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Analysis of Influencing Factors on the Success of Material Recovery Facility Program at Desa Peganden Manyar Gresik

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Abstract:- Material recovery facility program of Desa Peganden, Manyar, Gresik was established in 2016 which planned to serve as much as 600 households out of 1.380. There were still tons of waste being piled up outside the hangar which caused by the lack of society participation on its separation. This study will review on what factor which influence the program the most by using "Factor Analysis Method". The beginning was with question a ire to obtain information on who was and was not willing to pay for waste service. After data has collected, variables i.e education (X1); earning(X2); population(X3); society's behavior and perception on waste management (X4); organizational force and institutional support (X5); society's awareness (X6); waste management knowledge (X7); willingness to pay (X8); health and environment impact (X9); handling and collection (X10); alternative resource availability (X11); set fare/rate (X12); technical/fitness functionality (X13) were analyzed. The result has shown "Factor 1" which variables were society's behavior and perception on waste management (X4); organizational force and institutional support (X5); technical/fitness functionality (X13) has the most dominant influence on the success of the program.

***Keywords**:- Factor Analysis, Forum Group Discussion, Material Recovery Facility, Society Participation, Waste Treatment.*

I. INTRODUCTION

Waste management was still became tough challenge for urban areas over the world which rapidly developed, especially in developing country (Foo, 1997). In order to balance rapid economy development and population growth and considering the substantial role of waste management in promoting the health of environment and society, an effective and efficient method has to be prioritized (Afroz, 2009). Efficient waste recycling can be done by maximizing the utilization of available technology for sustainable and environment oriented management (Demirbas, 2011). According to Cimpan et al. (2015)waste management system was purposely to improve energy recovery and to reduce economical cost from complete waste management chain, which actually has to be done by the government. Effective waste recycling and reusing could promote job vacancies, economical development, and reduction of environmental pollution as well (Gundupallidkk, 2016).

Desapeganden was divided into real estate and slum area. As wide as 198 m^2 hangar was available for material recovery facility which built in 2016 and planned to serve as much as 600 households that year and 1.380 household the next year (BPS Kabupaten Gresik, 2017).There were still tons of waste being piled up outside the hangar which caused by lack of society participation on its separation.Most of them could be efficiently reused or recycled after being sorted and separated (Ardolino dkk, 2017). This study will review on factors which dominantly influence the success and how this program could be optimally run. According to government's objective, every part of this program was expected to independently operated without the government's subvention by 2019 as well as policy recommendation to support more achievement of mentioned program.

II. DATA AND METHODS

A. Data Collection

There were 2 collected data which divided into primary and secondary. Primary data is a directly obtained data from study location in which on waste management in desapeganden, regarding facilities, subject, and manager. Data was collected by direct observation and interviews on authorized personal. Questionnaires were also spread to obtain data from resident of desapeganden. Secondary data is usually a document and regulation which related to the study. It can be obtained from badan pusat statistik (BPS) in a form of population number, households, and total area of desapeganden. Scheaffer formulation is used to determine total sample number (Scheafferdkk, 1996) :$n = \frac{N}{(N-1)\delta^2+1}$ with population(N) as much as1.380and10% margin of error (δ). According to the formula, minimum sample taken was $n = 93{,}3 \approx 95$. simple random sampling was used, where every individual has the same opportunity to be randomly taken. (Singarimbu,1987). The Questionnaires were given to 50 and 45 slum and real estate respectively. The chosen sample were both those willing and not willing to pay for waste service fare.

B. Factor Analysis

The analysis method used in this study was exploratory factor analysis or principle component analysis (PCA). PCA is the simplest method for eigen factor of multivariant analysis which used to reduce the variable and will transform into new laten variable that determine dominant multivariate relationship (Abdul-Wahab et al, 2005). It has the ability to reduce the majority of data into several new variables where principle component was less or equal to the number of original variable (Ahmad Zia Ul-Saufie et al, 2013).

Data appropriateness for factor analysis was assessed by*Kaisere Meyere Olkin* (KMO > 0,5) and Barlett test (ρ<0,001) (Kaiser, 1974). According to Santoso et al. (2002), several stages of factor analysis were as follow:

- To choose the variable which relevant to principle issue. Factor analysis was used to classify some variables, so there has to be strong correlation on each of them;
- The chosen variable will be extracted into one or more factors. Typical value of 60%-90% describe the significancy of each variable (Abdul-Wahab dkk, 2005);
- Give ranking to formed factors (Abdul-Wahab dkk, 2005).

III. RESULT AND DISCUSSION

Researched data variables approppriateness was tested by*KMO and Bartlett's Test.* The result has shown KMO = 0,636 > 0,5 andρ = 0,000 < 0,001, the collected variable then feasible to be processed furthermore.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,636
Bartlett's Test of Sphericity	Approx. Chi-Square	410,314
	df	78
	Sig.	0,000

Table 1. KMO and Bartlett's Test

Anti image matrices will be shown on the following table where diagonally formed numbers describe the MSA value on each variable. According tothe *Anti Image Matrices,*variables that have value of > 0,5were X1 = 0,608; X2 = 0,699; X3 = 0,510; X4 = 0,600; X5 = 0,632; X6 = 0,683; X7 = 0,681; X8 = 0,700; X9 = 0,544; X10 = 0,771; X11 = 0,556; X12 = 0,694; and X13 = 0,645 so that factor analysis could be advanced.

		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13
Anti-image Covariance	X1	0,566	0,033	-0,02	0,139	0,039	-0,16	-0,08	-0,19	0,076	-0,04	-0,09	-0,01	-0,09
	X2	0,033	0,719	-0,10	0,012	-0,01	0,021	-0,07	-0,04	-0,11	0,037	0,104	-0,12	0,104
	X3	-0,02	-0,10	0,436	-0,19	-0,16	0,047	0,063	-0,09	0,195	0,076	-0,08	-0,17	0,047
	X4	0,139	0,012	-0,19	0,364	0,059	-0,14	0,066	-0,15	-0,14	-0,10	-0,02	0,040	-0,03
	X5	0,039	-0,01	-0,16	0,059	0,450	-0,16	-0,01	-0,07	-0,11	-0,01	0,096	0,096	-0,19
	X6	-0,169	0,021	0,047	-0,149	-0,165	0,429	-0,119	0,065	0,044	-0,105	0,073	-0,002	0,001
	X7	-0,084	-0,075	0,063	0,066	-0,018	-0,119	0,486	-0,006	-0,023	-0,080	-0,205	-0,159	0,104
	X8	-0,198	-0,041	-0,009	-0,156	-0,076	0,065	-0,006	0,567	-0,101	0,069	0,022	-0,095	0,089
	X9	0,076	-0,119	0,195	-0,146	-0,113	0,044	-0,023	-0,101	0,496	0,063	-0,122	-0,026	-0,140
	X10	-0,046	0,037	0,076	-0,108	-0,014	-0,105	-0,080	0,069	0,063	0,636	-0,077	-0,130	-0,021
	X11	-0,093	0,104	-0,089	-0,028	0,096	0,073	-0,205	0,022	-0,122	-0,077	0,703	0,056	-0,087
	X12	-0,008	-0,126	-0,171	0,040	0,096	-0,002	-0,159	-0,095	-0,026	-0,130	0,056	0,524	0,000
	X13	-0,097	0,104	0,047	-0,035	-0,195	0,001	0,104	0,089	-0,140	-0,021	-0,087	0,000	0,546
Anti-image Correlation	X1	0,608[a]	0,052	-0,048	0,306	0,078	-0,343	-0,160	-0,349	0,143	-0,076	-0,147	-0,014	-0,175
	X2	0,052	0,699[a]	-0,179	0,024	-0,022	0,039	-0,126	-0,064	-0,200	0,055	0,146	-0,206	0,166
	X3	-0,048	-0,179	0,510[a]	-0,480	-0,369	0,110	0,137	-0,018	0,421	0,144	-0,161	-0,359	0,095
	X4	0,306	0,024	-0,480	0,600[a]	0,145	-0,378	0,156	-0,343	-0,344	-0,226	-0,056	0,091	-0,079
	X5	0,078	-0,022	-0,369	0,145	0,632[a]	-0,375	-0,040	-0,150	-0,239	-0,026	0,171	0,198	-0,393
	X6	-0,343	0,039	0,110	-0,378	-0,375	0,683[a]	-0,261	0,132	0,096	-0,200	0,133	-0,003	0,002
	X7	-0,160	-0,126	0,137	0,156	-0,040	-0,261	0,681[a]	-0,011	-0,047	-0,144	-0,351	-0,316	0,202
	X8	-0,349	-0,064	-0,018	-0,343	-0,150	0,132	-0,011	0,700[a]	-0,190	0,116	0,035	-0,174	0,159
	X9	0,143	-0,200	0,421	-0,344	-0,239	0,096	-0,047	-,0190	0,544[a]	0,112	-0,206	-0,052	-0,269
	X10	-0,076	0,055	0,144	-0,226	-0,026	-0,200	-0,144	,0116	0,112	0,771[a]	-0,116	-0,226	-0,035
	X11	-0,147	0,146	-0,161	-0,056	0,171	0,133	-0,351	,0035	-0,206	-0,116	0,556[a]	0,092	-0,141
	X12	-0,014	-0,206	-0,359	0,091	0,198	-0,003	-0,316	-0,174	-0,052	-0,226	0,092	0,694[a]	0,000
	X13	-0,175	0,166	0,095	-0,079	-0,393	0,002	0,202	0,159	-0,269	-0,035	-0,141	0,000	0,645[a]

Table 2. Anti Image Matrices

Each variable has contribution to newly formed factor. Factor that describe variable's variant and showing the correlation of variable and formed factor was exhibited by communality value.

	Initial	Extraction
X1	1,000	0,572
X2	1,000	0,565
X3	1,000	0,675
X4	1,000	0,687
X5	1,000	0,704
X6	1,000	0,739
X7	1,000	0,727
X8	1,000	0,530
X9	1,000	0,809
X10	1,000	0,515
X11	1,000	0,607
X12	1,000	0,670
X13	1,000	0,687

Table 3.Variable communality value

The value of each analyzed variable was shown on the total variance explained table. The coloumn of *Extraction Sums of Squared Loadings* exhibit the number of newly formed factor. It could be obtained if *Initial Eigen values* was ≥ 1. According to analysis result, the number of newly formed factors from 13 variables were 4, with the variant of 65.266%.

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,509	26,990	26,990	3,509	26,990	26,990	2,479	19,071	19,071
2	2,121	16,319	43,309	2,121	16,319	43,309	2,437	18,745	37,816
3	1,754	13,493	56,802	1,754	13,493	56,802	2,291	17,622	55,438
4	1,100	8,464	65,266	1,100	8,464	65,266	1,278	9,828	65,266
5	0,873	6,717	71,983						
6	0,811	6,237	78,220						
7	0,678	5,218	83,438						
8	0,545	4,194	87,632						
9	0,473	3,635	91,267						
10	0,389	2,993	94,261						
11	0,299	2,301	96,562						
12	0,271	2,087	98,649						
13	0,176	1,351	100,000						

Table 4. Total variance explained

Extraction Method: Principal Component Analysis.

The contribution percentage of the variables were 26.99%; 16.319%; 13.493%; and 8.464% for factor 1; factor 2; factor 3; and factor 4 respectively.
Scree plot Figure will show 4 new factors from 13 variables which formed with the value of ≥ 1.

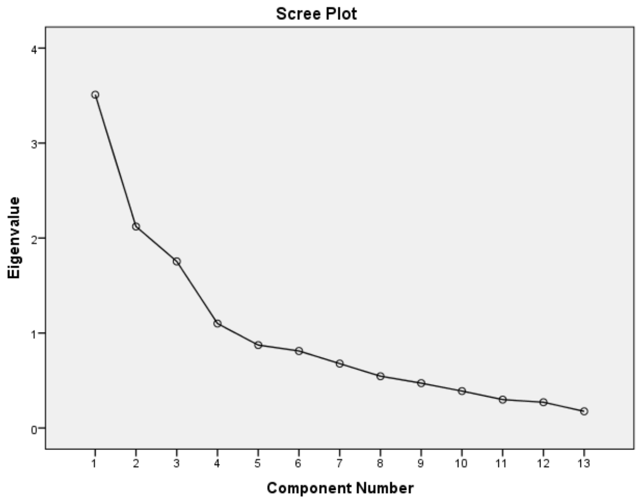

Fig 1:- Factor Analysis Scree plot

Rotation process was required to clarify the formed factor which significantly different to other factors. Details of variable which divided into 4 factors could be identified through Rotate Component Matri Table below.

	Component			
	1	2	3	4
X1	0,047	0,754	-0,031	0,025
X2	-0,128	-0,058	0,733	0,082
X3	0,287	0,085	0,694	-0,324
X4	0,639	0,015	0,519	0,093
X5	0,819	0,129	0,119	-0,050
X6	0,543	0,647	0,107	-0,120
X7	-0,212	0,742	0,215	0,293
X8	0,310	0,124	0,608	0,220
X9	0,518	-0,180	0,141	0,699
X10	0,181	0,688	0,089	0,030
X11	-0,025	0,402	0,001	,0667
X12	-0,180	0,436	0,668	,0013
X13	0,728	0,026	-0,290	,0268

Table 5. Rotate Component Matri

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

According to previous table, factor interpretation could be identified as follow:

- Factor 1:society's behavior and perception on waste management (X4); organizational force and institutional support (X5); and technical/appropriateness functionality (X13),
- Factor 2:Education (X1); society's awareness (X6); waste management knowledge (X7); and handling and collection (X10),
- Factor 3: earning (X2); population (X3); willingness to pay (X8); and set fare/rate (X12),
- Factor 4:health and environment impact (X9); and alternative resource availability(X11).

The ranking order of 4 factors in terms of significance from most to least were factor 1; factor 2; factor 3; and factor 4 with the value of 3.509; 2.121; 1.754; and 1.100 respectively. It could be concluded that society's behavior and perception on waste management (X4),organizational force and institutional support (X5), and technical/appropriateness functionality (X13) were necessarily need to be prioritized in order to get this program succeeded.

IV. CONCLUSION

According to the analysis, there was one factor which has dominantly influence the program. It was "Factor 1" with behavior and perception of society on waste management (X4); organizational force and institutional support (X5); and technical/appropriateness functionality (X13) as variables.

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