Analysis of Satisfaction Level of Service Users of PDAM Surya Sembada Surabaya

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***Abstract:** PDAM Surya Sembada Surabaya is the only company that manages drinking water in Surabaya. However, in practice, there are still deficiencies in the PDAM services. It can cause a lack of satisfaction from PDAM customers. Therefore, this study aims to analyze the satisfaction level of PDAM service customers and determine the priority strategies that must be carried out by the PDAM. The methods used in this research are Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA). Samples were taken directly from 125 respondents who are PDAM customers. The results showed that the CSI value was 87.3% which means that the customers of PDAM Surya Sembada are very satisfied with the service. Then the IPA analysis showed that ten attributes are in Quadrant I, two attributes in Quadrant II, seven attributes in Quadrant III, and five attributes in Quadrant IV.*

***Keywords:** PDAM Surya Sembada Surabaya, Customer Satisfaction Index (CSI), Importance Performance Analysis (IPA)*

1. Introduction

Water is an essential substance for everyday life. Every activity in life needs water. Along with increasing population growth, development progress, and human living standards, the need for air will also increase. Need clean air to fulfill these needs. One of the companies that satisfy the daily requirements of clean water is the Regional Drinking Water Company (PDAM). PDAM Surya Sembada Surabaya is the only company that manages drinking water in the City of Surabaya. The need for clean water for the community, both for households and industry, in Surabaya is held and managed by PDAM Surya Sembada. However, in practice, there are still areas for improvement compared to PDAM Surya Sembada. Many people still complain about the unfulfilled needs related to the distribution of water from PDAM Surya Sembada. Apart from water distribution, another problem is related to water containing dirt in the form of tiny particles that make the water cloudy. In addition, more often, the water that comes out is brown-black, causing discomfort in using water and with the quality of the water, which can have an impact on health if allowed to continue (Hakim, 2022). With complaints from PDAM service users, PDAM Surya Sembada must improve service quality by resolving complaints submitted by PDAM service users. Service quality is of quality if the service can satisfy the community. This can be seen from the 5 dimensions of service quality itself, namely the Tangible Dimension, the Reliability Dimension, the Responsiveness Dimension, the Assurance Dimension, and the Empathy Dimension (Yarimoglu, 2014).

In analyzing the level of satisfaction of PDAM service users for services at PDAM Surya Sembada Surabaya City, it is carried out using Customer Satisfaction Index (CSI) and Importance Performance Analysis (IPA). The advantage of the IPA method is that this method can describe the attributes of items that affect customer satisfaction. In addition, this method can be characterized using quadrants to make it easier to interpret which attributes need to be improved to maintain consumer satisfaction and which attributes require special attention by a company (Deng, Kuo, & Chen, 2008).

Based on the description of the background described above, in this study aims to to analyze the priority level of criteria that need to be improved for decision-making by PDAM Surya Sembada City of Surabaya after analyzing the level of user satisfaction with the services provided by PDAM Surya Sembada.

2. Literature Review

2.1 PDAM Surya Sembada

PDAM Surya Sembada Surabaya City is a regional company authorized to provide clean water needs for the people of Surabaya City. PDAM Surya Sembada is the only company that manages drinking water in Surabaya (Kuncoro, 2016). PDAM Surya Sembada has various facilities and services including complaint services related to cloudy water, pipe leaks, meter records, complaints of not getting water, and others. PDAM Surya Sembada also provides information related to online billing, new installations, record meters themselves, and others.

2.2 Validity Test

Validity is a test to measure the accuracy of data. The higher the validity of the instrument, the more accurate the measuring instrument is in measuring data. This validity test is important so that the questions given do not produce data that deviates from the intended variable description (Amanda, et al., 2019).

$$r_{xy} = \frac{n \sum_{i=1}^{n}(x_i y_i) - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\sqrt{\{n \sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2\}\{n \sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2\}}}$$
(1)

with :

r_{xy}	: Correlation coefficient for each item
n	: Number of samples
x	: Question item score
y	: Total score of the question
$\sum x$	: Total score of question items
$\sum y$	: Total number of question scores
$\sum x^2$	: Sum of squared scores of question items
$\sum y^2$	: Total squared score of questions

2.3 Reliability Test

Reliability test is an index test that shows the extent to which a measuring device can be trusted or relied upon. In other words, this test is used to show the extent to which the measurement results will remain consistent if carried out twice or more on the same symptoms using the same measuring instrument. A measuring instrument is said to be reliable if it produces the same results even though it is measured many times (Amanda, et al., 2019).

One way to measure the reliability of the questionnaire items is by using Cronbach's Alpha value. The value of Cronbach's Alpha reliability level is shown in Table 1 below.

Table 1. Level of Reliability Coefficient Cronbach's Alpha Value

Cronbach's Alpha Value	Reliability Level
$0.00 \leq r_a < 0.20$	Very Low
$0.20 \leq r_a < 0.40$	Low
$0.40 \leq r_a < 0.60$	Medium or Fair
$0.60 \leq r_a < 0.80$	High
$0.80 \leq r_a < 1.00$	Very High

Source : (Guilford, 1956)

An instrument is declared reliable if the Cronbach's Alpha value is ≥ 0.60. The Cronbach's Alpha reliability coefficient formula can be seen in the following equation.

$$r_\alpha = \frac{k}{(k-1)}\left\{1 - \frac{\sum_{i=1}^{k} \sigma_i^2}{\sigma_t^2}\right\}$$
(2)

with :

r_α	: Cronbach's alpha value
k	: Number of question items
σ_i^2	: Variance of question items
σ_t^2	: Variance of the total score of all questions

2.4 Customer Satisfaction Index (CSI)

Customer Satisfaction Index (CSI) is a method used to determine the level of overall consumer or customer satisfaction by looking at the level of satisfaction of the product or service attributes concerned (Pranata, et al., 2019).

To find the magnitude of the CSI value, the following steps can be taken (Pambudi & Martini, 2017).

1. Determining the Mean Important Score (MIS)

$$MIS_j = \frac{\sum_{i=1}^{n} Y_{ij}}{n}; j = 1,2,\dots,p$$
(3)

With n is the number of respondents and Y_{ij} is the expectation value of the i-th respondent at the j-th attribute.

2. Calculating Weighted Factors (WF)

$$WF_j = \frac{MIS_j}{\sum_{r=1}^{p} MIS_r} \times 100\%$$
(4)

Where p is the p-th attribute of importance.

3. Determining the Mean Satisfaction Score (MSS)

$$MSS_j = \frac{\sum_{i=1}^{n} X_{ij}}{n}; j = 1,2,\dots,p$$
(5)

With n is the number of respondents and X_{ij} is the perception or reality value of the i-th respondent at the j-th attribute.

4. Calculating Weight Score (WS)

$$WS_j = WF_j \times MSS_j$$
(6)

5. Determining the Customer Satisfaction Index (CSI)

$$CSI = \frac{\sum_{j=1}^{p} WS_j}{HS} \times 100\%$$
(7)

With Highest Scale (HS) being the maximum scale used (scale 5).

In general, if the CSI value is above 50%, it can be said that consumers or customers are satisfied. Meanwhile, if the CSI value is below 50%, it can be said that consumers or customers are not satisfied.

The following are the criteria for CSI assessment.

Table 2. Criteria CSI

CSI Value (%)	Criteria CSI
81 – 100	Very Satisfied
66 – 80	Satisfied
51 – 65	Moderately Satisfied
35 – 50	Less Satisfied
0 – 34	Not Satisfied

2.5 Importance Performance Analysis (IPA)

IPA is a technique used to identify the attributes of a product or service that are most needed. The IPA method has the primary function of displaying

information related to service attributes which, according to customers/consumers, significantly affect the satisfaction of their loyalty. The IPA method also shows information related to service attributes that, according to customers/consumers, need to be improved due to not achieving satisfaction from customers/consumers (Deng, Kuo, & Chen, 2008).

In this study, there are two variables: variable X, which is the level of performance or the fact of customer satisfaction, and variable Y, which is the level of interest or customer expectations. The formula used in calculating the value of the suitability level is as follows:

$$T_{ki} = \frac{\sum_{i=1}^{k} X_i}{\sum_{i=1}^{k} Y_i} \times 100\% \qquad (8)$$

with :

T_{ki} : Compatibility level
X_i : Performance appraisal score (reality)
Y_i : Importance rating score (expectation)
k : Number of question items

After measuring the level of conformity, then the average level of performance or reality (X) and the level of importance or expectation (Y) for each factor that influences customer satisfaction are calculated with the following formula:

$$\bar{X}_I = \frac{\sum_{j=1}^{n} X_{ij}}{n} \; ; i = 1,2,\dots,k \qquad (9)$$

$$\bar{Y}_I = \frac{\sum_{j=1}^{n} Y_{ij}}{n} \; ; i = 1,2,\dots,k \qquad (10)$$

with :

$\bar{X}_I$: Average score of performance/reality level
$\bar{Y}_I$: Average score of importance/expectation level

The next stage maps the importance-performance position shown in a four-quadrant, two-line, perpendicularly intersecting Cartesian figure $(\bar{\bar{X}}, \bar{\bar{Y}})$. The following formula is employed:

$$\bar{\bar{X}} = \frac{\sum_{i=1}^{k} \bar{X}_I}{n} \; ; i = 1,2,\dots,k \qquad (11)$$

$$\bar{\bar{Y}} = \frac{\sum_{i=1}^{k} \bar{Y}_I}{n} \; ; i = 1,2,\dots,k \qquad (12)$$

with :

$\bar{\bar{X}}$: The average of average performance level scores for all qualities
$\bar{\bar{Y}}$: The average of the average importance scores for all qualities
k : Numerous factors influence satisfaction

The last stage is the translation of each attribute into a Cartesian diagram which is divided into four quadrants as follows.
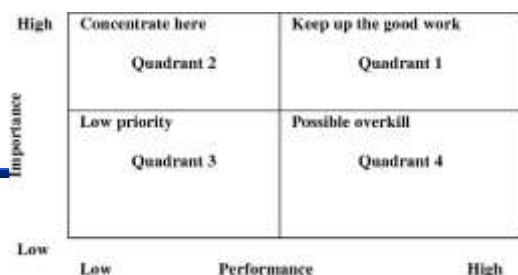

Figure 1. Importance Performance Analysis Quadrant

The Importance Performance Analysis quadrant is interpreted as follows (Deng, Kuo, & Chen, 2008).

1. Quadrant I (Keep Up The Good Work)
   In this quadrant, there are attributes that are considered essential and are expected to support attributes for consumer satisfaction. Because of this, the company is obliged to maintain these performance achievements.
2. Quadrant II (Concentrate Here)
   In this quadrant, there are attributes that are considered essential or expected by consumers. However, the performance of the company is still regarded as unsatisfactory, so the company needs to concentrate on concentrating its resources to improve the performance of the attributes included in this quadrant.
3. Quadrant III (Low Priority)
   In this quadrant, there are attributes that are considered to have a low level of perception or level of performance (not too important) and are not highly expected by consumers. Because of this, the company does not need to prioritize or pay more attention to the attributes included in this quadrant.
4. Quadrant IV (Possibly Overkill)
   In this quadrant, there are attributes that are considered not too important and are not considered by the company. Because of this, the company should allocate more resources related to these attributes to other attributes that have a higher priority level.

3. Methodology

3.1 Data

The data source used in this study is primary data obtained from a survey of PDAM Surya Sembada service users in Surabaya City.

3.2 Data Collection Techniques

The data collection technique in this study uses purposive sampling technique, namely the selection of respondents with certain objectives and considerations. In this study, the target population to be selected is the people who use the services of PDAM Surya Sembada Surabaya City. The sample taken is respondents who are purposely selected to fill out a research questionnaire with the criteria that respondents are native Surabaya people or reside in Surabaya for at least 10 years and users of PDAM

Surya Sembada Surabaya City services and are at least 17 years old.

Determination of the number of samples in this study is as follows.

$$n = \frac{(1,96)^2 . 0,5(0,5)}{(0,09)^2} = 118,57 \approx 119$$

Based on the above calculations, the minimum sample size required in this study was 119 respondents.

3.3 Research Variable

Table 3. Satisfaction Variable

No.	Dimensions	Attribute	Information
1	Tangible	$Z_{1.1}$	Water flows 24 hours smoothly
2		$Z_{1.2}$	Water meter accuracy
3		$Z_{1.3}$	Water quality does not smell of chlorine
4		$Z_{1.4}$	Water quality is colorless or not cloudy
5		$Z_{1.5}$	The water pipes used are of good quality
6	Reliability	$Z_{2.1}$	The procedure for installing PDAM water connections according to the set time
7		$Z_{2.2}$	Officers record the water meter correctly and accurately
8		$Z_{2.3}$	There is information or instructions that are easy to understand both offline and online regarding services at PDAM
9		$Z_{2.4}$	The amount of payment is by the use of water used
10		$Z_{2.5}$	Repairs related to damage or leakage of water meters or water pipes according to a set schedule
11.	Responsiveness	$Z_{3.1}$	Responsiveness of officers in serving customers quickly and precisely
12.		$Z_{3.2}$	Responsiveness of officers in answering or responding to customer complaints
13.		$Z_{3.3}$	Responsiveness of officers in responding to all forms of criticism or suggestions from customers either directly or through other services (websites and applications)
14.		$Z_{3.4}$	If there is a problem in the field, the officer immediately informs the customer
15.		$Z_{3.5}$	Responsiveness of officers in helping the flow of service to customers
16.	Assurance	$Z_{4.1}$	Officers manage all information related to services provided to customers
17.		$Z_{4.2}$	Water bill according to usage
18.		$Z_{4.3}$	If there is an increase in tariffs, the company conducts outreach to the public
19.		$Z_{4.4}$	Documents that you submit as a requirement for service implementation are guaranteed security
20.		$Z_{4.5}$	Officers are polite to customers when serving
21.	Emphaty	$Z_{5.1}$	Officers appreciate if there are suggestions and criticisms from customers

No.	Dimensions	Attribute	Information
22.		$Z_{5.2}$	There is a friendly attitude (good relations and no problems) between officers and customers
23.		$Z_{5.3}$	Officers care about the problems faced by customers
24.		$Z_{5.4}$	Service to customers who do not distinguish social status

4. Results

4.1 Validity Test

a. Tangible Dimension
Table 4. Validity Test on the Dimensions of Tangible

Attribute	P-value	Decision	Conclusion
$Z_{1.1}$	0,000	Reject H_0	Valid
$Z_{1.2}$	0,000	Reject H_0	Valid
$Z_{1.3}$	0,000	Reject H_0	Valid
$Z_{1.4}$	0,000	Reject H_0	Valid
$Z_{1.5}$	0,000	Reject H_0	Valid

Based on **Table 4**, the results of the validity test of the tangible dimension variable obtained all question attributes have a p-value smaller than $\alpha = 0,05$ so the decision to reject H_0. Because of this, it can be concluded that there is a correlation between the question items and the total question so that all question items for the tangible dimension variable on the questionnaire are valid.

b. Reliability Dimension
Table 5. Validity Test on the Dimensions of Reliability

Attribute	P-value	Decision	Conclusion
$Z_{2.1}$	0,000	Reject H_0	Valid
$Z_{2.2}$	0,000	Reject H_0	Valid
$Z_{2.3}$	0,000	Reject H_0	Valid
$Z_{2.4}$	0,000	Reject H_0	Valid
$Z_{2.5}$	0,000	Reject H_0	Valid

Based on **Table 5**, the results of the validity test of the reliability dimension variable obtained all question attributes have a p-value smaller than $\alpha = 0,05$ so the decision to reject H_0. Because of this, it can be concluded that there is a correlation between the question items and the total question so that all question items for the reliability dimension variable on the questionnaire are valid.

c. Responsiveness Dimension
Table 6. Validity Test on the Dimensions of Responsiveness

Attribute	P-value	Decision	Conclusion
$Z_{3.1}$	0,000	Reject H_0	Valid
$Z_{3.2}$	0,000	Reject H_0	Valid
$Z_{3.3}$	0,000	Reject H_0	Valid
$Z_{3.4}$	0,000	Reject H_0	Valid
$Z_{3.5}$	0,000	Reject H_0	Valid

Based on **Table 6**, the results of the validity test of the responsiveness dimension variable obtained all question attributes have a p-value smaller than $\alpha = 0,05$ so the decision to reject H_0. Because of this, it can be concluded that there is a correlation between the question items and the total question so that all question items for the responsiveness dimension variable on the questionnaire are valid.

d. Assurance Dimension
Table 7. Validity Test on the Dimensions of Assurance

Attribute	P-value	Decision	Conclusion
$Z_{4.1}$	0,000	Reject H_0	Valid
$Z_{4.2}$	0,000	Reject H_0	Valid
$Z_{4.3}$	0,000	Reject H_0	Valid
$Z_{4.4}$	0,000	Reject H_0	Valid
$Z_{4.5}$	0,000	Reject H_0	Valid

Based on **Table 7**, the results of the validity test of the assurance dimension variable obtained all question attributes have a p-value smaller than $\alpha = 0,05$ so the decision to reject H_0. Because of this, it can be concluded that there is a correlation between the question items and the total question so that all question items for the assurance dimension variable on the questionnaire are valid.

e. Emphaty Dimension
Table 8. Validity Test on the Dimensions of Emphaty

Attribute	P-value	Decision	Conclusion
$Z_{5.1}$	0,000	Reject H_0	Valid
$Z_{5.2}$	0,000	Reject H_0	Valid
$Z_{5.3}$	0,000	Reject H_0	Valid
$Z_{5.4}$	0,000	Reject H_0	Valid

Based on **Table 8**, the results of the validity test of the emphaty dimension variable obtained all question attributes have a p-value smaller than $\alpha = 0,05$ so the decision to reject H_0. Because of this, it can be concluded that there is a correlation between the question items and the total question so that all question items for the emphaty dimension variable on the questionnaire are valid.

4.2 Reliability Test
Table 9. Reliability Test

No.	Variable	Cronbach's alpha	Conclusion

1.	Tangible	0,743	High reliability	
2.	Reliability	0,854	Very high reliability	
3.	Responsiveness	0,910	Very high reliability	
4.	Assurance	0,742	High reliability	
5.	Emphaty	0,818	Very high reliability	

Based on **Table 9,** it can be seen that the results of the analysis with Cronbach's Alpha values for the reliability dimension, responsiveness dimension, and empathy dimensions have very high reliability with Cronbach's Alpha values between 0.8 to 0.9. Meanwhile, the tangible dimension and assurance dimensions have high reliability. Thus, it means that someone's answer to the question is consistent and stable from time to time.

4.3 Customer Satisfaction Index (CSI)

Customer Satisfaction Index measurement is carried out to determine the user satisfaction index and become a reference in the formation of specific strategies to maintain and improve service satisfaction of PDAM Surya Sembada Surabaya City. The following are the results of the calculation of the Customer Satisfaction Index (CSI).

Table 10. CSI calculation

Atribute	MIS_j	WF_j	MSS_j	WS_j
$Z_{1.1}$	4,8872	4,240402	4,2432	17,99287
$Z_{1.2}$	4,8392	4,198754	4,4376	18,63239
$Z_{1.3}$	4,8688	4,224437	4,4424	18,76664
$Z_{1.4}$	4,8968	4,248731	4,1	17,4198
$Z_{1.5}$	4,836	4,195978	4,372	18,34481
$Z_{2.1}$	4,804	4,168213	4,3696	18,21342
$Z_{2.2}$	4,8712	4,226519	4,4368	18,75222
$Z_{2.3}$	4,7272	4,101577	4,2552	17,45303
$Z_{2.4}$	4,8792	4,23346	4,4656	18,90494
$Z_{2.5}$	4,796	4,161272	4,3016	17,90013
$Z_{3.1}$	4,7728	4,141142	4,3488	18,009
$Z_{3.2}$	4,7856	4,152248	4,3648	18,12373
$Z_{3.3}$	4,7232	4,098106	4,312	17,67103
$Z_{3.4}$	4,82	4,182095	4,368	18,26739
$Z_{3.5}$	4,7696	4,138365	4,3616	18,04989
$Z_{4.1}$	4,7104	4,087	4,324	17,67219
$Z_{4.2}$	4,8512	4,209166	4,4424	18,6988
$Z_{4.3}$	4,64	4,025917	4,044	16,28081
$Z_{4.4}$	4,8472	4,205695	4,4968	18,91217
$Z_{4.5}$	4,8536	4,211248	4,5496	19,1595
$Z_{5.1}$	4,788	4,15433	4,4096	18,31894
$Z_{5.2}$	4,754032	4,124858	4,4016	18,15598
$Z_{5.3}$	4,7544	4,125177	4,4512	18,36199
$Z_{5.4}$	4,7776	4,145307	4,4488	18,44164

Atribute	MIS_j	WF_j	MSS_j	WS_j
CSI Value				$\dfrac{436,50335}{5}$ $= 87,3\%$

Based on **Table 10**, the results of the CSI calculation obtained a value of 87.3%. This value is in the interval value "81-100". This means that the community of service users of PDAM Surya Sembada Surabaya City is very satisfied with the service at PDAM Surya Sembada as a whole. However, even though it has received a very good CSI value, PDAM Surya Sembada Surabaya City needs to improve and maintain the quality of service in PDAM Surya Sembada Surabaya City.

4.4 Importance Performance Analysis (IPA)

IPA is a technique used to identify the attributes of a product or service that are most needed. This IPA method analyzes by comparing the performance or reality that consumers can feel compared to the expected level of satisfaction.
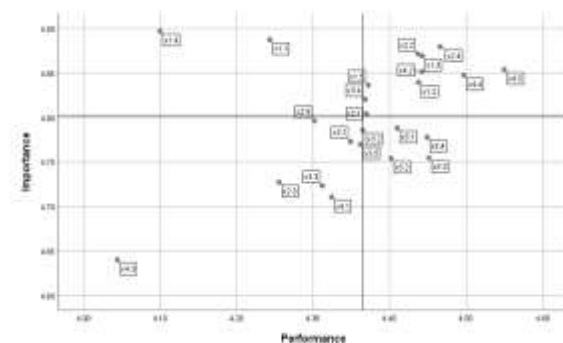

Figure 2 Importance Performance Analysis 5 Dimensions

Based on **Figure 2,** the attributes included in quadrant I are superior service attributes, so they need to be maintained, namely attributes are water meter accuracy ($Z_{1.2}$), water quality does not smell of chlorine ($Z_{1.3}$), the water pipes used are of good quality ($Z_{1.5}$), the procedure for installing PDAM water connections according to the set time ($Z_{2.1}$), officers record the water meter correctly and accurately ($Z_{2.2}$), the amount of payment is by the use of water used ($Z_{2.4}$), if there is a problem in the field, the officer immediately informs the customer ($Z_{3.4}$), water bill according to usage ($Z_{4.2}$), documents that you submit as a requirement for service implementation are guaranteed security ($Z_{4.4}$), and officers are polite to customers when serving ($Z_{4.5}$).

In quadrant II there are service attributes that are a top priority for improvement, namely attributes are water flows 24 hours smoothly ($Z_{1.1}$) and water quality is colorless or not cloudy ($Z_{1.4}$). In quadrant III there are service attributes that are not considered and have low service quality, namely attributes are there is

information or instructions that are easy to understand both offline and online regarding services at PDAM ($Z_{2.3}$), repairs related to damage or leakage of water meters or water pipes according to a set schedule ($Z_{2.5}$), responsiveness of officers in serving customers quickly and precisely ($Z_{3.1}$), responsiveness of officers in responding to all forms of criticism or suggestions from customers either directly or through other services (websites and applications) ($Z_{3.3}$), responsiveness of officers in helping the flow of service to customers ($Z_{3.5}$), officers manage all information related to services provided to customers ($Z_{4.1}$), and if there is an increase in tariffs, the company conducts outreach to the public ($Z_{4.3}$). In quadrant IV there are service attributes that are considered less important but have satisfactory service quality, namely attributes are responsiveness of officers in answering or responding to customer ($Z_{3.2}$), officers appreciate if there are suggestions and criticisms from customers ($Z_{5.1}$), there is a friendly attitude (good relations and no problems) between officers and customers ($Z_{5.2}$), officers care about the problems faced by customers ($Z_{5.3}$), and service to customers who do not distinguish social status ($Z_{5.4}$).

5. Conlusion

The results showed that the CSI value was 87.3% which means that the customers of PDAM Surya Sembada are very satisfied with the service. Then the IPA analysis showed that ten attributes are in Quadrant I, two attributes in Quadrant II, seven attributes in Quadrant III, and five attributes in Quadrant IV.

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