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Positioning Analysis of Automotive Mold & Dies Industry Business Using Multidimensional Scaling Method in PT. Duta Panitra Serco

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Abstract

This research is an analysis of the positioning of PT. Duta Panitra Serco by identifying market opportunities in the automotive Mold & Dies manufacturing industry. Companies that become respondents are in areas in Cikarang, Purwakarta, Karawang and Bandung. Determining the potential market by forecasting demand. Importance Factor Analysis uses factor analysis with the help of SPSS software. The results of the factor analysis contained 5 attributes, namely Mold & Dies Quality, Service Quality, Affordable Product Prices, Output Capability, Product & Company Value Added. Positioning Companies using the Multidimensional Scaling Scale (MDS). Based on the results of data processing, it was concluded that PT. Duta Panitra Serco can occupy quadrant 4, which is the quadrant in line with the factors 1,2 & 3 to compete in the market so that they can dominate the existing market. In this market the company will experience a little competition with PT. Wafiq Mitra Teknik because currently PT. Wafiq Teknik Partners have started to enter quadrant 4.

Keywords: Positioning, Factor Analysis, Multidimensional Scaling.

1. Introduction

The Mold & Dies industry in Indonesia has only developed since the 1980s, so that its production technology experience is far behind compared to other countries such as Japan, South Korea, Taiwan and even other countries in ASEAN. There are 3 types of Mold & Dies industries, namely the Mold & Dies user industry, the Mold & Dies manufacturer industry, and the industry providing raw materials for the manufacture of Mold & Dies. The three types of industries are mutually sustainable and need each other.

According to data from the Directorate General of Metal, Machinery, Transportation & Electronics (ILMATE) Ministry of Industry (2014), the largest import value of ILMATE from 2009 to 2013 was the Electronics and Telematics Industry (IET) and the Land Transportation Equipment Industry (IATD, the Mold & Dies industry). which dominates the import value in Indonesia.

The amount of ILMATE import value which tends to increase, shows the absence of local industries that are able to meet the existing demand, because currently Mold & Dies production is still produced by large-scale companies, resulting in relatively low supply localization. On the other hand, the technological capabilities of Mold & Dies producing companies are still limited and still inferior to other countries, causing these user companies to import. The high import value will increase the value of the product due to high production costs.

Seeing these conditions, PT. Duta Panitra Serco, a company engaged in building construction and metal forming, wants to expand its business by planning to build a business in the Mold & Dies

manufacturing industry to meet the increasing demand for Mold & Dies products, of course by producing Mold & Dies products. Dies that have the best quality and are not inferior to Mold & Dies imported from other countries or from domestic producers that already exist today. However, in developing this business, PT. Duta Panitra Serco wants to take advantage of the facilities already owned by the company because the facilities they currently have are deemed appropriate to produce Mold & Dies, so that the company does not need to re-invest in fulfilling machine needs.

Judging from the capabilities of the facilities owned by the company and the large percentage of the number of imports for the types of Molds & Dies obtained, the types of Molds & Dies that can be made by the company are for the Automotive industry. To realize its desire in the Mold & Dies industry, the company needs to identify whether the business opportunity really exists and to find out what the most important attributes are judged by Mold & Dies users in deciding to purchase Mold & Dies products, so that the company can determine the right positioning to build this new business and later be able to compete with existing Mold & Dies industries through products that have high quality, namely in accordance with market desires. So the purpose of this research is to analyze market opportunities in the mold & dies manufacturing industry in the automotive industry so that it can determine the right positioning for PT. Duta Panitra Serco.

2. Methodology

Forecasting

Forecasting is an attempt to predict future conditions through examining past conditions (Hyndman & Athanasopoulos [1]). In social life, everything is very uncertain, difficult to predict with accuracy, it is necessary to predict. Forecasting aims to get a forecast that can minimize forecasting errors which are usually measured by Mean Squared Error, Mean Absolute Error, and so on.

Posisitioning

According to Kotler and Keller [2] Positioning is the act of designing a company's offering so that it occupies different values and is placed in the minds of target customers. That is, looking for a "position" in the market, this step is done after determining the segmentation strategy used. In other words, positioning is an action or steps from the producer to design the company's image and value offering where consumers in a certain segment understand and appreciate what a certain segment is doing, understand and appreciate what a company is doing, compared to its competitors. Positioning plays a very big role in marketing strategy, after conducting market analysis and competitor analysis in an internal company analysis.

Validity and Reliability

According to Sugiyono in Pardiyono [3] the validity test is done using the scale reliability method. The validity of the statement / question items can be seen from the corrected item total-correlation figures. The correlation number obtained is then compared with the critical number r = 0.3, if the correlation number is higher than the critical number in the table, then the item is considered valid. 2) Test the validity of the instrument using the Spearman Rho correlation. The question / statement item is declared valid if the r-count value (> 0.5) with two-sided significance testing is (<0.05). According to Ghozali in Pardiyono and Indrayani [4] states that reliability is a tool for measuring a questionnaire which is an indicator of variables or constructs. A questionnaire is said to be reliable or reliable if a person's answer to a statement is consistent or stable over time. The method commonly used for reliability testing is Alpha Cronbach. General agreement was that reliability was considered satisfactory if ≥ 0.700

Factor Analysis

Factor analysis is used to reduce the manifest variables to latent variables which are less in number but can represent as many of the existing manifest variables as possible (Gozali in Pardiyono and Nugrahati [5]). The stages in the factor analysis that must be carried out are 1) Compilation of the Raw Data Matrix, 2) Compiling the Correlation Matrix, 3) Modeling Feasibility Testing, 4) Calculating Eigenvalues and Eigenvectors, 5) Factor Extraction, 6) Factor Rotation and 7) Factor Weighting

Multidimensional Scaling

According to Cox & Cox [6] Multidimensional scaling is a method in multivariate analysis which is used to present proximities or differences between objects on a map. The basic concept of MDS is to determine the position coordinates for each object in a geometric map, so that the distance between these objects will match the proximity value based on the input data. This geometric map is called spatial maping and the coordinates of the position for each object in the spatial map are called scale values. In spatial mapping, research objects are represented as points. Points placed on a map will produce the distance between each pair of objects. The distance between one point and another illustrates the similarity or difference between objects from one another. Two similar objects are indicated by two points that are close to each other, and two relatively different objects are indicated by two points that tend to be far from each other.

3. Result and Discussion

Data collection was carried out using a questionnaire with the respondents being companies that produce automotive components using molds & dies. Respondent companies are in areas in Cikarang, Purwakarta, Karawang and Bandung. The research variables used in the questionnaire to determine consumer opinions and assessments are as follows:

Table 1. Questionnaire Research Variables

Variable	Manifest variable (indicator) stated in question number
Mold & Dies Precision Level	1. The resulting product has a small tolerance
Completeness of Facilities Provided	2. All mold components are complete and in accordance 3. The size of the mold is in accordance with the machine to be used 4. The size of the mold is not too far from the basic size of the object to be formed
Human Resources Owned Good / Competent	5. The technology owned by the company is good / sophisticated 6. Resources owned by competent companies
Product Quality Assurance	7. All parts of the mold are strong, including the supporting components 8. The resulting mold output is large 9. The suitability of the selection of mold raw materials with the product to be printed
Ease of Maintenance (Maintanance)	10. Easy if necessary repairs 11. The components needed are not too many
Price (Cheap & Affordable)	12. Prices can compete with other companies 13. The price offered is not too expensive 14. The price offered is in accordance with the quality given
Speed of Manufacture to Delivery (Delivery)	15. Fast manufacturing process 16. Delivery of mold on time 17. Easy ordering process

Variable	Manifest variable (indicator) stated in question number
	18. Good ordering service

Reliability and Validity Testing

The coefficient of measuring instrument shows the level of consistency of the respondent's answer. Validity testing produces values above 0.5 which means valid. The legitimacy of the measuring instrument in this study uses Cronbach alpha. Based on tests that have been carried out using SPSS software, the following reliability values are obtained:

Table 2. Reliability Statistics

Cronbach's Alpha	N of Items
.730	18

With an alpha coefficient of 0.730, the reliability of the measuring instrument in this study is acceptable. This is in accordance with what Ghozali put forward in Pardiyono and Indrayani [4] if the variable r-count value is greater than the r-table then the questionnaire is declared reliable.

Determination of Potential Markets

How to determine the potential market by forecasting demand. The forecasting process is carried out to see the size of the existing market opportunities, where past data are obtained from trade balance data between exports and imports of mold products. A negative trade balance shows that the value of imports is greater than exports, which means that many companies import mold (not fulfilled by the Indonesian market). Based on the forecasting process, here are the forecast results for each type of mold:

Table 3. Results of Mold & Dies Demand Forecasting

No	Types of Molds & Dies	Forecasting Trade Balance					Average
		2015	2016	2017	2018	2019	
1	Moulds for glass	-3108	-2750	-2392	-2034	-1676	-2392
2	Boxes, moulding, for metal foundry	-13531	-13531	-13531	-13531	-13531	-13531
3	Moulds for rubber or plastics, nes	-14270	-14992	-15712	-16436	-17158	-15714
4	Moulds, injection or compression types, for metal or metal carbides	-27273	-30036	-32780	-35561	-38323	-32795
5	Moulds for metal or metal carbides, nes	-39328	-42875	-46423	-49971	-53518	-46423
6	Moulds for mineral materials	-51125	-59541	-67956	-76372	-84788	-67957
7	Bases, mould	-42919	-47692	-52465	-57238	-62012	-52466
8	Patterns, moulding	-65334	-75513	-85693	-95872	-106052	-85693
9	Moulds, injection or compression types, for rubber or plastics	-199680	-224157	-248634	-273111	-297589	-248635

Based on the forecasting data above, there are 3 types of molds which have a significant increase in imports each year where the annual increase exceeds 10%. Thus the company will focus on making the 3 types of molds. Based on data from the Directorate General of the Ministry of Industry, there is data on the increase in the import value of mold & dies for each type of industry which says that for

the Land Transportation Equipment Industry, the import value is 29.91%. contributed by IATD. So that the size of the market that is formed is as follows:

Market size = (67,957 + 85,693 + 248,635) x 29.91% = 120,323.44 Units / Year = 120,323 Units / Year

Determination of potential markets based on the results of the questionnaire, 69.33% of respondents are free to choose vendors, so the size of the potential market is:

Potential Market = 120,323 Units / Year x 69.33% = 83,423, 947 Units / Year = 83,423 Units / Year

Available Market based on the results of the questionnaire is 53.85%, so the size of the available market is:

Available Market = 83,423 Units / Year x 53.85% = 44,920,077 Units / Year = 44,920 Units / Year

Target Market Based on the answers to the questionnaire part I no. 3 who answered very interested and interested. Based on the results of the questionnaire, it is 25% and can be said to be the size of the market share, so the size of the target market is:

Target Market = 44,920 Units / Year x 25% = 11,230 Units / Year

By looking at the size of the target market that has been formed, this proves that there is so much potential for the company to enter the mold & dies manufacturing business. Based on the capacity owned by the company, the size of the market that the company is able to fulfill is:

Markets filled = (192 Units / Year ÷ 11,230 Units / Year) x 100 = 1.7% to meet the market in Indonesia

Interest Level Factor Analysis

At this stage it will be seen whether the results of data collection are sufficient for data processing (Keizer Mayer Ollkin test) and multicolinearity testing between variables is carried out as one of the conditions for factor analysis because the variables to be analyzed must have a correlation with other variables (Bartlet Test of Sphericity). Based on data processing, the KMO Bartlet Test values were obtained as follows:

Table 4. Test Results 3

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.678
Bartlett's Test of Sphericity	Approx. Chi-Square	283.021
	Df	120
	Sig.	.000

The significance value on the Bartlet Test of Sphericity shows the sig 0.00 and KMO 0.678, this indicates that there is multicollinearity between variables, so that factor analysis can be carried out.

After knowing the average and standard deviation of each variable, the correlation between these variables can be calculated. If there are variables that have no relationship, then factor extraction cannot be done. Besides being able to be seen from the anti image matrix, the correlation can also be seen from the correlation matrix presented by the results of data processing using SPSS. The correlation value (r) ranges from -1 to +1, if the value of r = 0 then the variable has no correlation. For r = +1 it shows that between variables have perfect correlation in the same direction, while r = -1 shows that between variables have perfect correlation in the opposite direction. The following is the correlation matrix generated from the variables used:

Table 5. Correlation Matrix Between Variables

Correlation Matrix																	
		p1	p2	p3	p5	p6	p8	p9	p10	p11	p12	p13	p14	p15	p16	p17	p18
Correlation	p1	1.000	.267	.300	.265	.515	.097	.494	.448	.135	-.077	-.111	-.012	.000	.224	.125	-.035
	p2	.267	1.000	.133	-.010	.225	.165	.299	.120	.010	.048	.017	-.021	.079	.186	.031	.010
	p3	.300	.133	1.000	.224	.328	-.034	.202	.387	.014	-.026	.140	.032	.139	.255	.217	.133
	p5	.265	-.010	.224	1.000	.356	.240	.146	.163	-.054	-.185	-.143	-.114	.194	.147	.235	-.012
	p6	.515	.225	.328	.356	1.000	.180	.528	.450	.155	.192	.139	.266	.322	.356	.374	.199
	p8	.097	.165	-.034	.240	.180	1.000	.142	.080	.032	.060	-.066	-.020	.326	.205	.131	-.039
	p9	.494	.299	.202	.146	.528	.142	1.000	.381	.148	.029	-.003	.116	.156	.200	.235	.022
	p10	.448	.120	.387	.163	.450	.080	.381	1.000	.389	.036	.020	.108	.160	.193	.218	.177
	p11	.135	.010	.014	-.054	.155	.032	.148	.389	1.000	.209	.004	.208	-.060	-.035	.056	.287
	p12	-.077	.048	-.026	-.185	.192	.060	.029	.036	.209	1.000	.328	.421	.107	.068	-.082	.249
	p13	-.111	.017	.140	-.143	.139	-.066	-.003	.020	.004	.328	1.000	.289	.031	-.059	.043	.120
	p14	-.012	-.021	.032	-.114	.266	-.020	.116	.108	.208	.421	.289	1.000	.109	.228	-.154	.340
	p15	.000	.079	.139	.194	.322	.326	.156	.160	-.060	.107	.031	.109	1.000	.329	.242	-.060
	p16	.224	.186	.255	.147	.356	.205	.200	.193	-.035	.068	-.059	.228	.329	1.000	.355	.234
	p17	.125	.031	.217	.235	.374	.131	.235	.218	.056	-.082	.043	-.154	.242	.355	1.000	.334
	p18	-.035	.010	.133	-.012	.199	-.039	.022	.177	.287	.249	.120	.340	-.060	.234	.334	1.000

Factor extraction is carried out to determine the result of factor extraction if the rotation process is not carried out. The determination of the factors is based on the criteria for eigenvalues (e)> 1.00. Based on the results of data processing using this factor analysis, namely the factor analysis extracting the manifest variable into 5 factors with a variance value of 60.211% of the total variance, this is seen in the table below:

Table 6. Total Variance Explained Factor Analysis

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.595	22.470	22.470	3.595	22.470	22.470	2.557	15.981	15.981
2	2.105	13.156	35.626	2.105	13.156	35.626	2.089	13.054	29.034
3	1.500	9.374	45.000	1.500	9.374	45.000	2.003	12.520	41.554
4	1.299	8.121	53.121	1.299	8.121	53.121	1.545	9.656	51.210
5	1.134	7.090	60.211	1.134	7.090	60.211	1.440	9.001	60.211
6	.999	6.244	66.455						
7	.877	5.478	71.933						

Total Variance Explained			
……	…..	……	……
15	.301	1.884	98.447
16	.249	1.553	100.000
Extraction Method: Principal Component Analysis.			

After extracting the factor, to get the formed factors, a factor rotation is performed. The results of this grouping can be seen in the following table:

Tabel 7. Rotated Component Matrix (a)

Rotated Component Matrix[a]					
	Component				
	1	2	3	4	5
p1	.804	.110	-.182	-.036	.102
p2	.546	-.137	.102	.190	-.165
p3	.419	.553	.078	-.283	-.190
p5	.210	.433	-.367	.247	-.048
p6	.630	.446	.217	.216	.095
p8	.116	.013	-.078	.789	.059
p9	.736	.099	.029	.136	.098
p10	.585	.303	.004	-.070	.404
p11	.180	-.056	.123	-.032	.831
p12	.013	-.100	.746	.174	.187
p13	.025	.124	.686	-.222	-.261
p14	.072	.024	.734	.090	.230
p15	.087	.326	.147	.644	-.203
p16	.173	.537	.152	.377	-.025
p17	.025	.772	-.127	.132	.116
p18	-.150	.494	.351	-.099	.527

Thus, the manifest variables form the 5 components (factors) as follows:

Table 8. Results of the Formed Factors

Factor	Variable	Weight	Information
F1	p1	0.804	The resulting product has a small tolerance
	p2	0.546	All mold components are complete and in accordance
	p6	0.63	Resources owned by competent companies
	p9	0.736	Suitability of the selection of mold raw materials with the product to be printed

Factor	Variable	Weight	Information
	p10	0.585	Easy if it needs repairs
F2	p3	0.553	Mold size according to the machine to be used
	p5	0.433	The technology that belongs to the company is sophisticated
	p16	0.537	On time mold delivery
	p17	0.772	Easy ordering process
F3	p12	0.746	Prices can compete with other companies
	p13	0.686	The price offered is not too expensive
	p14	0.734	The price offered is in accordance with the quality given
F4	p8	0.789	The resulting mold is large
	p15	0.644	Fast manufacturing process
F5	p11	0.831	The components needed are not too many
	p18	0.527	Good ordering service

Company Positioning

Attribute Perception Analysis uses data that has been reduced to 5 factors, then the average value of each factor is sought and then processed using the Multidimensional Scaling (MDS) Attribute.

Table 9. Average Factor of Each Object

Factor	WMT	IMT	TP	DPT	TAS	MED
Factor 1	9.67	8.01	14.60	10.47	15.28	12.55
Factor 2	11.49	12.60	16.77	13.87	17.51	14.59
Factor 3	6.68	11.25	7.13	12.29	9.37	5.99
Factor 4	5.85	7.91	5.12	6.17	5.79	3.44
Factor 5	7.83	3.64	5.69	7.12	5.03	2.84

The following are the results of the coordinates of the six companies being compared on a potential map:

```
Stimulus Coordinates

                          Dimension
Stimulus    Stimulus      1         2
 Number       Name

    1        WMT          .0482    -.4641
    2        IMT          .1394     .9773
    3        TP         -1.2592    -.3329
    4        DPT         -.2226    1.1532
    5        TAS        -1.4487     .0665
    6        MED         -.7482    -.3236
```

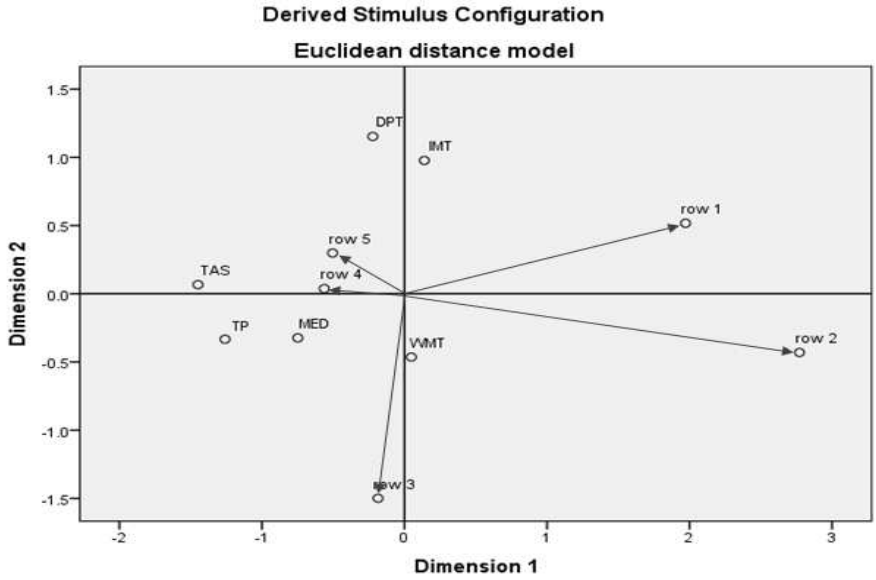

Figure 1. Attribute-Based Perception Map

DPT = PT. Duta Persada Teknik
IMT = PT. Indo Metal Teknik
WMT = PT. Wafiq Mitra Teknik
MED = CV. MED Manufaktur
TP = PT. Trindo Pratama
TAS = PT. Tridaya Artaguna Santara

Row 1 = Quality Vector Molds & Dies
Row 2 = Service Quality Vector
Row 3 = Product Price Vector
Row 4 = Vector Output Capability
Row 5 = Value Added Product & Company Vector

From the picture above, it can be seen that the competition that occurs between companies is compared based on the attributes that are used as an assessment. According to Malhotra, an acceptable model is one that has an RSQ value ≥ 0.6. While the Stress value identifies the proportion of disparity that is not explained by the model, the lower the stress value, the better the resulting model. Based on the results of data processing, the RSQ value is 0.986 and the stress is 0.128, thus the resulting model can be said to be quite good.

Analysis of Non-Attribute Perceptions based on the level of similarity obtained from the questionnaire, data processing was carried out using the multidimensional scaling non-attribute scale method which aims to obtain a map of the position of the six companies. The similarity level data that has been obtained is tabulated into a 6 x 6 matrix without diagonals. Similarity level data for each pair is obtained from the average value of each pair being compared.

```
Raw (unscaled) Data for Subject 1

1          2          3          4          5          6
1       .000
2      1.947       .000
3      3.013      3.093       .000
4      2.560      2.480      4.107       .000
5      4.040      3.800      3.720      4.227       .000
6      1.773      2.813      2.373      3.653      4.227       .000
```

The results of this processing show a stress value of 0.076 which indicates that the resulting model is said to be good, it can also be seen from the RSQ value which shows a fairly large number, namely 0.965. The following is a map of the position generated from this data processing:

Stimulus Coordinates

Stimulus Number	Stimulus Name	Dimension 1	Dimension 2
1	WMT	.7150	.0814
2	DPT	.5006	-.3577
3	TP	-.5363	1.2810
4	IMT	.9765	-1.3371
5	TAS	-2.1215	-.7451
6	MED	.4657	1.0774

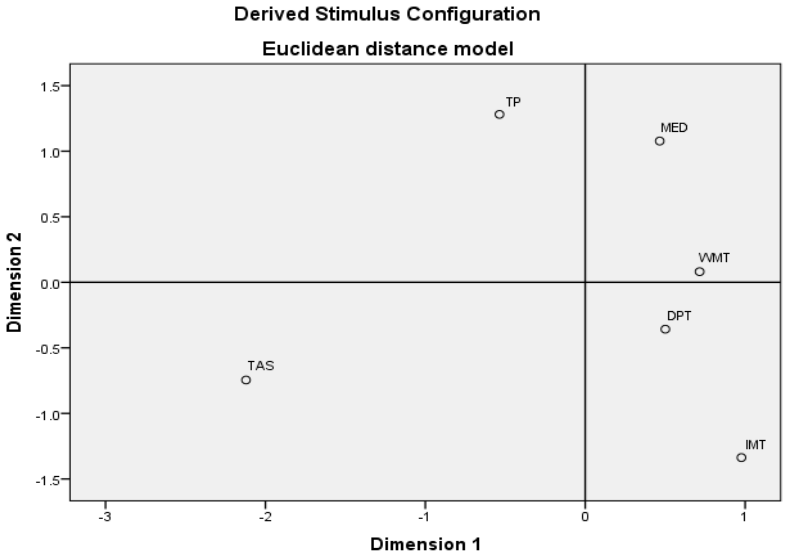

Figure 2. Non-Attribute Based Perception Map

DPT	= PT. Duta Persada Teknik	MED	= CV. MED Manufaktur
IMT	= PT. Indo Metal Teknik	TP	= PT. Trindo Pratama
WMT	= PT. Wafiq Mitra Teknik	TAS	= PT. Tridaya Artaguna Santara

4. Conclusion

The results of the position analysis using the Multidimensional Scaling Attribute, the company rankings for each attribute are obtained as follows, the Quality Attributes of Molds & Dies are PT. Indo Metal Teknik, PT. Duta Persada Teknik, PT. Wafiq Mitra Teknik, CV. MED Manufacturing, PT. Trindo Pratama, PT. Tridaya Artaguna Santara. Service Quality Attributes are PT. Wafiq Mitra Teknik, PT. Indo Metal Teknik, PT. Duta Persada Teknik, CV. MED Manufacturing, PT. Trindo Pratama, PT. Tridaya Artaguna Santara. Product Price Attributes are PT. Wafiq Mitra Teknik, PT. Trindo Pratama, CV. MED Manufacturing, PT. Tridaya Artaguna Santara, PT. Indo Metal Teknik, PT. Duta Persada Teknik. Attributes of Outstanding Ability are PT. Tridaya Artaguna Santara, PT. Trindo Pratama, CV. MED Manufacturing, PT. Duta Persada Teknik, PT. Indo Metal Teknik, PT. Wafiq Engineering Partners. Product and Company Value Added Attributes are PT. Tridaya Artaguna Santara, PT. Duta Persada Teknik, PT. Trindo Pratama, PT. Indo Metal Teknik, CV. MED Manufacturing, PT. Wafiq Engineering Partners.

The results of the position analysis using non-attribute based multidimensional scaling can describe the level of similarity, distance and also the market served based on consumer perceptions. The results obtained are that PT. Indo Metal Teknik and PT. Duta Persada Teknik has a competitive side with the same market share because it can be seen that both are in the same quadrant, this also happens between PT. Wafiq Engineering Partners with CV. MED Manufacturing. PT. Duta Panitra Serco can occupy quadrant 4, which is the quadrant in line with the factors 1,2 & 3 to compete in the market so that they can dominate the existing market. In this market the company will experience a little competition with PT. Wafiq Mitra Teknik because currently PT. Wafiq Engineering Partners have started to enter quadrant 4.

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