CHAPTER IV

DATA COLLECTING AND PROCESSING

This chapter will explain about the data collection and processing that used in this research. This chapter contains several sub-chapters such as data collection, processing and analysis.

4.1 Data Collecting

4.1.1. Questionnaire Result

The data collecting is conducted by spreading the online questionnaires using google form. The target respondents of the questionnaire are the customers of property industry which associated with REI Yogyakarta, and questionnaires that distributed to consumers consist of 22 statements. The number of respondents in this questionnaire totaled as 400 consumers who have already bought or familar about property industry. The characteristics of respondents who have filled out the questionnaire can be seen in the Table 4.1 below.

Table 4. 1 Characteristic of Respondents

Characteristic	Total	Percentage
Gender		
Female	194	48.5%
Male	206	51.5%

Characteristic	Total	Percentage
Age		
<20 years old	11	2.75%
20-30 years old	248	62%
>30 years old	141	35.25%
Occupation		
Government Employee	78	19.5%
Entrepreneur	135	33.75%
Employee	69	17.25%
Others	118	29.5%

Based on the data that already collected by the online questionnaire, the respondents are 400 customers of the property industry that associated with the Real Estate Indonesia. The result of the questionnaire will be shown in the appendix.

4.2 Data Processing

In this research, this stage will be done by using the method of Structural Equation Model (SEM) within IBM SPSS AMOS 22 as the tools to calculate SEM. This stage will be divided into several stages to analyze the SEM calculation.

4.2.1 Development of Theory Models

Based on the objective that already determined by the researcher, it can be built a theory-based model. The theories aim as the idea of the SEM application. The theories contain several variables that needed in this research. The explanation of variables will be shown in the table 4.2 below.

Table 4. 2Variable and Its Definition

Variable	Definition of Variable Dimensions
Enthusiasm	This represents an individual's strong level of excitement and interest regarding the focus of engagement, such as brand.
Attention	Attention is an invisible material resource that can be allocated in multiple ways by a person.
Absorption	Absorption means while the customer spending time toward a brand, the time will passing quickly.
Interaction	This referred to both of online and offline participation with the customer.
Identification	Identification will appear when the customer describe themself as the brand or the product.
Irritation	The activities of other customer that disturb other customers.
Customer Satisfaction	Customer Satisfaction is the measurement of customers' pleasure.
Service Quality	Service quality is the value given by the customer based on the its service.

Based on the table above, there are eight variables that will be processed. Each of variables has its indicator. The indicator can be shown in the table 4.3 below.

Table 4. 3 Variables and Its Indicators

No	Variable	Attributes	Variable	Instruments code
1.	Ethusiasm	The customer really like the eco-friendly products offered by Industrial Property Yogyakarta.	X1	EN1
2.		In choosing an environmentally friendly brand, the customer is enthusiastic about Industrial Property Yogyakarta.	X2	EN2
3.		The customer feel excited about environmentally friendly products offered by Industrial Property Yogyakarta.	X3	EN3
4.	Attention	The customer is interested in finding out about eco-friendly promotions offered by Industrial Property Yogyakarta.	X4	AT1
5.		The customer gives more attention to the eco-friendly promotions offered by Industrial Property Yogyakarta.	X5	AT2
6.		The customer took the time to look for eco-friendly promotions offered by Industrial Property Yogyakarta.	X6	AT3
7.	Absorption	When the customer interacts with Industrial Property Yogyakarta, I forget about other brands.	X7	AB1
8.		When the customer interacts with Industrial Property	X8	AB2

No	Variable	Attributes	Variable	Instruments code
		Yogyakarta, I feel happy.		
9.	Interanction	The customer like to participate in the brand community to discuss eco-friendly promotions from Industrial Property Yogyakarta.	X9	IN1
10.		The customer like to interact with other people who think the same in the Community Industrial Property Yogyakarta.	X10	IN2
11.		The customer often participates in all the eco-friendly promotions offered by Industrial Property Yogyakarta.	X11	IN3
12.	Identification	When someone criticizes this brand about its campaigning for the environment, the customer feels like a personal insult.	X12	ID1
13.		The success of Industrial Property Yogyakarta is the customer's success.	X13	ID2
14.	Irritation	Sometimes I get irritated by some customers'moralistic or argumentative behavior	X14 X15	IR1
15.		Sometimes i am getting disturbed of other customers' discussion	X16	IR2
16.	Customer Satisfaction	As a customer, as a whole, how do you rate Industrial Property Yogyakarta in implementing environmentally friendly programs / products?	X17	

No	Variable	Attributes	Variable	Instruments code
17.		Very dissatisfied - Very satisfied	X18	CS1
		Very unpleasant - very pleasant	X19	CS2
18.	Service Quality	As a customer, what is the rating for environmentally friendly products offered by the Industrial Property Yogyakarta?	X20	SQ1
		Poor – Excellent		
19.		Low Standards – High Standards	X22	SQ2
20.	Customer Engagement	The customer would say positive things about the property brand to other people.	Y1	CE1
21		The customer would recommend the property brand to someone who seeks their advice.	Y2	CE2
22.		The customer would encourage friends and relatives to do business with this tourism site.	Y3	CE3

4.2.2 Development of Path Diagram

As stated in the theory models, then the path diagram of causality relationship on the factors can be made. Generally, path diagram contains with two elements such as the construct and the relationship between them. In terms of AMOS application, the construct represents the variable and signed by oval shape. Besides, the observed

variable is signed as rectangles or squares and for the relationship between constructs is represented as arrow. The path diagram that will be used in this research can be seen on the figure 4.1 below.

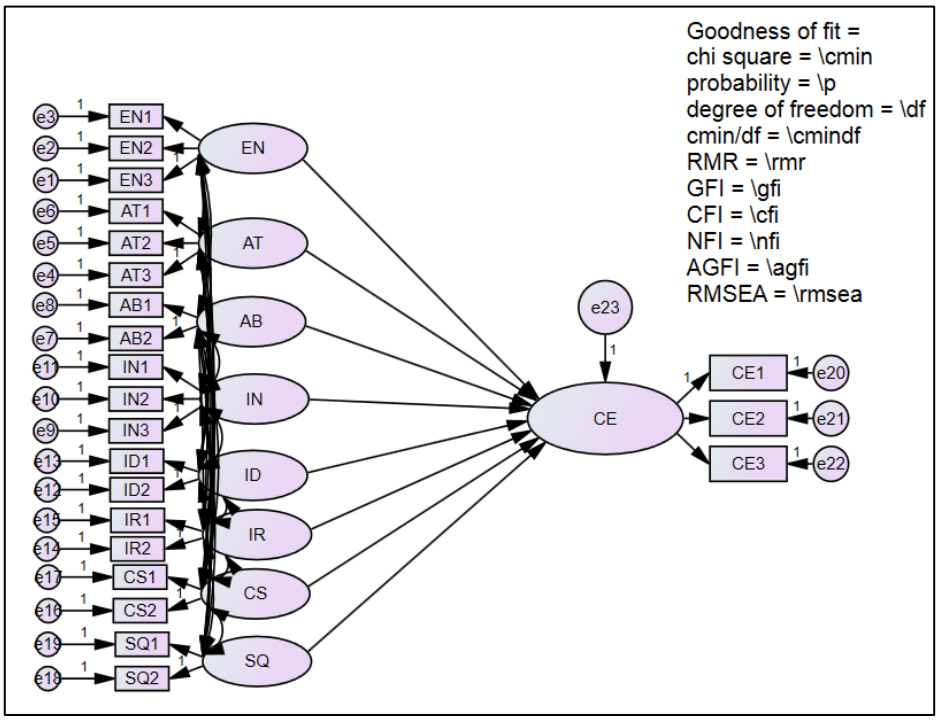


Figure 4. 1 Path Diagram of Customer Engagement

4.2.3 Conversion of Path Diagram into the Equation

Based on the path diagram that will be processed in AMOS software, the research can develop it into an equation for the structural model and measurement model.

a. Structural Equation Model

Structural equation model aims to indicate the causality relationship between various contructs that used in this research. The figure 4.2 below explain about the structural equation model.

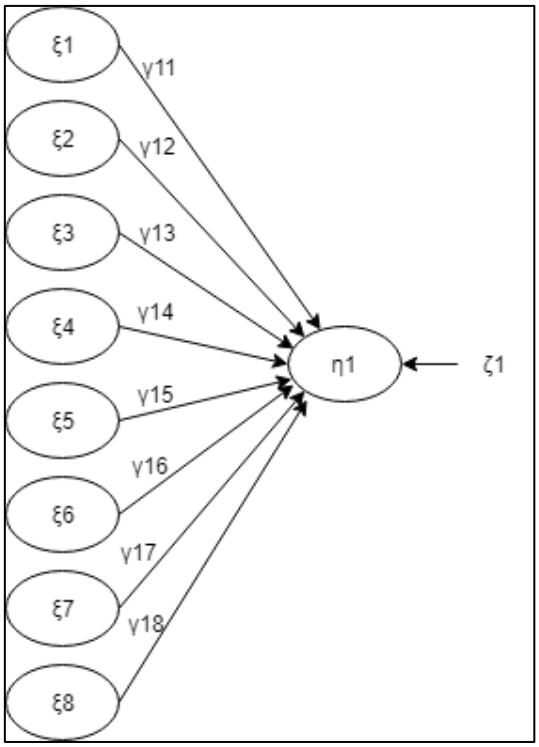


Figure 4. 2 Structural Equation Model

The formulation of structural equation model can be defined as :

$$\mu_1 = \gamma_{11}\xi_1 + \gamma_{12}\xi_2 + \gamma_{13}\xi_3 + \gamma_{14}\xi_4 + \gamma_{15}\xi_5 + \gamma_{16}\xi_6 + \gamma_{17}\xi_7 + \gamma_{18}\xi_8 + \zeta_1$$

Noted :

μ_1 = Customer engagement	ξ_1 = Enthusiasm
ξ_2 = Attention	ξ_3 = Absorption
ξ_4 = Interaction	ξ_5 = Identification
ξ_6 = Customer satisfaction	ξ_7 = Irritation
ξ_8 = Service Quality	ζ_1 = Structural error in brand trust

b. Measurement equation model

Measurement model is the assumption of unidimensionality that contains the relationship between the manifest variable and latent. This measurement is divided between two types as follows :

1) Measurement equation model for endogenous variable

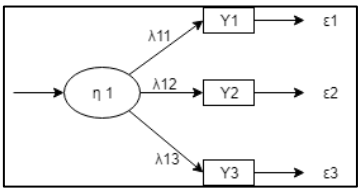


Figure 4. 3 Endogenous Variables

The figure 4.3 above showsthe structural equation model for the endogenous variable. The endogenous variable in this research is customer engagement. The formulation for the endogenous variable is defined as:

$$Y1 = \lambda_{11}\eta_1 + \varepsilon_1$$

$$Y2 = \lambda_{21}\eta_2 + \varepsilon_2$$

2) Measurement equation model for endogenous variable

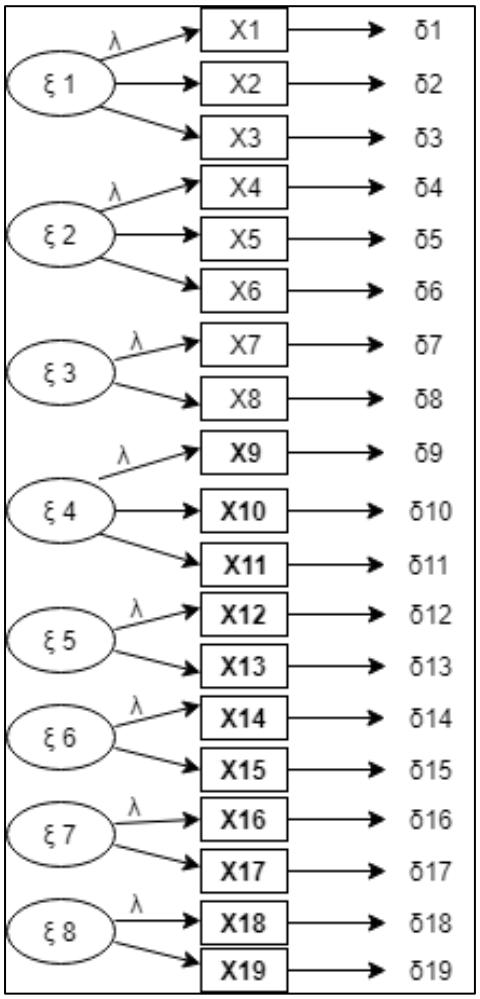


Figure 4. 4 Exogenous Variables

The figure 4.4 above shows the structural equation model for the exogenous variable. The exogenous variables in this research are enthusiasm, attention, absoption, interaction, identification, irritation, customer satisfaction and service quality. The formulation for the endogenous variable is defined as :

$$X1 = \lambda_{11}\xi_1 + \delta_1 \qquad X2 = \lambda_{21}\xi_1 + \delta_2$$

$$X3 = \lambda_{31}\xi_1 + \delta_3 \qquad X4 = \lambda_{42}\xi_2 + \delta_4$$

$$X5 = \lambda_{52}\xi_2 + \delta_5 \qquad X6 = \lambda_{62}\xi_2 + \delta_6$$

$$X7 = \lambda_{73}\xi_3 + \delta_7 \qquad X8 = \lambda_{83}\xi_3 + \delta_8$$

$$X9 = \lambda_{94}\xi_4 + \delta_9 \qquad X10 = \lambda_{104}\xi_4 + \delta_{10}$$

$$X11 = \lambda_{114}\xi_4 + \delta_{11} \qquad X12 = \lambda_{125}\xi_5 + \delta_{12}$$

$$X13 = \lambda_{135}\xi_5 + \delta_{13} \qquad X14 = \lambda_{146}\xi_6 + \delta_{14}$$

$$X15 = \lambda_{156}\xi_6 + \delta_{15} \qquad X16 = \lambda_{167}\xi_7 + \delta_{16}$$

$$X17 = \lambda_{177}\xi_7 + \delta_{17} \qquad X18 = \lambda_{178}\xi_8 + \delta_{17}$$

$$X19 = \lambda_{198}\xi_8 + \delta_{19}$$

4.2.4 Model Input and Estimation

The matrix/covariance or correlation matrix is used as the only data inputation for overall estimation on model input and estimation. There are two types of structural equation model such as variance and covariance. In this research, Covariance matrices are choosen by the researcher as the data inputation because it offers clear comparisons between different population and samples that cannot be offered by the correlation. There are four criteria of proposed model that categorized by the number of sample data. The minimum sample data that can be processed in the SEM AMOS is 100 sample data. However, the minimum sample size is 5 respondents per parameter estimates.

This research used 400 sample data or categorized as Generalized Least Square (GLS) for its proposed model. The number of indicators are 22 indicators. Within its minimum 5 respondents per parameter estimates the sample size data have to be 110. Therefore, the sample data for this reseach is qualified.

4.2.5 Identification

The problem that usually appears in the identification is the incapability of the model to produce good estimation. AMOS 22 as the tools to calculate SEM provides the solution of the problem. The problem can be utilized, in case the estimation can be done, the program in AMOS 22 software will give a text box that contains about the error.

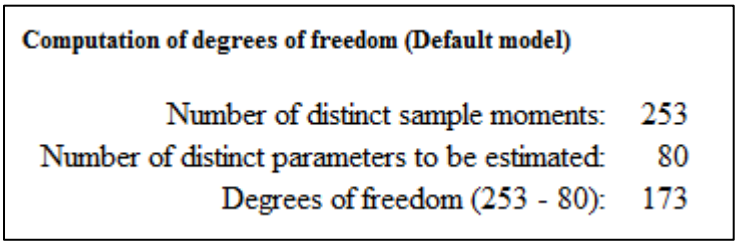


Figure 4. 5 Computation Degree of Freedom

Figure 4.5 is about the computation of degree of freedom that occur from the result of AMOS. Based on the result, it can be concluded that number of distinct sample moment is 253 and the number of parameter to be estimated is 80. Therefore, degree of freedom in the model is 173, this number comes from subtraction of number of distinct sample moment and number of parameters to be estimated which is 253-80 = 173. This result means that the model is identified and can be estimated.

4.2.6 Model Evaluation

Model evaluation aims to evaluate the model whether it meets the criteria of goodness of fit. While the AMOS 22 software already interpreted the estimate value of the model, the model evaluation is also done. There are two types of feasibility test that

have been done in this research. Two types of feasibility test includes feasibilty test of measurement model and structural model.

a. Feasibilty test of measurement model

Feasibility test of measurement is also known as confirmatory factor analysis (CFA). This measurement has two measurements such as realibility and validity. The aims of this measurement are to identify the consistency and accuracy of the data collected from the use of indicator. The function of this measurement is to determine whther the variable is already measured well for each indicator. A variable is truly measured by each indicator if it has a variance extracted value (AVE) ≥ 0.5 and constructed reliability (CR) ≥ 0.7. Here is the analysis of SEM output for data quality test can be shown in Table 4.4.

Table 4. 4 SEM Output

			Estimate
EN3	<---	EN	1.000
EN2	<---	EN	1.280
EN1	<---	EN	1.232
AT3	<---	AT	1.000
AT2	<---	AT	1.328
AT1	<---	AT	1.525
AB2	<---	AB	1.000
AB1	<---	AB	.432
IN3	<---	IN	1.000
IN2	<---	IN	1.443
IN1	<---	IN	1.630
ID2	<---	ID	1.000

			Estimate
ID1	<---	ID	1.191
IR2	<---	IR	1.000
IR1	<---	IR	.584
CS2	<---	CS	1,000
CS1	<---	CS	.661
SQ2	<---	SQ	1,000
SQ1	<---	SQ	.663
CE1	<---	CE	1.000
CE2	<---	CE	1.089
CE3	<---	CE	1.168

Based on the data obtained by the AMOS result, the research can calculate the value variance extracted and construct realibilty by using Microsoft Excel. The result can be shown in table 4.5 below.

Table 4. 5 Validity and Realibility Result

No	**Variable**	**Indicator**	**Standard Loading**	**Standard Loading^2**	**Measurement Error (1- Std Loading^2)**	**CR**	**AVE**
1	Enthusiasm	EN3	0.636	1.000	0.000	0.821	0.684
		EN2	0.701	0.491	0.509		
		EN1	0.748	0.560	0.440		
		∑	2.085	2.051	0.949		
		∑2	4.347				
2	Attention	AT3	0.695	0.483	0.517	0.798	0.571
		AT2	0.703	0.494	0.506		
		AT1	0.858	0.736	0.264		
		∑	2.256	1.713	1.287		
		∑2	5.090				

No	Variable	Indicator	Standard Loading	Standard Loading^2	Measurement Error (1- Std Loading^2)	CR	AVE
3	Absorption	AB2	1.351	1.825	-0.825	1.033	1.058
		AB1	0.539	0.291	0.709		
		∑	1.890	2.116	-0.116		
		∑2	3.572				
4	Interaction	IN3	0.486	0.236	0.764	0.641	0.379
		IN2	0.605	0.366	0.634		
		IN1	0.732	0.536	0.464		
		∑	1.823	1.138	1.862		
		∑2	3.323				
5	Identification	ID2	0.744	0.554	0.446	0.752	0.602
		ID1	0.807	0.651	0.349		
		∑	1.551	1.205	0.795		
		∑2	2.406				
6	Customer Satisfaction	CS2	0.606	0.367	0.633	0.420	0.272
		CS1	0.421	0.177	0.823		
		∑	1.027	0.544	1.456		
		∑2	1.055				
7	Irritation	IR2	1.034	1.000	0.000	0.831	0.718
		IR1	0.661	0.437	0.563		
		∑	1.661	1.437	0.563		
		∑2	2.759				
8	Service Quality	SQ2	0.939	0.882	0.118	0.772	0.637
		SQ1	0.627	0.393	0.607		
		∑	1.566	1.275	0.725		
		∑2	2.452				
9	Brand Trust	BT1	0.793	0.629	0.371	0.865	0.682

No	Variable	Indicator	Standard Loading	Standard Loading^2	Measurement Error (1- Std Loading^2)	CR	AVE
		BT2	0.817	0.667	0.333		
		BT3	0.865	0.748	0.252		
		∑	2.475	2.045	0.955		
		∑2	6.126				

~~Based on the~~ Ttable 4.5 above~~, it is~~ shows~~n~~ us about the value of construct reliability and variance extracted of the eight exogenous variables and ~~the~~ one endogenous variable. Most of the value of construct reliability on the variables are greater than 0.7, it means the indicator has good internal consistency. Those variables are Enthusiasm, Attention, Absorption, Identification, Irritation and Service Quality Although, there are two variables, which are not consistence such as interaction and customer satisfaction. The variance extracted has smaller value than CR. It is also because the VE only needs the value of 0.5 to prove that the indicators are valid. For AVE values, six variables have the value more than 0.5 that the number of variances of the indicators extracted by latent variables that is more than the error variances. It means that the six variables are valid. Other than that, two variables are indicated as unvalid variables such as interaction and customer satisfaction.

b. Test model assumptions

There several tests should be done before it turned into structural model. Those tests are normality and outlier assumption.

1) Normality assumption

The value of normality test in the research is already provided by the AMOS 22 software, normality test can be defined by the value of skewness and kurtosis. Normality contains about two types of tests such as univariate and multivariate normality. The requirement for a data to be a normally distributed is when the CR value in both skewness and kurtosis are in the range of ± 2.58 and the significance level is 0.01. Table 4.6 below shows the result provided by the AMOS.

Table 4. 6 Normality Test

Variable	min	max	skewness	c.r.	Kurtosis	c.r.
CE3	3,000	5,000	-,206	-1,685	-1,082	-4,418
CE2	3,000	5,000	-,040	-,329	-1,046	-4,269
CE1	3,000	5,000	-,061	-,495	-,817	-3,336
SQ1	2,000	5,000	-,071	-,578	-,551	-2,249
SQ2	3,000	5,000	-,039	-,321	-,749	-3,056
CS1	1,000	5,000	-,784	-6,399	1,647	6,724
CS2	1,000	5,000	-,666	-5,438	1,145	4,674
IR1	2,000	5,000	,871	7,112	,294	1,200
IR2	2,000	5,000	,411	3,352	,124	,508
ID1	2,000	5,000	-,099	-,810	-,877	-3,582
ID2	2,000	5,000	-,019	-,156	-,465	-1,899
IN1	3,000	5,000	-,027	-,221	-,812	-3,317
IN2	3,000	5,000	-,095	-,774	-1,088	-4,441
IN3	3,000	5,000	,040	,330	-,445	-1,816
AB1	3,000	5,000	-,191	-1,559	,498	2,034
AB2	3,000	5,000	,301	2,455	-,671	-2,738
AT1	3,000	5,000	-,054	-,442	-1,126	-4,596

AT2	3,000	5,000	-,117	-,958	-1,334	-5,444
AT3	3,000	5,000	,062	,506	-,327	-1,333
EN1	3,000	5,000	,222	1,811	-,640	-2,611
EN2	3,000	5,000	,347	2,831	-,941	-3,841
EN3	3,000	5,000	,075	,609	-,372	-1,519
Multivariate					8,721	2,684

According to the table 4.6, it can be said that most of the data are normally distrubuted. This is because the number of critical ratio (CR) for both skewness and kutosis is higher than 2.58. It is also found that some of indicators are not normally distributed for the skewness value except CS1, CS2, AB2 and EN2. For the kutosisvalue, almost all of the values are normally distributed excluding IR2.

The abnormal indictors that occur on the data will affect the value of chi-square (increase) and probability (decrease). Abnormal data are appeared because of the data are obtained by the customer who has their own perspective about the company. Abnormal data are possibility result in inflated goodness of fit statistics and underestimated standart error, while these effects are lessened with larger sample sizes (Shah & Goldstein, 2006).

2) Outlier assumption

Outlier can be said as the data that has siginificant different with other data. Outlier can be identified in the AMOS 22 software by looking at the mahalanobis Distance. The data will be defined as multivariate outlier data if the p <0.001. In this research, there are 22 variables to observe. The standard of mahalanobis distance value for 22 already measured by using Microsoft Excel within the function of CHIINV. The result

of CHIINV of 22 variables is about 48.26794. It means, if the mahalanobis distance value is higher than 48.26794 then the data are defined as the outlier. The result of mahalanobis distance that generated by the AMOS 22 software can be shown in the table below.

Table 4. 7 Outlier Test

Observation number	Mahalanobis d-squared	p1	p2
26	47,283	,001	,417
9	45,845	,002	,201
142	45,845	,002	,051
275	45,845	,002	,010
28	45,621	,002	,002
23	41,293	,008	,087
106	40,598	,009	,079
30	38,342	,017	,357
159	37,623	,020	,418
292	37,623	,020	,291
33	37,433	,021	,232
20	36,942	,024	,257
87	35,573	,034	,592
163	35,359	,036	,560
296	35,359	,036	,452
102	35,153	,037	,425
89	35,049	,038	,365
39	34,906	,040	,325
166	34,756	,041	,292
299	34,756	,041	,215
79	34,647	,042	,181

Observation number	Mahalanobis d-squared	p1	p2
62	34,490	,044	,164
400	34,309	,046	,156
3	33,745	,052	,269
136	33,745	,052	,203
269	33,745	,052	,148
128	33,555	,054	,150
261	33,555	,054	,107
394	33,555	,054	,074
220	33,138	,060	,124
52	32,794	,065	,176
6	32,162	,075	,369
235	32,111	,076	,325
368	32,111	,076	,261
29	32,068	,076	,222
162	32,068	,076	,172
295	32,068	,076	,130
133	32,028	,077	,106
266	32,028	,077	,077
399	32,028	,077	,055
185	31,877	,080	,058
318	31,877	,080	,041
14	31,702	,083	,047
54	31,617	,084	,042
187	31,617	,084	,029
320	31,617	,084	,020
105	31,583	,085	,015
217	31,583	,085	,010
172	31,286	,090	,019

Observation number	Mahalanobis d-squared	p1	p2
305	31,286	,090	,013
239	30,238	,113	,196
372	30,238	,113	,157
41	30,208	,113	,132
24	30,204	,114	,104
157	30,204	,114	,079
290	30,204	,114	,060
88	30,072	,117	,066
56	29,933	,120	,076
53	29,492	,131	,188
212	29,436	,133	,174
195	29,420	,133	,145
59	29,329	,136	,146
81	29,329	,136	,116
63	29,170	,140	,141
156	29,116	,142	,130
186	29,116	,142	,103
289	29,116	,142	,081
319	29,116	,142	,062
170	29,033	,144	,062
303	29,033	,144	,047
37	29,019	,144	,037
202	28,941	,147	,037
60	28,790	,151	,048
82	28,790	,151	,036
193	28,790	,151	,027
215	28,790	,151	,020
326	28,790	,151	,014

Observation number	Mahalanobis d-squared	p1	p2
348	28,790	,151	,010
112	28,577	,157	,018
103	28,555	,158	,015
236	28,555	,158	,011
369	28,555	,158	,007
76	28,545	,158	,005
209	28,545	,158	,004
342	28,545	,158	,003
111	28,397	,163	,004
353	28,391	,163	,003
122	28,002	,176	,013
345	27,990	,176	,010
238	27,214	,203	,154
328	27,214	,203	,127
350	27,214	,203	,103
371	27,214	,203	,083
85	27,068	,209	,109
73	27,047	,209	,095
206	27,047	,209	,076
92	26,949	,213	,087
50	26,925	,214	,076
84	26,781	,220	,101
98	26,273	,240	,341

Based on the table above, it can be concluded that there is no data that have mahalnobis distance value higher than 48.26794, it means that there is no outlier in the data.

c. Feasibility test of structural model

This stage aims to identify the relationship on the model and also to determine that it has a significant effect. This structural model is also specified as the hypothesis test. The result of structural model can be seen in the figure 4.6 below.

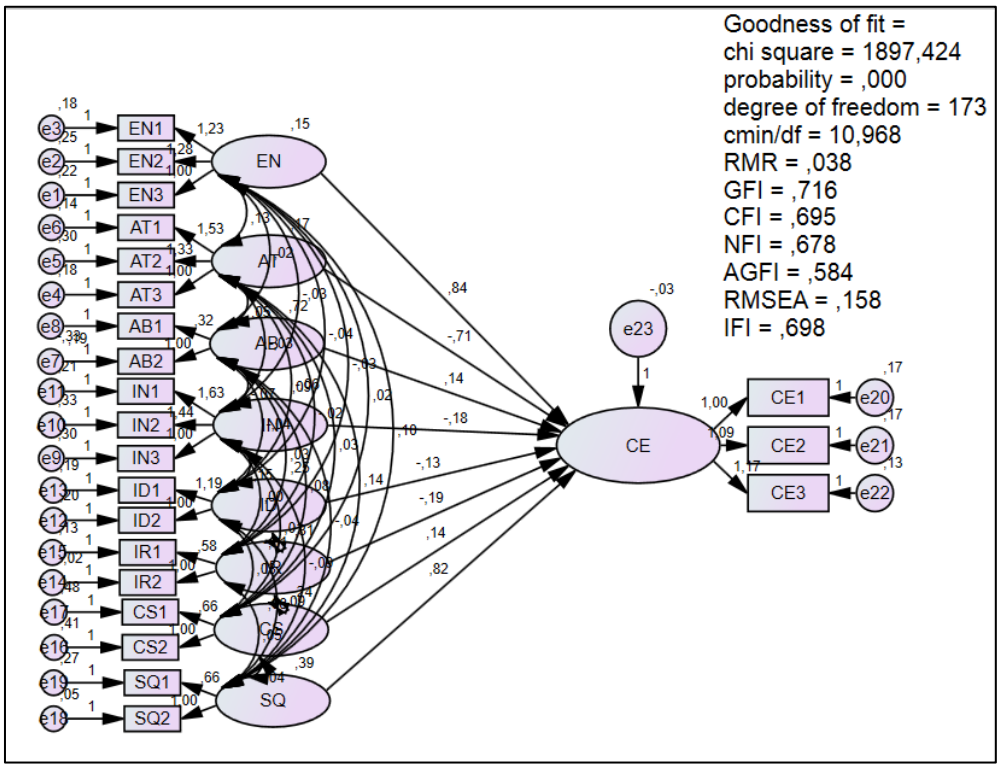


Figure 4. 6 Structural Model of Customer Engagement

While the relationship already defined by the AMOS 22 software. Next, the goodness of fit can be analyzed. The detail of goodness of fit can be seen in table below.

Table 4. 8 Goodness of Fit

No	Type of Goodness of Fit Indicates	Goodness of fit Indicates	Cut of Value	Model Result	Category
1	Absolute Fit Indicates	Probability	≥ 0.05	.000	Accepted
2		Cmin/df	≤ 2.0	10.968	Accepted
3		Chi-Square	*Small	1897.424	
4		GFI	≥ 0.90	.716	Rejected
5		RMSEA	< 0.1	.158	Rejected
6		RMR	≤ 0.05	.038	Accepted
7	Incremental Fit Indicates	AGRI	≥ 0.90	.584	Rejected
8		IFI	≥ 0.90	.698	Rejected
9		CFI	≥ 0.90	.695	Rejected
10		NFI	≥ 0.90	.678	Rejected

Based on Ghozali (2017) , it is stated that some of the accepted values of goodness of fit can represent the model as accepted model. It means that the model used for this research is accepted.

4.3 Hypothesis Testing

The last stage of data testing for the SEM method that already calculated by using AMOS 22 Software and Microsoft Excel is hypothesis testing. The result of hypothesis testing can be seen in the regression weight. The hypothesis will be

accepted if the data have the value of critical ratio more than ± 1.96 and the probability value is <0.005. The result of hypothesis testing in this research can be seen in the table below.

Table 4. 9 Estimation result

			Estimate	S.E.	C.R.	P	Label
CE	<---	EN	,840	,191	4,403	***	par_14
CE	<---	AT	-,711	,201	-3,530	***	par_15
CE	<---	AB	,137	,038	3,593	***	par_16
CE	<---	IN	-,182	,351	-,517	,605	par_17
CE	<---	ID	-,128	,206	-,621	,534	par_18
CE	<---	IR	-,192	,052	-3,675	***	par_19
CE	<---	CS	,143	,075	1,916	,055	par_20
CE	<---	SQ	,815	,085	9,539	***	par_21

Based on the estimation result, five out of eight exogenous variables have an influence for the customer engagement or the endogeneous variable. It is because both of its critical ratio and probability value are more than the requirement. Those of variables are Enthusiasm, Attention, Absorption, Irritation and Service Quality. Besides, there are three variables that have no influence for the Customer Engagement such as Interaction, Identification and Customer Satisfaction.

4.4 Recommendation model

Based on the result of SEM on the previous model, new model can be built. The new model contains only about the valid variable which five variables. New model can be seen on the figure 4.7 below.

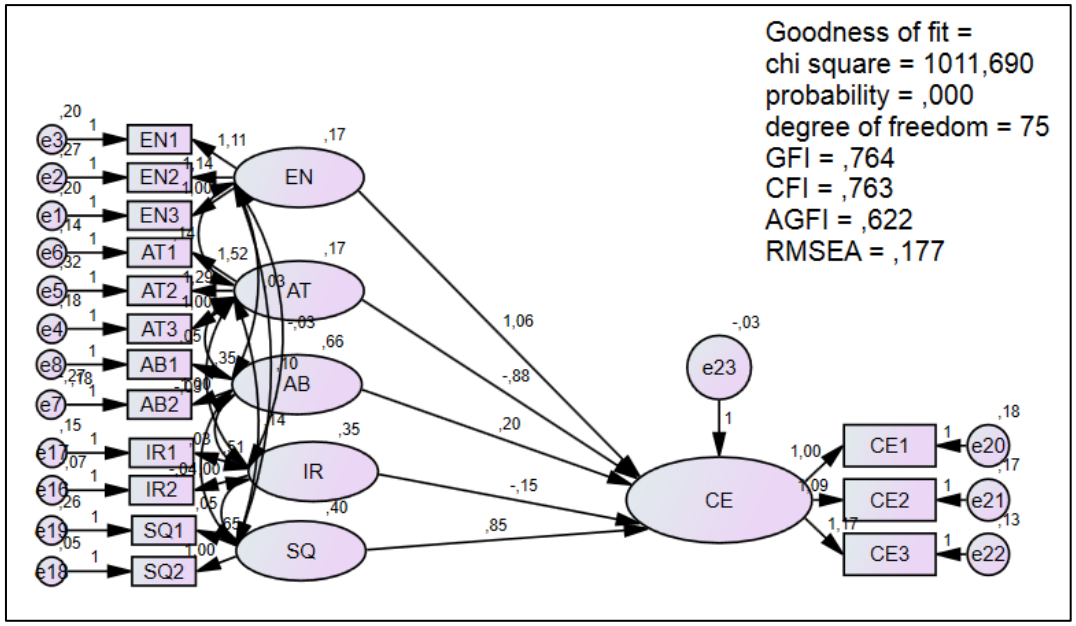


Figure 4. 7 Recommendation Model and Its result of Customer Engagement

The running data for this model use the previous data on the previous model. If it is compared with the previous result, almost all of the results are better than the previous one. The table below will show the regression weight.

Table 4. 10 Estimation Result

			Estimate	S.E.	C.R.	P	Label
CE	<---	EN	1,061	,228	4,660	***	par_10
CE	<---	AT	-,885	,241	-3,678	***	par_11
CE	<---	AB	,195	,036	5,466	***	par_12
CE	<---	IR	-,151	,039	-3,884	***	par_13
CE	<---	SQ	,851	,067	12,638	***	par_14

Based on the table above, all of the hypotheses on the variables are accepted. It is because the value of critical ratio is more than ± 1.96 and the value of probability is more than 0.005.

4.5 Simulation

4.5.1 Causal Loop Diagram

Causal loop diagram (CLD) is the diagram within the cause and effect relationship. This also can be defined by the logic equation and model formulation. CLD aims as the problem solving by looking for all of the factors which are interconnected. The relationship in CLD will not contain the relationship for each variable but it also builds the loop. The variables on the CLD will be adopted by the SEM result which is

five accepted variables. The endogenous variable in the SEM which is customer engagement will be the internal factor. Building a model within the customer engagement as the internal factor aims to make the research is easier to determine the formulation. Exogenous variables in the recommendation model are included on the CLD. The variables are enthusiasm, attention, absorption, irittation and service quality. The figure below will show about CLD that used in this research.

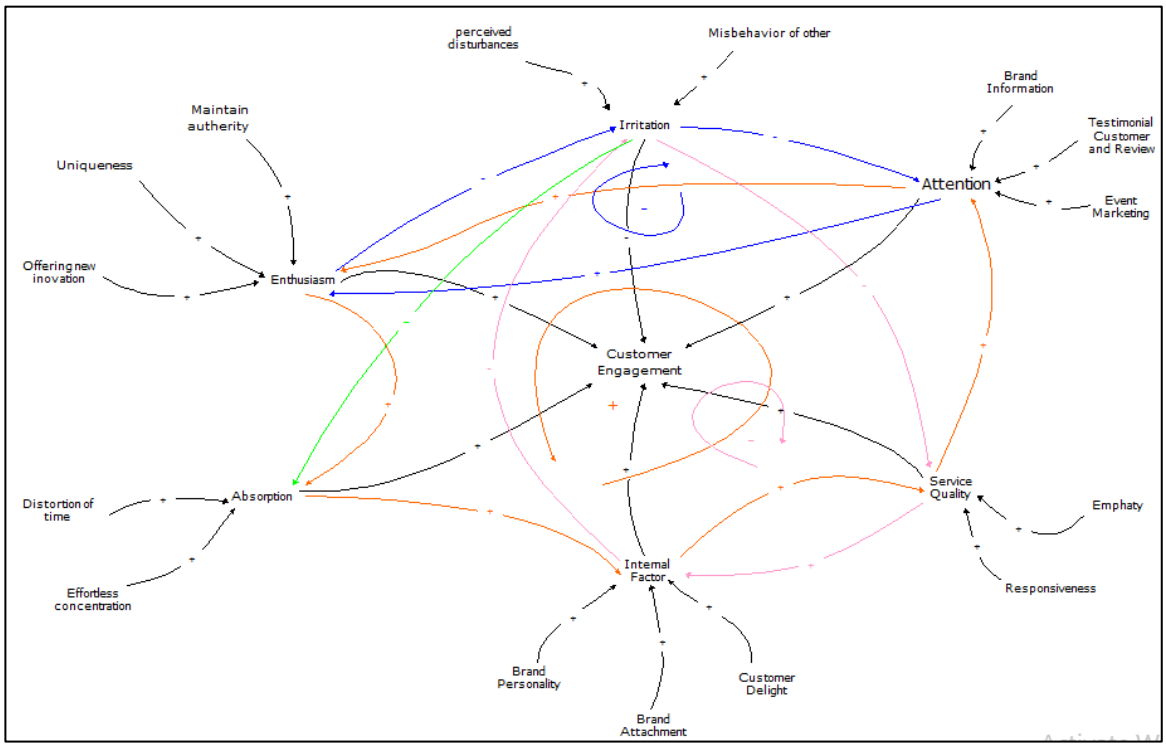


Figure 4. 8 Causal Loop Diagram of Customer Engagement

One variable can be involved in more than one link. Variable of attention is one of the examples. Attention is the one of the variables that involves on the two different links. The first one is in the positive loop, which directly affects the service quality and influence the enthusiasm. Second link is in the negative loop that affected by the irritation and will influence the enthusiasm. This CLD has three relationships

such as two negative loops and one positive loop. Two negatives loops are indicated by the blue and pink lines, while the orange line represents the positive relationship.

4.5.2 Flow diagram

Flow diagram was as the explanation of the flow on the variables and indicators that influences the customer engagement. The data inputation in the flow diagram is based on the questionnaire result. The figure 4.9 below will be determine the flowdiagram.

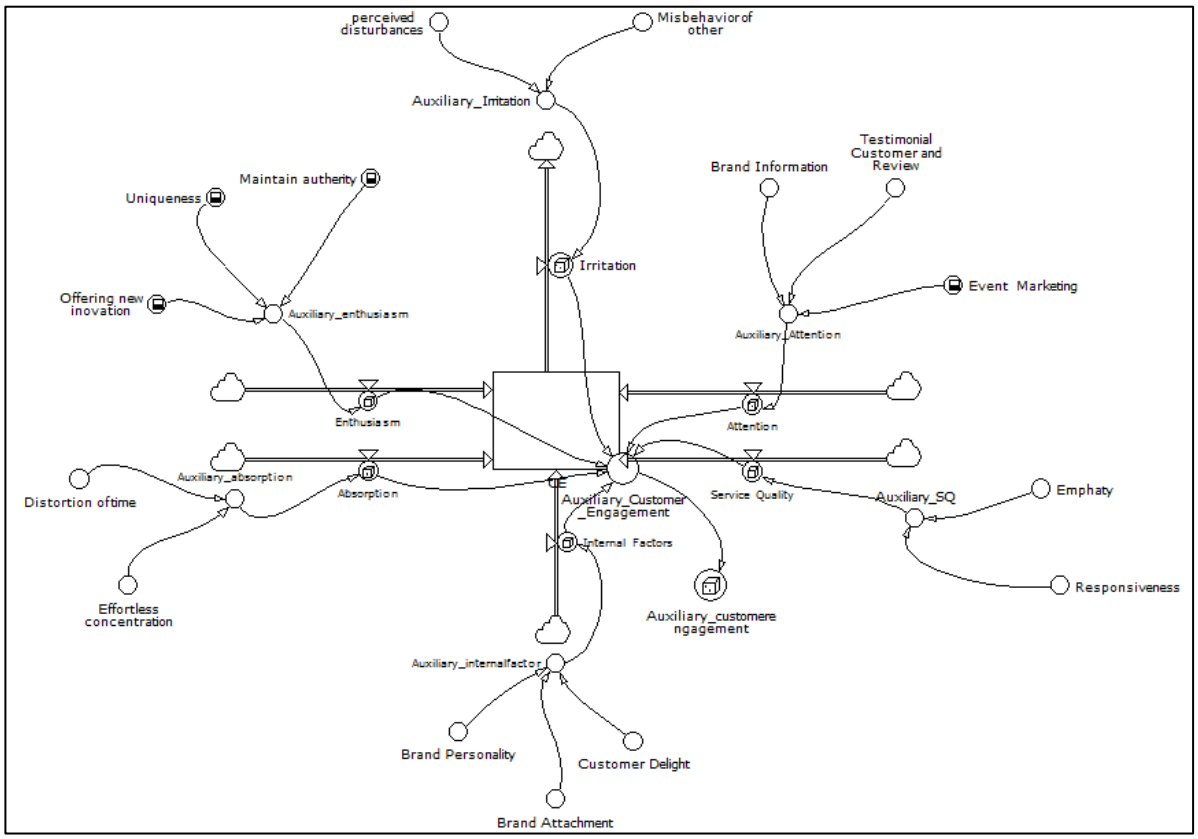


Figure 4. 9 Flow diagram of Customer Engagement

4.5.3 Flow diagram modelling

1. Input data

The inputation data that will be used in this research will be in the same model as the SEM, the number of variables and indicators will be the same as the recommendation model in the SEM calculation. Input data is defined as the data that have constant value. The data was obtained by the questionnaire and the interview toward three experts at the Real Estate Indonesia in the Yogyakarta city. The likert scale that has been done by the interviewer with the expert judgement is in the range of 1 to 5. The data that were derived from the expert judgements is processed by using GEOMEAN function on the Microsoft Excel, so the data will be a single data. The table below will be explained about the input data within its value on the variables and indicators :

Table 4. 11 Input Data

No	Variable	EP1	EP2	EP3	Geomean	
1	**Customer Engagement**	3	3	2	2.621	3
2	**Enthusiasm**	2	2	2	2.289	2
3	Offering new inovation	2	2	3	2.140	2
4	Uniqueness	1	2	2	1.906	2
5	Maintain autherity	2	2	3	1.906	2
6	**Attention**	3	2	2	2.289	2
7	Brand Information	3	2	3	2.449	2
8	Testimonial and Review	2	2	1	2.040	2
9	Event Marketing	2	2	3	1.906	2
10	**Absorption**	2	2	1	1.906	2
11	Distortion of time	2	1	2	1.587	2
12	Effortless concentration	2	1	2	1.587	2
13	**Irritation**	2	3	2	1.906	2

No	Variable	EP1	EP2	EP3	Geomean	
14	Perceived disturbances	1	2	1	1.698	2
15	Misbehavior of other	2	2	1	1.414	1
16	**Service Quality**	3	2	3	2.040	2
17	Responsiveness	3	2	2	2.449	2
18	Emphaty	2	2	2	2.140	2
19	**Internal Factor**	1	1	1	1.414	1
20	Brand Personality	2	2	3	1.513	2
21	Brand Attachment	3	2	2	2.289	2
22	Customer Delight	2	2	2	2.140	2

2. Formulation

Formulation of the model is defined mathematically, the parameter and also by the inputation data that already done in the previous stage. The data imputation is derived from the interview with the expert jugdements. Before the formulation is inputed into the model, it should be defined the unit first. The definition will be used to define the unit as “values”. The “values” is defined as unit because the research is the qualitative research. The qualitative research has no units, therefore values is defined as the units of the number generated by expert jugements. On the simulation process within the Powersim application, it needs to have same units. The figures below will explain about the formulation of the simulation model that attached on the definition box of each variable. Figure 4.10 below will show the formulation that used to run the variable without delay.

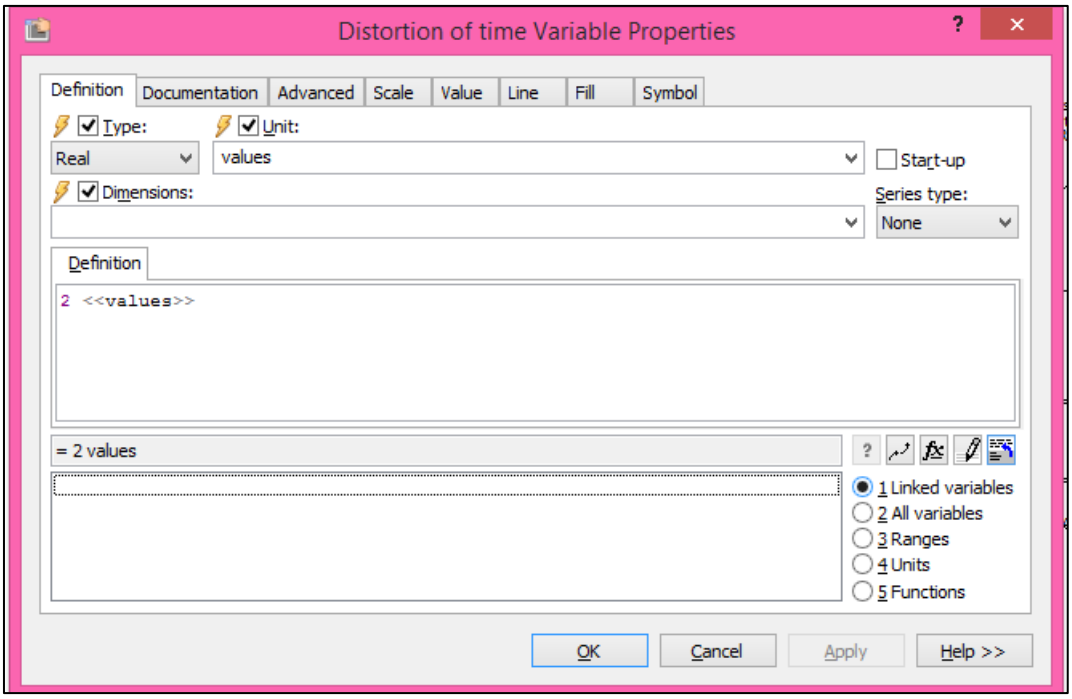


Figure 4. 10 Formulation of Exogenous Variable

Based on the flow chart that already presented before, there are several variables that have the delay. The formulation of the delayed variable will use DELAYINF. The use of DELAYINF causes the data can be defined as the information data. The unit for the time used in this research is hour (hr). The figure below will show the definition of delayed variables.

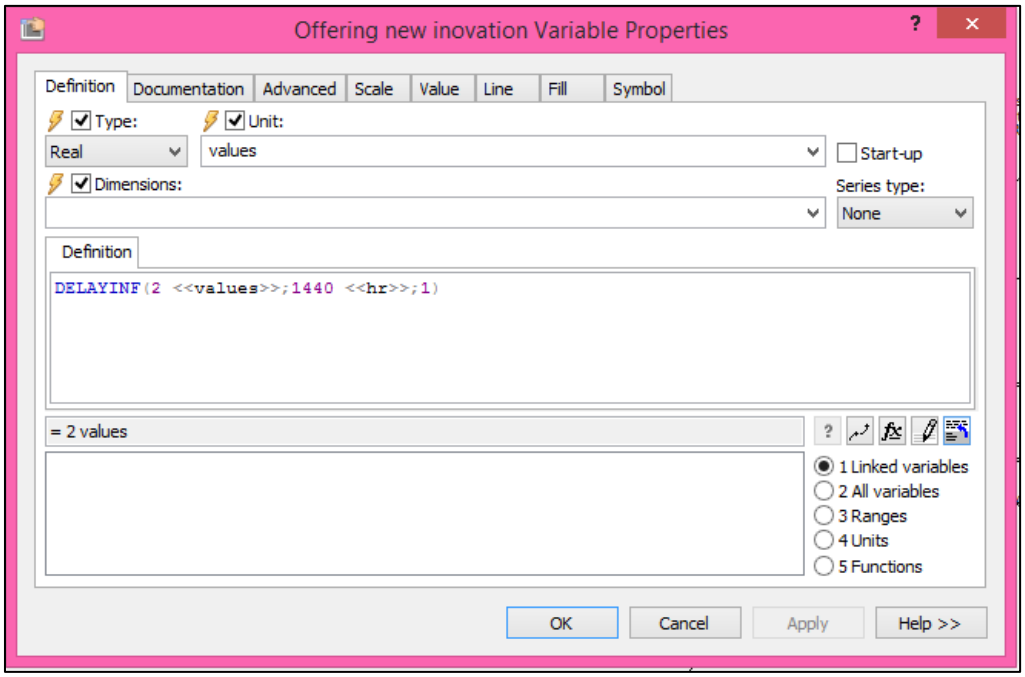


Figure 4. 11 Formulation for the Delayed Variable

The variables (indicators) that have already defined, then connected with the additional auxiliary just like in the figure 4.9. The definition that used in the additional auxiliary is IF function. On this simulation, it is also used the function of RANDOM. However, the funcion of IF and RANDOM cannot be combined in one box of definition. Then, it is required to make an additional auxiliary. The figure below will show the if function application on the definition box.

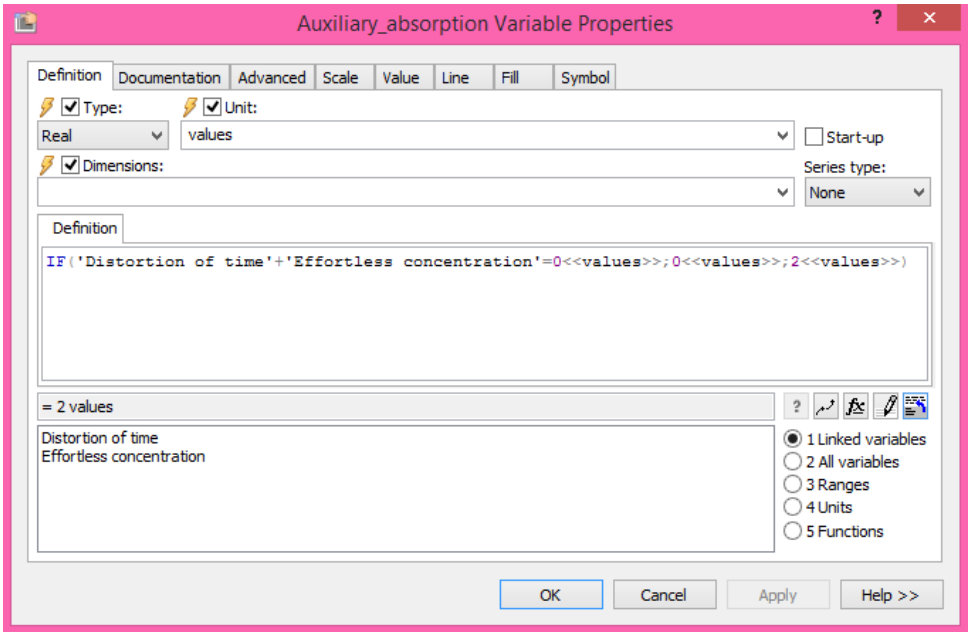


Figure 4. 12Definition of Auxiliary with IF function

The figure above shows the definition, while IF function is used on the model. The definition is about IF (all of the connected variables=0<<values>>;0<<values>> ;3<<values>>). The definition means that IF all of the connected variables have 0 value, then it will be valued by 0, other than that the value will be based on the geomean value of its variables.

The auxiliary that contains IF function, will be connected to other auxiliary with the RANDOM and ROUND function. The function of RANDOM and ROUND aim to determine the value of the variables in the simulation that can be changed based on its limitation on the definition box. In this study, the random number will be started from 1 to 5. This number is based on the likert scale that used to determine the value of variables. The definition of the auxiliary with RANDOM and ROUND function will be shown in the figure below.

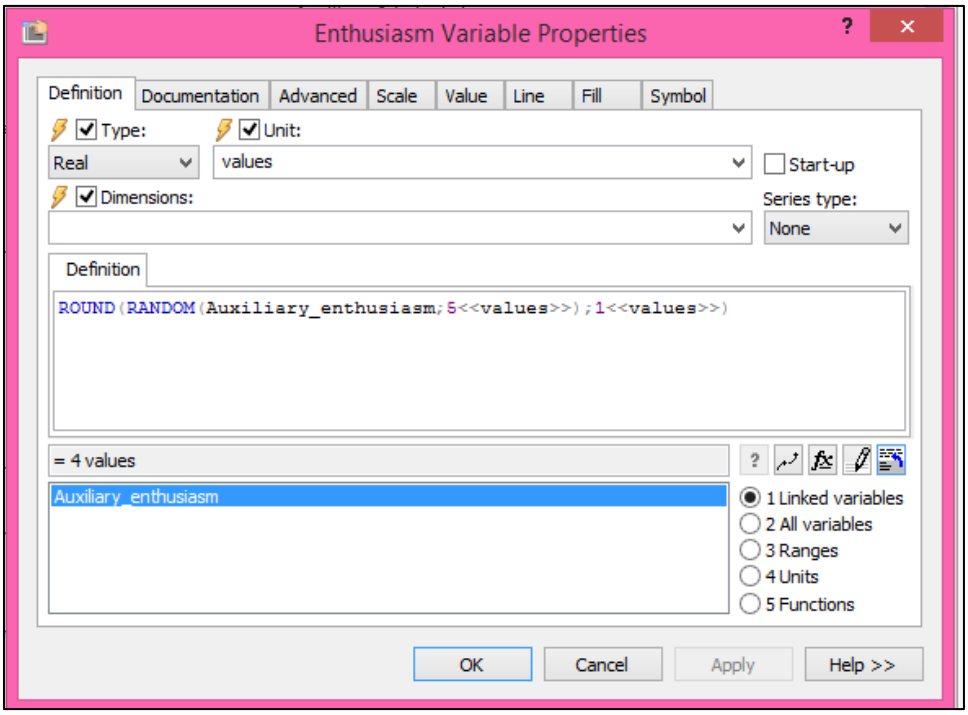


Figure 4. 13 The Definition of Auxiliary with RANDOM and ROUND function

The last connection flow for the auxiliary is the auxiliary for the customer engagement (can be seen on the figure 4.9). This auxiliary is needed as the final result of the model. Customer Engagement in this level cannot be defined, then the additional auxiliary will be simulated to determine whether the model can be used as the simulation to increase the value of Customer Engagement.

3. Simulation result

The simulation will be done for the ten years later. It means that the model will be simulated to the year of 2029. The figure below will show the result of the model that already simulated for the next ten years :

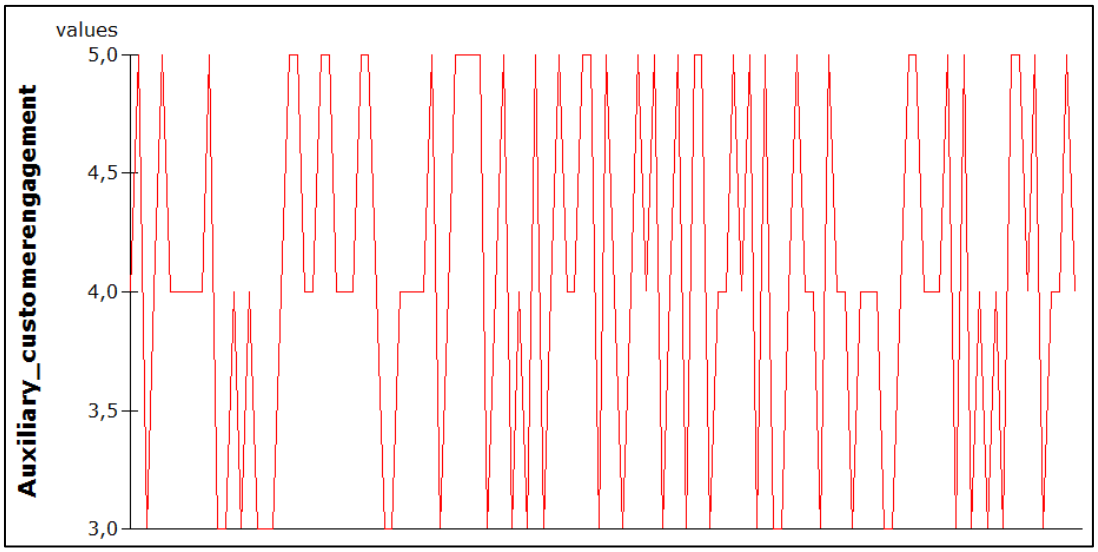


Figure 4. 14 The Graphic of simulation result of Customer Engagement

Based on the figure 4.14 above, it can be concluded that for the next ten years, the transformation of the customer engagement value on the REI Yogyakarta is neither always increase or decrease. The minimum value is three. However, the maximum value of customer engagement is five. The table of simulation result for ten years will be attached on the appendix. The result of the variable value on the powersim is very variative. If the customer engagement value compared to the variables that influence its value, it can be seen that those variables are really matters to the customer engagement value. Wheres, the customer engagement value will decrease if the variables have small value. The comparison can be seen on the figure 4.15 below.

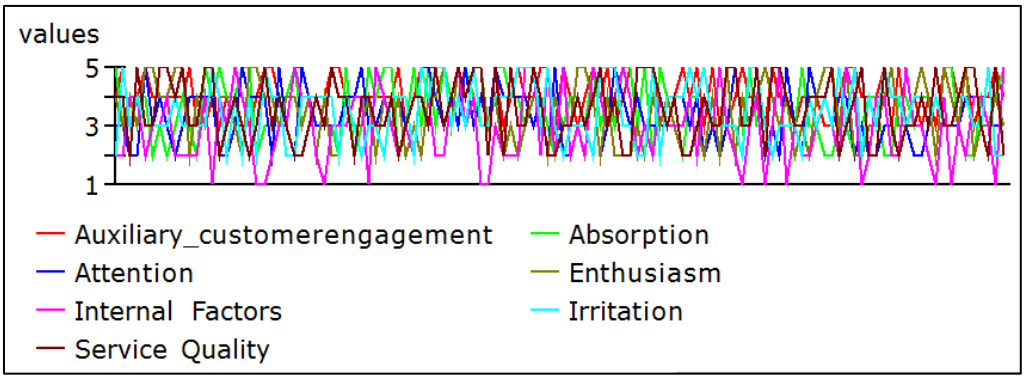


Figure 4. 15 The Customer Engagement Value compared with Its Variables

Each of the variable has its own value. This simulation also provides variables value. The variables here are enthusiams, attention, absorption, irritation and service quality.

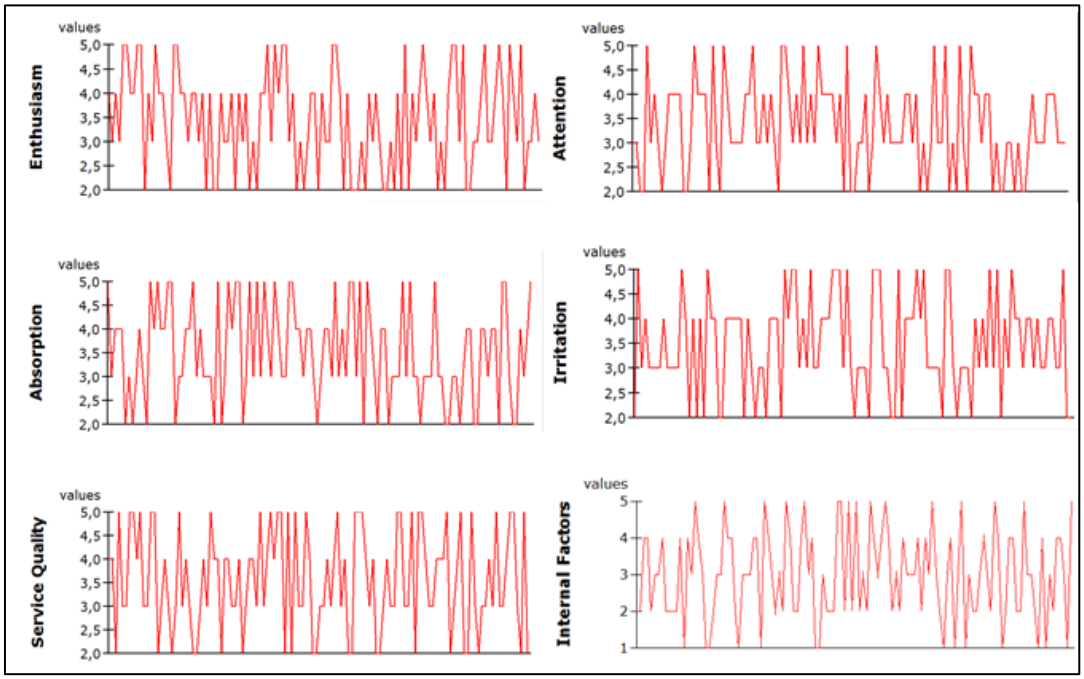
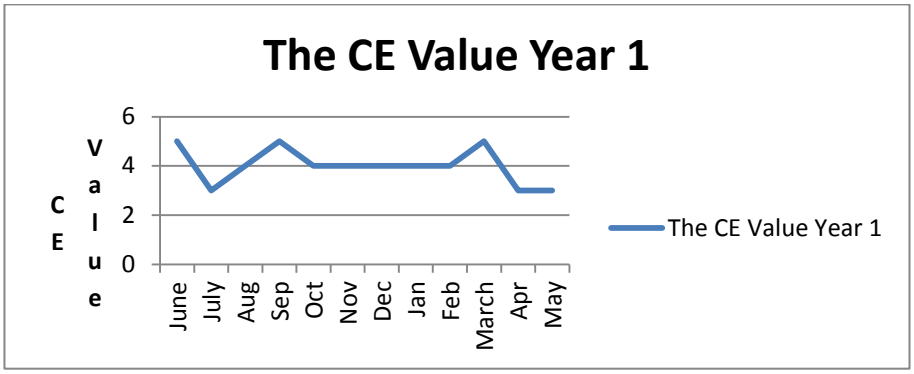


Figure 4. 16 Variables Values

The figure 4.16 above shows the variables value. Based on the result, most of the variables have the minimum value of 2 and maximum value of 5, except the

internal factor that has the minimum value about 1. This research simulates the customer engagement value for ten years. The points below will explain the simulation result for the customer engagement values :

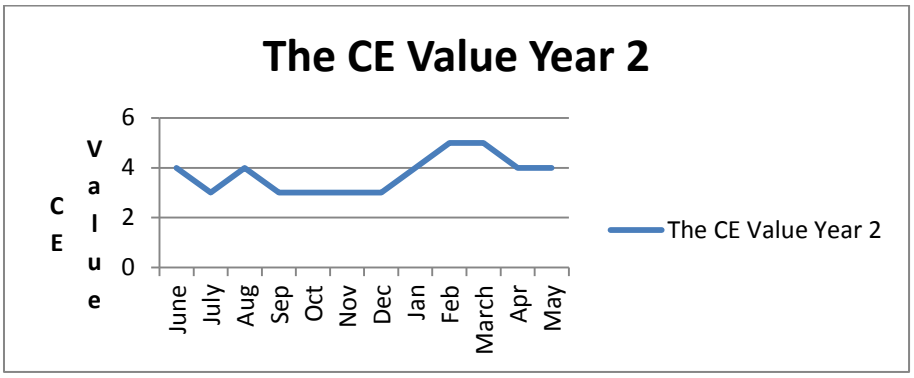
a. Simulation graph of year 1



Graph 4. 1 Simulation Graph of Year 1 for the customer Engagement Value

Based on the graph 4.1 above, it can be concluded that the customer engagement value has minimum value about three and maximum value about five. On the month of October to February, the value is contants. It can be seen in the graph that there is no change of the value for about five month.the result tells us that there is a decreasing for the customer engagemet value on May 2020, if it is compared with the CE value on the beginning of period.

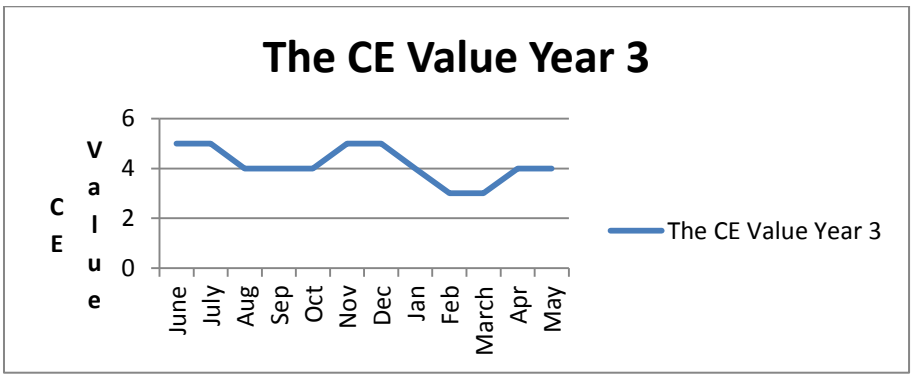
b. Simulation graph of year 2



Graph 4. 2 Simulation Graph of Year 2 for the customer Engagement Value

Graph 4.2 above tells about the customer engagement value for the period 2. This graph tells that if the beginning value is compared with the ending value, then there is no change for both of the value. Although, there are increase and decreace values between the first and end value of period 2.

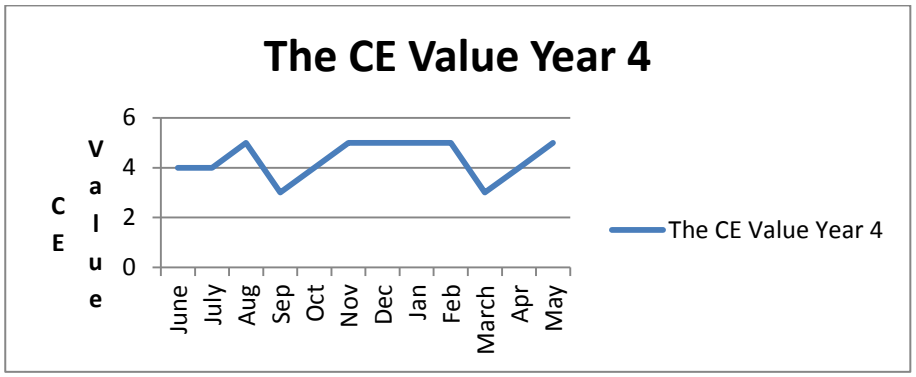
c. Simulation graph of year 3



Graph 4. 3 Simulation Graph of Year 3 for the customer Engagement Value

Period 3 of the simulation shows that if it is compared to the first value of period 3, then by the end of the period, the value decreases. However, there is an increase on the March 2021 to April 2021.

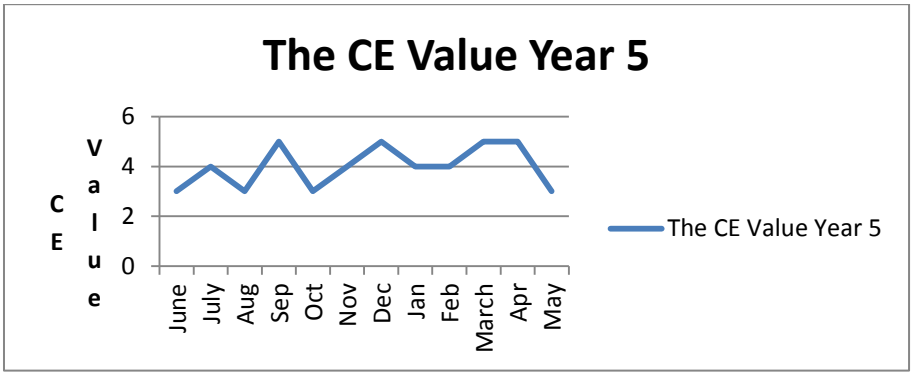
d. Simulation graph of year 4



Graph 4. 4 Simulation Graph of Year 4 for the customer Engagement Value

Based on the simulation result, the customer engagement value in the year 4 shows the increase. This result got value of 4 in the beginning of period then it turns into 5 in the last time of period. The result also tells that in this period, the customer engagement value is quite good because it has 4 times of 5 value.

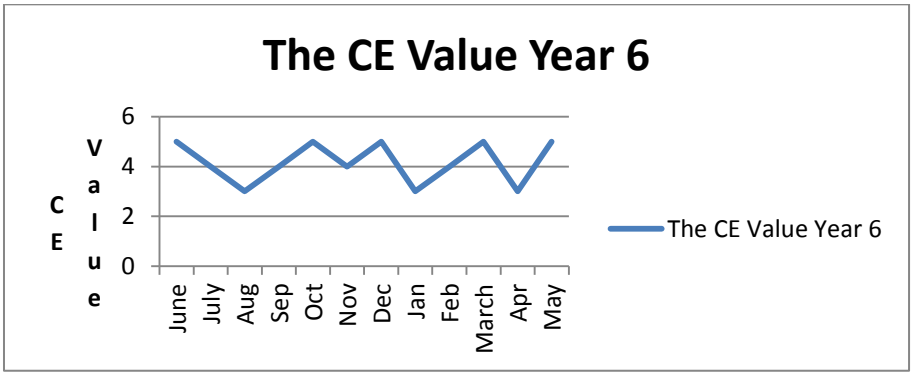
e. Simulation graph of year 5



Graph 4. 5 Simulation Graph of Year 5 for the customer Engagement Value

The result shows that along of this period there are significant change for the value. Although it still has constant value of 2 point on the January-February 2024 and March-April 2024.

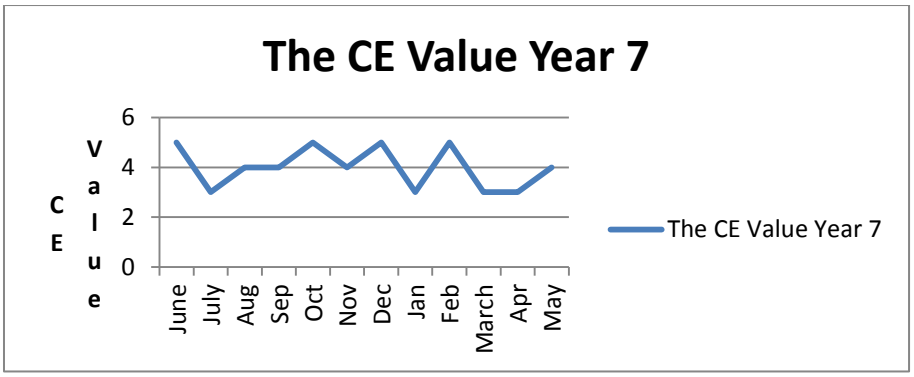
f. Simulation graph of year 6



Graph 4. 6 Simulation Graph of Year 6 for the customer Engagement Value

Based on the graph, this period do not have constant value on its result. The lowest value on the result is spotted on the August 2024, January 2025 and April 2025. Also, the maximum value on the result can be seen on the June 2024, October 2025, December 2025, March 2025 and May 2025.

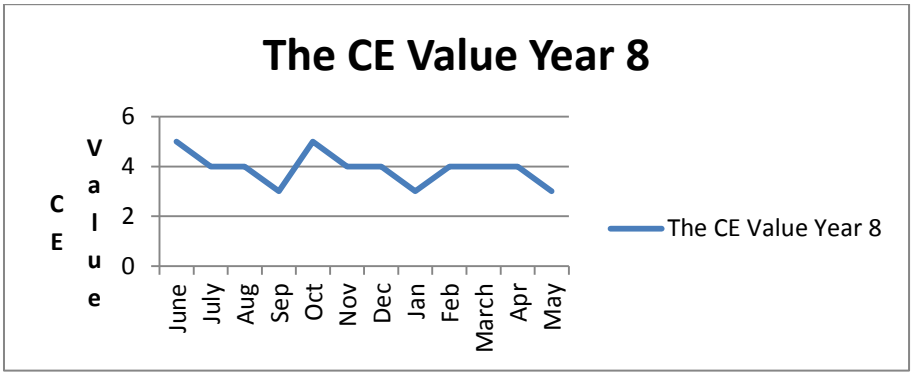
g. Simulation graph of year 7



Graph 4. 7 Simulation Graph of Year 7 for the customer Engagement Value

The result shows that from September 2025 to the March 2026, the graph is significantly changed and there is no constant value between those times. The constant value only appears twice which are on August-September 2025 and March-April 2026. The constant value only occurs at short time.

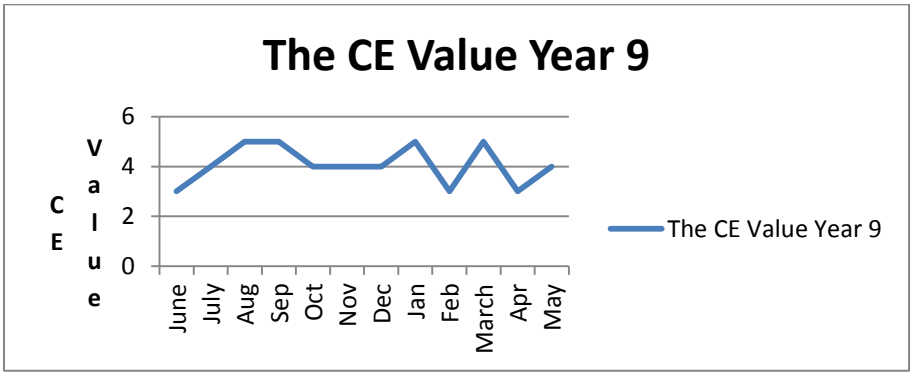
h. Simulation graph of year 8



Graph 4. 8 Simulation Graph of Year 8 for the customer Engagement Value

This period only obtains two times of the 5 value. It means, this period is the most rarely period in getting value of 5. The value for the February-April 2027 is constantly stays at 4.

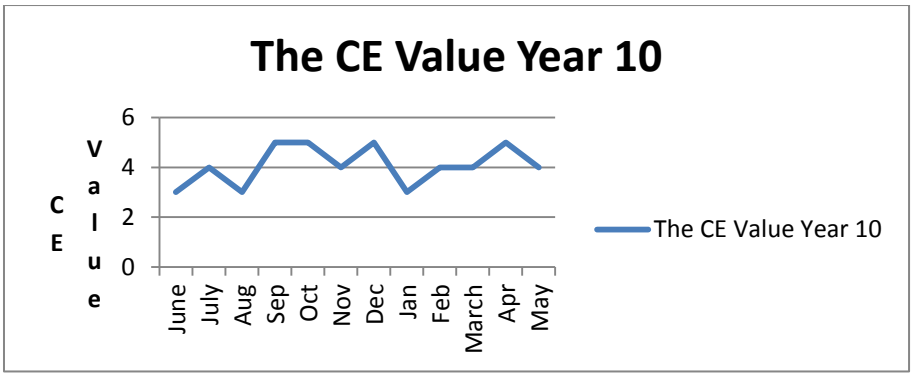
i. Simulation graph of year 9



Graph 4. 9 Simulation Graph of Year 9 for the customer Engagement Value

The simulation result of the customer engagement value on the year 9 has a constant value for three month which is on the October-December 2027, if the value on the first and last month are compared, it prove that there is an increase on the value.

j. Simulation graph of year 10



Graph 4. 10 Simulation Graph of Year 10 for the customer Engagement Value

This period can be specified as the graph with the significant change. It is because the graph only has one constant value and short time spent. The last result of the simulation is value of 4 for the customer engagement on the REI Yogyakarta.