focusing on internal performance metrics. Importance Performance Analysis (SIPA) method was developed by Burns [22]. The SIPA method allows for a more comprehensive evaluation by comparing a company's performance to its competitors, revealing potential areas of competitive advantage or disadvantage [49].

Drawing on the SIPA introduced by Burns [22], the application of SIPA was employed by

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Dolinsky [50] to assess the significance of healthcare attributes and competitor performance. Yavas and Shemwell [51] devised a set of 16 strategies aimed at determining competitive strategies within diverse service sectors operating in a competitive market. Bei and Shang [14] compared service features between private and public banks and private and public gas stations. In a study by Lee and Hsieh [52], SIPA was combined with DEMATEL to analyze the competitive advantages, disadvantages, and strategies of telecommunication service providers. Chang *et al*. [53] introduced an integrated approach that combined the SIPA method and the analytical Kano model. This integrated approach was utilized to examine the market competition strategies implemented by participants within the shopping website industry. The study conducted by Chen and Chen [9] proposed a Kano-SIPA integration model to compare the performance of quality attributes for fast food restaurants. The model enables management teams to draw useful conclusions on customer satisfaction levels and how they compare to their competitors.

This study adopts the SIPA method to provide a more comprehensive service quality evaluation in the telecommunication industry. The steps of the SIPA method are as follows [9]:

1. Data collection of respondents related to importance and performance questions.
2. Calculate the total score.

   Total score = Likert scale value x total respondents (1)

3. Calculate the average score.

   $$Average\ score = \frac{Total\ Score}{Total\ respondent} \quad (2)$$

4. Service attributes are categorized based on the importance level into high and low categories.
   a. The service attributes are categorized as "high" if the value exceeds the average level of attribute importance.
   b. The service attributes are categorized as "low" if the value is below the average value of the attribute importance.
5. Determinate the service attribute categories based on performance into two categories.
   a. An attribute is considered "good" if its value exceeds the average value of the company's and its competitor's performance.
   b. An attribute is considered "poor" if its value is lower than the average value of the company's and its competitor's performance.
6. The service attributes under investigation are classified into two categories: "priority improvement attributes." denoted by "P", and "attributes that require maintaining awareness." denoted by "K" (Table 2).

The outcomes of the SIPA are further divided into eight distinct categories of service attributes as follows:

1. Neglected Opportunity. The company and its competitors provide poor service performance, but the value of the attribute's importance is extremely high. Competitors may see this as an opportunity to improve their performance to satisfy customers.
2. Competitive Disadvantage. A condition arises when a particular attribute is important to the customer, but the competitor performs better. This condition is a loss, and the service provider company must prioritize enhancing these attributes to minimize losses.
3. Competitive Advantage. A company gains a competitive advantage when customers perceive that its performance in a critical attribute is better than its competitors.
4. Head-to-Head Competition. A condition is when an attribute is considered important, and the performance of the company and its competitors is good. Therefore, this attribute can also be a concern.
5. Null Opportunity. The company and competitors perform well, while customers do not consider the attributes significant. Therefore, improving this aspect would not yield a competitive advantage for the company.
6. False Alarm. Competitors' performance is considered better than the company on attributes customers consider unimportant. The company does not need to improve this attribute because it does not provide an advantage over the competition.
7. False advantage. The company's performance is significantly better than competitors' performance on attributes considered unimportant by customers. This condition means that the company spends excessive resources.
8. False Competition. The company and its competitors have commendable performance on attributes deemed significant by customers. Therefore, investing resources to improve these attributes is not likely to have a significant impact on sales.

Table 2. Classification of the SIPA method [9]

Importance	Company performance	Performance of competitor company	SIPA (categorized) result
High	Good	Good	Head-to-Head Competition (K)
		Poor	Competitive Advantage
	Poor	Good	Competitive Disadvantage (P)
		Poor	Neglected Opportunity (P)
Low	Good	Good	False Competition
		Poor	False Advantage
	poor	Good	False Alarm
		Poor	Null Opportunity

2.4. Modified Kano

Kim [29] developed a modified Kano, which aims to find out and identify Kano categories that are not included in the main category. These categories of quality attributes include indifferent, reverse, and questionable. This model enables the categories to be grouped into main categories, allowing customer responses to be identified more widely. Table 3 and Table 4 show the difference between the conventional Kano evaluation by Berger *et al*. [54] and the modified Kano evaluation developed by Kim [29]. Only a few researchers have utilized Kim's modified Kano model, with two researchers applying it in their studies. Oey *et al*. [55] studied a medical device distributor's customer needs by combining ServQual, gap analysis, and modified Kano. Masudin *et al*. [25] evaluated two logistics service providers in Indonesian e-commerce, using SIPA and modified Kano to devise strategies for improving service quality and outperforming competitors.

The Kano attribute questions consist of two dimensions: functional (customers' feelings when a service attribute is fulfilled) and dysfunctional (customers' feelings when a service attribute is not fulfilled) [27]. These two dimensions can be divided into five categories: attractive factors (Attractive), critical factors (Must-be), and expected factors (One-dimensional) [29].

The categories that have changed in the modified Kano model are:

1. *Indifferent* turns into *attractive*, that is, when, in the functional questions, "must be," then in the dysfunctional question, "must be," as well as in functional "must be" and dysfunctional "neutral.".
2. *Indifferent* turns into *one-dimensional*, that is when in the functional question "must be", then in the dysfunctional question "can accept it.".
3. *Indifferent* turns into *must be*, that the functional customers answer "neutral" while dysfunctional "can accept it.".
4. *The reverse* turns into *indifference*, that the functional questions "dislike" while dysfunctional questions "can accept it".

The classification of each attribute into its respective category on the Kano model is accomplished by applying the guidelines outlined in Berger's formula [54]:

a) If the total of one dimensional + attractive + must be > the total of indifference + reverse + questionable, then the grade obtained is the maximum value of one dimensional, attractive, must be.
b) If the total of one dimensional + attractive + must be < the total of indifferent + reverse + questionable, then the maximum grade is obtained from indifferent, reverse, questionable.

Table 3. Conventional Kano evaluation [27]

		Dysfunctional				
	Customer needs	1. Like	2. Must be	3. Neutral	4. live with	5. Dislike
Functional	1. Like	Q	A	A	A	O
	2. Must be	R	I	I	I	M
	3. Neutral	R	I	I	I	M
	4. Can accept it	R	I	I	I	M
	5. Dislike	R	R	R	R	Q

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Table 4. Modified Kano evaluation [29]

		Dysfunctional				
	Customer needs	1. Like	2. Must be	3. Neutral	4. Can accept it	5. Dislike
Functional	1. Like	Q	A	A	A	O
	2. Must be	R	A	A	O	M
	3. Neutral	R	I	I	M	M
	4. Can accept it	R	I	I	I	M
	5. Dislike	R	R	R	I	Q

c) If the total of one dimensional + attractive + must be = the total of indifferent + reverse + questionable, then the maximum grade is obtained among all canoe categories, namely one dimensional, attractive, must be and indifferent, reverse.

The steps of the modified Kano model:

1. Data collection of respondents related to functional and dysfunctional questions.
2. Determine attribute classification using Kano's evaluation (Table 4).
3. Determine attribute categories using calculations with the following conditions: If $(O+A+M) > (I+R)$, the category is max (O, A, M). Otherwise, it is categorized into (I, R).
4. Determine the value of the Customers Satisfaction Level (CS1) and Customers Dissatisfaction Level (CS2).

$$CS1 = \frac{A+O}{A+O+M+I} \quad (3)$$

$$CS2 = -\frac{O+M}{(A+O+M+I)} \quad (4)$$

The customer satisfaction coefficient states whether meeting product requirements can increase satisfaction or whether the product requirements can only prevent customer dissatisfaction [48].

5. Fig. 1 shows the location of service attributes based on the results of CS1 and CS2 values on modified Kano. The overall mean value for CS1 and CS2 becomes the midpoint of this map. Service attributes (quadrant I) weigh heavily on customer satisfaction. Thus, this quadrant is called the "Effective improving area." The attributes in quadrant I are thought to be the most successful attempts to increase customer satisfaction because they significantly impact consumers' functional and dysfunctional dimensions. If this attribute is effectively met, customers will be satisfied, but if it is not, they will be disappointed.

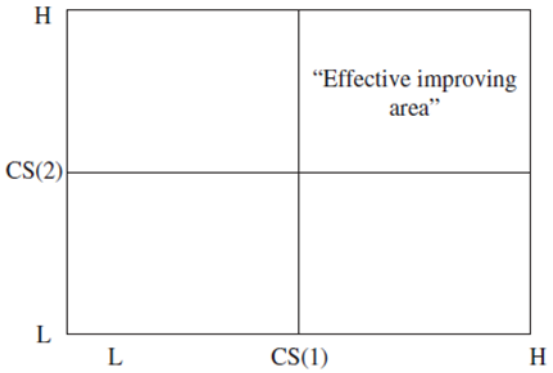

Fig. 1. Modified Kano CS grid [9]

2.5. Integration of SIPA – Modified Kano

The modified Kano and SIPA integration models offer a more comprehensive approach that provides deeper insights for evaluation, analysis, and benchmarking for companies in the service sector [49]. This integrated approach surpasses the use of the IPA, Kano, or SIPA models separately. The modified Kano model considers the performance of attributes relative to their importance and nonlinear relationships with competitors, while the SIPA model provides a means for comparing the performance of different companies. Although some studies have attempted to compensate for this advantage by combining the Kano model with the SIPA, the modified Kano and SIPA integration remains the most comprehensive and effective approach for evaluating service quality in the service sector [9], [25], [49], [53].

Research by Masudin *et al*. [25] stands as the only known study to integrate both SIPA and the modified Kano model to investigate customer perception of logistics service quality in the Indonesian e-commerce industry. The research is aimed to evaluate the performance of two logistics service providers. It determines effective strategies to improve their service quality. The SIPA method was employed to identify crucial service attributes and compare the performance of the two

Table 5. Integration of SIPA and modified Kano

SIPA		Modified Kano		Integration SIPA and modified Kano
Competitive Disadvantage (Priority improving Area) or Neglected Opportunity (Priority improving Area) or Head-to-Head Competition (Keep Alert Attribute)	and	Effective Improving Area	=	Key Improving Attribute

logistics services in meeting customer expectations. The Kano Modification was then utilized to create a dynamic cycle of service attributes to determine essential customer requirements and managerial strategies to maintain superior quality and outperform competitors. The study's findings provided valuable insights into the main strategies necessary to improve the service quality of logistics providers in the Indonesian e-commerce industry. Specifically, the study emphasized the importance of maintaining the quality of critical service attributes while enhancing less critical attributes to stay ahead of competitors.

Integrating the modified Kano and SIPA model provides a comprehensive framework for evaluating service quality attributes in telecommunication home services. In this study, attributes falling into competitive disadvantage, neglected opportunity, or head-to-head competition on the SIPA grid are prioritized for improvement. Additionally, the attributes included in the "improvement is prioritized" category on SIPA and the "effective improving area" category on the modified Kano model are identified as the "key improving attributes". Table 5 describes these attributes and their improvement priorities based on modifications from Chen and Chen [9].

3. RESULTS AND DISCUSSION

3.1. The average value of importance level and service attribute performance

The data analysis using the Simultaneous Importance Performance Analysis (SIPA) method (Table 6), yielded results based on responses from 74 respondents. The analysis revealed that the mean value of the overall importance level of the evaluated attributes was 4.38. The reported mean value of 4.38 represents the intersection between service attributes categorized as having high and low levels of importance and attributes categorized as performing well or poorly [9]. Specifically, the study identified that the service attribute "A3-The employees look tidy and have a good attitude" had the highest level of importance, with an average score of 4.85, while the attribute "A1-Have comfortable office" had the lowest level of importance, with an average score of 4.03. Based on these findings, the study concludes that the overall average performance of service attributes for telecommunication Company X and its competitors was 4.38. These results provide valuable insights into the relative importance of different service attributes and their corresponding performance levels, which can be used to guide efforts to improve the quality of internet home services provided by telecommunication companies.

3.2. Categorization based on SIPA

Table 7 categorizes service attributes into four categories based on their importance and performance: competitive disadvantage, false competition, false alarm, and competitive advantage [29]. Based on the analysis, it is evident that Telecommunication Company X has several service quality attributes that require improvement to meet customer needs and expectations. The attributes that fall under the Competitive Disadvantage category are employees' attitudes and appearance, internet and TV channel offerings, cost-effectiveness, information and promotion delivery, transaction administration, on-time service, complaint response time, and customer service professionalism. This result means that Company X performs poorly in these attributes compared to its competitor. Therefore, the company must improve its performance in these areas to gain a competitive advantage. These attributes are critical for customer satisfaction and retention, and their poor performance could lead to customer churn and decreased revenue. Research studies have also shown that poor service quality and customer dissatisfaction are significant determinants of customer churn in the telecommunications industry [56].

In contrast, the result also found that telecommunication Company X has service quality attri-

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butes that fall under the False Alarm category, including easy subscription cancellation, guaranteed updates, free exchange for error devices, and flexible operational hours. This category implies that the customers do not consider these attributes significant, even though the competitor performs better. The improving these attributes would not provide a competitive advantage for the company.

Table 6. The average score for importance, company performance, and competitor performance

Attribute code	Attribute definition	Importance score		Company performance score		Competitor performance score	
		Total	Average	Total	Average	Total	Average
A1	Have comfortable office	298	4.03	317	4.28	318	4.30
A2	Have a comfortable office facility	300	4.05	299	4.04	318	4.30
A3	The employees look tidy and have a good attitude	359	4.85	280	3.78	326	4.41
A4	Good internet connection and complete TV channel	324	4.4	259	3.50	299	4.04
A5	Affordable offered cost	336	4.54	248	3.35	330	4.46
A6	Fast and easy installation	321	4.34	279	3.77	323	4.36
A7	Service obtained by the customer is following the information and the promotion that is given	338	4.57	235	3.18	325	4.39
A8	Easy and fast administration when doing transaction	336	4.54	286	3.86	326	4.41
A9	On-time service	339	4.58	253	3.42	300	4.05
A10	Quick and responsive when responding to customer complaints or network trouble	337	4.55	255	3.45	315	4.26
A11	The network operates with a broad and smooth performance that is free of major issues or disruptions	339	4.58	226	3.05	315	4.26
A12	Customers can easily cut off their subscription to the network anytime	306	4.14	244	3.30	310	4.19
A13	Customers are guaranteed to get the newest update and features easily	311	4.20	278	3.76	320	4.32
A14	Providing free exchange for error device	315	4.26	257	3.47	300	4.05
A15	Operational hours according to customers' need	309	4.18	280	3.78	311	4.20
A16	Inform of the newest promo to customers	302	4.08	300	4.05	320	4.32
A17	Customer service employees provide the service politely to the customer with their needs	339	4.58	290	3.92	319	4.31
A18	The available of advice box	323	4.36	284	3.84	300	4.05
	Average		4.38		3.66		4.26

Table 7. Categorization of SIPA

Attribute code	Importance category	Performance category		SIPA category
		Company	Competitor	
A1	Low	Good	Good	False Competition
A2	Low	Good	Good	False Competition
A3	High	Poor	Good	Competitive Disadvantage
A4	High	Poor	Good	Competitive Disadvantage
A5	High	Poor	Good	Competitive Disadvantage
A6	Low	Poor	Good	False Alarm
A7	High	Poor	Good	Competitive Disadvantage
A8	High	Poor	Good	Competitive Disadvantage
A9	High	Poor	Good	Competitive Disadvantage
A10	High	Poor	Good	Competitive Disadvantage
A11	High	Poor	Good	Competitive Disadvantage
A12	Low	Poor	Good	False Alarm
A13	Low	Poor	Good	False Alarm
A14	Low	Poor	Good	False Alarm
A15	Low	Poor	Good	False Alarm
A16	Low	Good	Good	False Competition
A17	High	Poor	Good	Competitive Disadvantage
A18	Low	Poor	Good	False Alarm

Table 8. Categorization by modified Kano

Attribute code	A	O	M	I	R	Q	O+A+M	I+R+Q	Category	CS1	CS2
A1	18	20	10	22	0	4	48	26	O	0.54	-0.43
A2	16	41	11	4	1	1	68	6	O	0.79	-0.72
A3	12	49	10	1	1	1	71	3	O	0.85	-0.82
A4	16	22	34	1	0	1	72	2	M	0.52	-0.77
A5	17	42	10	3	0	2	69	5	O	0.82	-0.72
A6	10	44	15	3	0	2	69	5	O	0.75	-0.82
A7	14	38	20	1	0	1	72	2	O	0.71	-0.79
A8	35	19	17	2	0	1	71	3	A	0.74	-0.49
A9	15	40	17	1	0	1	72	2	O	0.75	-0.78
A10	14	42	15	2	0	1	71	3	O	0.77	-0.78
A11	35	22	15	1	0	1	72	2	A	0.78	-0.51
A12	14	43	13	3	0	1	70	4	O	0.78	-0.77
A13	12	40	17	4	0	1	69	5	O	0.71	-0.78
A14	17	41	12	1	2	1	70	4	O	0.82	-0.75
A15	37	21	11	4	0	1	69	5	A	0.79	-0.44
A16	14	41	14	3	1	1	69	5	O	0.76	-0.76
A17	29	25	15	4	0	1	69	5	A	0.74	-0.55
A18	17	45	10	1	0	1	72	2	O	0.85	-0.75

Furthermore, four service attributes under False Competition are comfortable office, comfortable office facility and newest promo information. These attributes have good performance from the company and its competitors, but customers do not consider them important. Therefore, improving these attributes will not yield a competitive advantage for the company. Moreover, companies should consider the dynamic nature of customer preferences and expectations and continuously monitor and adjust their service delivery accordingly [57]. Thus, it can help companies stay competitive and avoid investing in attributes that may become less

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relevant or obsolete over time

3.3. Categorization by modified Kano

Categorizing respondent answers is a crucial step in service attribute analysis, as it helps identify each attribute's importance and performance categories. Blauth's formula was used [54], which involves dividing the score of each attribute by its importance rating. Once the scores are categorized, the CS1 and CS2 are calculated using equations 3 and 4, respectively. The values of CS1 and CS2 provide insight into each attribute's performance and importance levels. These steps are crucial in evaluating service performance and customer satisfaction levels. The results of the categorization and CS1 and CS2 calculations are then presented in Table 8, which serves as a key reference point for analyzing service attributes.

Based on the Modified Kano Grid analysis results, the average CS1 and CS2 were calculated and mapped onto the grid, as presented in Fig. 2. The intersection of CS1 and CS2 indicates the quadrant where the attributes fall, representing their potential for improvement. In this study, the average value of CS1 was at coordinate 0.75, while the average value of CS2 was at -0.69.

Attributes A11 and A15 were identified as part of the "Effective Improving Area" quadrant. These attributes are important to customers, and improving them could significantly enhance service quality. These attributes may impact customer satisfaction and loyalty more than others. Therefore, the company should focus on these attributes to improve its overall service quality and gain a competitive advantage. These findings support the study by Pai *et al.* [18] that has shown the importance of focusing on attributes most valued by customers to enhance overall service quality and customer satisfaction. By identifying and improving attributes of high importance to customers, service providers can increase customer loyalty and gain a competitive edge.

3.4. Proposed improvements based on key attributes on SIPA-Modified Kano

Based on the analysis of the SIPA-Modified Kano (Table 9), the study identified attribute A11 as the "key improving attribute" that requires immediate attention from Company X. Improving service attributes is critical for companies to maintain competitiveness in today's highly dynamic and demanding market environment. As demonstrated in the previous section, the SIPA-modified Kano model can identify key service attributes that companies must prioritize in their improvement initiatives. In this study, the "wide network performance, smooth and no interference" attribute (A11) emerged as the key improving attribute that requires immediate attention from Company X.

Therefore, attribute "wide network performance, smooth, and no interference" (A11) must immediately get the company's attention. Two suggestions are proposed to improve the attributes. First, providing technical training to technician operators can enhance their skills in dealing with disruptions and ensure a reliable internet connection. Second, Company X must maintain adequate infrastructure to achieve a good demographic reach, especially given the disruptions caused by Optical Distribution Cabinet (ODC) and Optical Distribution Point (ODP). Furthermore,

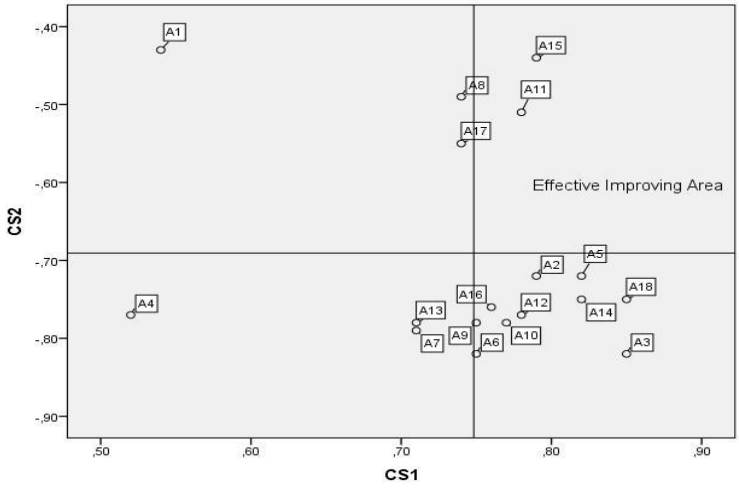

Fig. 2. Modified Kano CS grid

Table 9. Key attributes based on SIPA-Modified Kano

Code	SIPA		Modified Kano				Key improving attribute
	SIPA category	Priority improving attribute	Modified Kano category	CS1	CS2	Effective improving area	
A1	False Competition	X	I	0.54	-0.43	x	
A2	False Competition	X	O	0.79	-0.72	x	
A3	Competitive Disadvantage	√	O	0.85	-0.82	x	
A4	Competitive Disadvantage	√	M	0.52	-0.77	x	
A5	Competitive Disadvantage	√	O	0.82	-0.72	x	
A6	False Alarm	x	O	0.75	-0.82	x	
A7	Competitive Disadvantage	√	O	0.71	-0.79	x	
A8	Competitive Disadvantage	√	A	0.74	-0.49	x	
A9	Competitive Disadvantage	√	O	0.75	-0.78	x	
A10	Competitive Disadvantage	√	O	0.77	-0.78	x	
A11	Competitive Disadvantage	√	A	0.78	-0.51	√	Yes
A12	False Alarm	x	O	0.78	-0.77	x	
A13	False Alarm	x	O	0.71	-0.78	x	
A14	False Alarm	x	O	0.82	-0.75	x	
A15	False Alarm	x	A	0.79	-0.44	√	
A16	False Competition	x	O	0.76	-0.76	x	
A17	Competitive Disadvantage	√	A	0.74	-0.55	x	
A18	False Alarm	x	O	0.85	-0.75	x	

disconnected cables on the customer line are challenging to repair due to the large number of cables on the poles, stuck on the roofs of houses or constrained by trees. These improvements are critical to ensuring customer satisfaction and maintaining a competitive edge in the market. It is also relevant to the research by Pérez and Rodríguez [58], in which the company's responsibility is always to strive to provide the best quality to avoid customer complaints

4. CONCLUSION

This research proposed the integration of SIPA and modified Kano to analyze service quality and provide suggestions for improvements to telecommunication Company X in one of the cities in Indonesia. By integrating the two methods, it is obtained that "Wide network performance, smooth and no troubles" is a key improving attribute. This attribute must be prioritized for improvement. However, the company's average performance, with a value of 3.66, is still lower than the average performance of its competitors, with a value of 4.26. This study has several strengths, including using the SIPA method for performance comparison and modified Kano for broader customer satisfaction analysis. These methods could help the company to evaluate better and enhance its performance.

The research conducted in this study has encountered a few limitations that should be considered. One such limitation is the limited number of respondents from a single geographic area, which may not accurately represent the opinions and preferences of consumers in other regions. Additionally, comparing only one competitor may not comprehensively understand the industry's market dynamics and competitive landscape. Therefore, caution should be exercised when extrapolating the results to other contexts or making generalizations based solely on the data collected in this study.

The current study has provided valuable insights into the topic under investigation. Nevertheless, significant opportunities for future research remain to expand upon these findings and address the limitations identified within this study. One important direction for future research would be to use larger sample sizes to improve the generalizability of the results. Furthermore, adopting fuzzy sets and numbers to augment the precision of calculation outcomes emerges as a promising avenue. Integrating fuzzy sets and numbers in future studies would facilitate the

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capture of inherent uncertainties and imprecisions intrinsic to human judgments, thus enabling a more accurate representation of subjective evaluations. Also, adding a technical requirement and market position identification by employing a concurrent engineering method such as QFD could be added as a future expansion for this study.

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