An Analysis Correlation and Dynamic Simulation of Customer Engagement Value through Green Supply Chain Management

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***Abstract*- As the existance of green products and services are increasing, the property industry is trying to develop their product such as green supply chain management concept. Most of the green supply chain management concept that offered by the property industry are including green environmental, waste management, water management and many others. The objectives of this research is to identify the value of customer engagement model. Conceptual model is developed to idenfity the relationship between the variables and its indicators (exogenous) which affecting the customer engagement value (endogenous). This relationship identification has been done by using Structural Equation Modeling. Although, the measurement of customer engagement value is conducted by using system dynamics simulation. The result of this research prove that the relationship of five exogenous variables toward the endogenous are significant. Also, it is obtained the prediction value of customer engagement per unit of time.**

Keywords: *Green Supply Chain Management, Property Industry, Customer Engagement, Structural Equation Modeling, System Dynamics*

1. Introduction

1.1. Background

Nowaday, there are so many types of the problems that will be affected the performance of the marketing. Digital era is required the company to establish innovative marketing. In this case, the applied marketing strategy have to be more effective and efficience. Another point of the marketing is to reach the marketplate. Both of products and services quality that offered by the company will be the consideration for the customers toward a brand value.

One of many strategies that can be implemented in the company as a tools to improve a brand value is well-planned marketing strategy. Marketing strategy is not only how to get the marketplace, but also for building the relationship with the customers, promotion and many more. Although, in its implementation, the marketing strategy will not always be as easy as the expectation. The researcher should do the evaluation to make the marketing strategy became more effective and efficient. In [1-3] was develop a step for company evaluation such as trying to find out the problem in the company, identify why it can happen and decide what thing that the company needs to do to fix the problem.

Innovative strategy for the marketing is developed rapidly, the awareness toward the environment condition recently increase. Some of the company already apply the green supply chain marketing strategy when their promote the products or services. In [4] was divided the dimensional framework of green supply chain management marketing into three section including economic, technological and political. Those three will influence each other because they have a relationship. Economic is the popular trend that became the topic when someone make a decision on what products or services to be picked. This argument appear because most of the green product give higher price into the market rather than the conventional products or services [5]. Price issue of the green products or services makes the green supply chain management marketing has the limitation such as in the business sector, green consumerism and government [6].

Green supply chain management needs some integrated elements on this implementation. The integrated elements including product, price, place and promotion. Those integrated element is called as green supply chain management 4Ps. Green product needs to consider about the design, technology, usefulness, value, convenience, quality and packaging [5]. According to the price of the products, it proved that most of the customers' who have higher education and higher income will be properly choose and pay more for the green product [1]. For the place of green supply chain management, the customers' rarely search for the green products. This kind of condition makes the place of the green products is not really considered [7]. In addition, there are so many customers that still assumed that the promotion from the green product is only to promote the environmental benefit [8].

As the movement to accumulate the customers, the company have to promote the products. Same as the conventional product, green products also needs to be promoted. Green promotion can be described as an activities to campaign the programs related to the enviromental issue. The promotion can be as the advertising, sales promotions and also directly by public relation. As the awareness of environmental condition, there are so many green promotion that apply paperless methods by using online promotion. Proper promotion on the green products will be increasing the brand loyalty on a brand.

Loyalty means a exhaustived commitment for make a repeat order of products or services. A loyalty can be improved when the customer have a strong trust in a brand. Trust is not only something that occur among the human. It also can be built in terms of the human and a brand. Brand trust is customer's willingness to rely on the

brand interm of facing the risk which caused by the expectation that the brand will cause positive outcomes [9].

The value of customer engagement will be higher if the brand trust is high too. Customer engagement is a long term relationship that arise from utiliration motivations [10]. Customer engagement behavior can be obtained through word-of-mouth, customer helping company and also customer helping customer. Customer engagement behavior has some of the dimensions that will affect its value including perceived quality, service convenience and perceived fairness [11]. There are a cycle of customer engagement such as connection, interaction, satisfaction, reteration, commitment, advocancy and engagement [12].

This time, there are so many products or services within their green label. For instance, the green product in the property industry shaded by an assosiation called as Real Estate Indonesia in the Yogyakarta chapter. Real Estate Indonesia was establish in the Jakarta, February 11nd 1972. At that time, real estate indonesia do not has any kind of organizer. On the february 18th, real estate indonesia start to establish the management. February 1972 was a clamorous month for real estate indonesia. On the February 25nd, the management of REI was proposed to the government about their estabhlisment. Now, Real Estate Indonesia hold about thousands industrial property company. Industrial property is an interesting thing to follow year by year. On 2015, the data came from REI said that industrial property increased about 30% in a year. In several year, company under the REI assosiation was developed kind of new concept in the product which is green product. Most of the concept offer the environment around the green product with the green environment and other technologies. This research could identify the customer engagement values. The customer engagement has variables and each variables has its own indicators. Therefore, the research will investigate how to recognize the relationship of the eight variables to customer engagement with the indicators follow them. In this research, eight variables are the **exogeneous** variables and customer engagement became **endogenous** variables. Such situation gives a problem, how far is the relationship between eight variables to the customer engagement followed by the indicators. The next issue is to find out how much influences of those variables toward customer engagement, the conceptual model design is needed to clarify the direction of the relationship between exogenous and endogenous variables.

Therefore, based on the identification of the problem there were several way to solve this problem by defining the variables and indicators of customer engagement to build a model and then test the hypothesis on variable relationships and gain new insight from the data. This research is conducted by Structural Equation Modeling (SEM) using AMOS 22® software. Structural equation modeling as a method for multivariate statistical analysis technique that is used to analyze structural relationships among variables. This research has ever been done by the other reseacher with the differences number of varibales and indicator that used. Based on the literature review that already done, this research adds and renewing the variables and indicators. However, the result of the research still only to know about the relationship strengthen among endogenous and exogenous variables. Therefore, to prove that this research has a novelty, it will be conducted the measurement about the customer engagement value. Ceratainly, the research need a long time and expensive cost. One of the ways to make the research more efficient is to simulate the case. **System dinamics simulation** method can be used and will give the best solution.

1.2. Research Question

1. What is the conceptual design of variables and indicators for consumer engagement models?
2. How is the significance of the relationship between variables in the model that has been built?
3. How to develop simulation model to identify the value of customer engagement in every years?

2. Literature Review

2.1. Previous Research

There are so many types of marketing including digital marketing. In [13] was conducted a research about the framework, review and research agenda of digital marketing. This research aims to build a deep understading of digital marketing. Therefore, digital marketing can be applied well. The research is about the theoritical research. The researchers was observe directly and compare to the previous study. In conclusion, the researchers was integrated the related question of digital marketing and set a research agenda for future research related to tge digital marketing from the firms' perspective.

Green supply chain management customer-level theory review was conducted by [14]. This research aims to identify and detemine the individual-level consumer behaviour theories in green supply chain management. The first thing that already done by the researchers in this research is to defining the terms of green supply chain management. then, the researchers minimized 20 consumer-level theories into six categories. Each theories have its definition, marketing application and future suggestions. Most of the theories shown that few of the customers will pay more for the green product. However, a behavior of one environmental context will not be appropriate for the others contexts. Another thing that found out by the researchers in this research is disconnected of consumer green purchasing intention and actual green purchasing behavior. For this finding, the researchers provide two theories that have been implemented before. Those theories are behavior intentions and instantiaters. This study is also allow for the manager to developing the tools to reach the market.

In [15] conducted the research about green supply chain management in the Chinese way from a medium-sized high-tech daily chemical firm. In that time, the researchers said that China still in the underdeveloped of the green supply chain management research. The objectives of this research are to find out the perception, motivation, and marketing practices of a "daily chemical" firm in the China. This study was using the conceptual framework that are structured on the epistemological stance of pragmatism. Then, the researchers was conducted semistructured interviews with the general manager (GM) of each firm within the same questions. The interview questions contains of the questions that will

be identifying influental stakeholder, motivations and perception based on the company's marketing strategies interm of green contexts. As the result, this study proved that green supply chain management are not immediatelly conductive to green sustainable principle.

A study that conducted by [16] about coffee shop customers' emotional attachment and loyalty to green store. This research has been done to predict the customers' loyalty toward green stores and green products. The objectives of this study is also to determine the characteristic of the customers' whose support the green positively on the green practices. The researchers was collecting the data by using online survey ot the U.S. coffee shop customers, the survey was fulfilled by the 312 respondents. This study was using the structural equation modelling (SEM) with LISREL 8.5 as the tool to test the hypothesized relationships. Based on the result, this research said that there is a relationship between the green practices and the customers' interested. Futhermore, the customers' attachment to green store has an influence on the store loyalty where store loyalty directly influence the product loyalty. This research found out that the customers' with high awereness on the green environmental will have stronger respond to the green store and green products.

In [17] conducted a research about green-brown rating given by third-party based on the role of prior brand loyalty and environmental concern. This study aimed to identifying two characteristics such as environmental concern and prior brand loyalty toward their relationship to customer perceptions of the validity of third-party green-brown rating information and the greeness of the brand itself. There are about five hypothesis that used in this research. The methods that the researchers used in this research is an internet-based quasi-experiment. However, to avoid the biased data, the researchers also conducted a pretest with convenience sample from a Southeastern University within 212 respondents involved. The researchers was using multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) for the hypothesis testing. The findings of this study is stated that the relationship between thirt-party green-brown rating, customers' perceived about the rating and the brand greeness perceptions will not always appear.

Next research came from [18], this research aimed to investigate the customers' perceptions of a brand's green benefits and green transparency on their green perceived value (GPV), especially to test the role of GPV and self-brand connection toward its relationship between green benefits, green tranparency and brand loyalty. This study was collecting the data by 826 Chinese respondents. The measurement scale for this study was adopted by the previous studies by using 1 until 7 as the scale parameters where 1 is strongly disagree and 7 is strongly agree. Also, the researchers enter the demographic informaton while collecting the data. The data was testing by using structural equation modelling. The subject in this research was seven popular green brand realted to the products and service available in China. This research was approve that most of the hypothesis is accepted. Yet, products and services will have different strategies to make it more effective.

Image, satisfaction, trust, love, and respect on loyalty information have effect for a name-brand. In [19] conducted a research, the purpose of this research was identifying the structural associations among image, satisfaction, trust, lovemarks and brand loyalty for the name brand coffee shops. The researchers was spreading the questionnaire to 410 respondents. The data were analyzed by using the SPSS and AMOS statistical packages. Based on this research, it was found customers' brand love and respect will be affecting the relationship between trust and brand loyalty. brand image will have big impact to the rating of customers' satsfaction and trust. Satisfaction will be affecting the trust, trust will be positively related to the brand loyalty.

At that time, the research about customers engagement in a hospitality was really rare. In [20] conducted a research about the customers engagement behavior in hospitality. Since most of the previous study were about the things beside the customers engagement, it became the limitation for this research because it lake of references. The purpose of this research was to fulfill the hole between previous research by studying the influence of two customers engagement behavious such as word-of-mouth and co-creation. This study was done by using partial least squares (PLS) structural equation modeling to estimate the model. The data was collected in july 2012 by a market research firm using web-based survey. The result of this research shown that there are two types of driven motivate customer engagement such as common antecedents and behavior-specific antecedents, it can be setted as the theoritical base on the future research. For the practitioners, this study was provide the management of customer engagement behaviour by signifying which antecedents will work and observe the importance of implementing segmentation programs when managing customer engagement behaviour.

Industry 4.0 drive the world to be in the digital era. Therefore, any kind of social media can be the tools to building brand communities. The researchers was done a research that aimed to developing the model where this model will describe how customers' relationship with the elements of brand comunnity based on the social media influence brand trust. This research conducted with structual equation modeling (SEM) by using EQS. Then, the model will be assessed by using chi-square, the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR) and the comparative fit index (CFI). Three out of the four initial hypothesis are accepted. However, customer-other customers' relationships has negative impact to the brand trust, which is counter intuitive and interesting [21-29].

The researchers conducted the research about the role of customer engagement in building customer loyalty to tourism brands [30-34]. This research aimed to investigates the relationship of customer engagement with traditional antecedents of brand loyalty. This research was done by using structural equation modeling. The data collected on the 496 hotel and airline customers suggest that customer engagement enhance customers' service brand evaluation, brand trust and brand loyalty. Based on the result, it shown that service brand loyalty has strong impact not only through the service consumption experience but also through customer engagement beyond the service encounter. The findings of this research also shown that there are five strongly variable influence the customer engagement such as identification, enthusiasm,

attention, absorption and intercation, also there are three additional variable which are service quality, perceived value and customer satisfaction.

Before this research, there are so many research about the customer engagement but there is no research interm of tourism context. Harrigan and three researchers [35] conducted a research about customer engagement with tourism social media brands. The purpose of this research is investigate the nature customer engagement with tourism social media brands. the data was collected by Amazon Mechanical Turk (Mturk) market place during half of 2015 using online survey. As the result, 11 out of 25-item can be taken both for tourism and non-tourism context. Although, brand have to be becareful when works with the social media especially for how the contents (picture, video and soon) effectively shared to the public. Oktarizma was conduct the research about the effect of customer engagement toward brand trust in green supply chain management. The case study of this research is starbucks coffee in Yogyakarta. This research was focusing the observation to the green promotion. The purpose of the research is to make a design models of the customer engagement and to find out the relationship between variables. The data was collected by using online questionnaire toward google form. The researcher was used structural equation modeling (SEM) method. Data processing was done by using SPSS and AMOS 22 software. There are three variables that used in this research such as attention, interactiona nd customer satisfaction. As the result, two out of three variable has influence to the brand trust value.

In [36-40] was conducted the research about "System Dynamics in Tourism Planning and Development". The research aims to asses the application of the system dynamics method the tourism industry's planning and development. The researchers also used SLR method interm of finding out the data that will be needed. Based on the SLR method, the researchers collect the data from 27 paper. The paper analysis shows about the SD application to reduce many different problems. In the end of the research, it is concluded that the application of SD can be the tools for the tourism to provide decision-making and regulation to the tourism industry aspect. The system dynamics application also provide the tools for the strategy and operational policy. The recommendation for this research is to extend the used of SD modelling to promote the understanding and complex issues faced by industry. Based on the previous study, it can be built a CK-Chart.

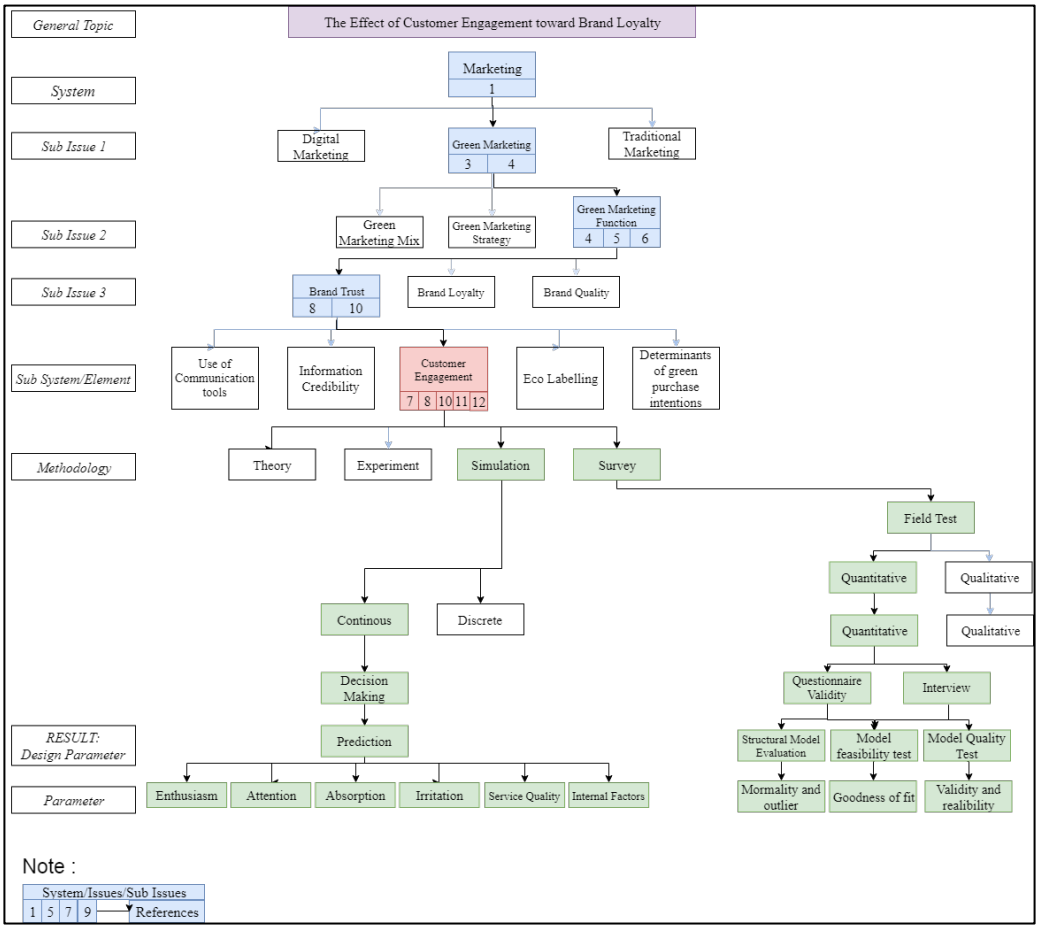

Figure 1. CK-Chart

2.2. Basic Theory

Marketing contains of many activities such as transaction, advertising, distributing and selling a product or service. Marketing is a process to sharing information and bulding relationships interm of compile the strategies goal, capabilities and resources, with the goal of increasing organizational relevance and influence to maintain awareness of broader policies and beliefs that set organizational directions through strategic initiatives and funding [41]. Marketing can be used for any kinds of organization inclusing profit organization and non-profit organization [42]. There are two types things that will be

offered during the marketing section such as a product or a service. Those two things have different ways of how it should be treated. If it is in the service company, employees who gets lower paid, then he or she will make more contacts to the customer. Whereas, in the product company, only a few of top employee will have contacts with the customer [43].

The issues about green supply chain management appears approximately in late 1980s and early 1990s. First workshop named as "ecological marketing" in [44]. The awareness of future environmental circumstances, many of the researchers was begin the research about green supply chain management, either for the green design, green product or another green program. This issues was created so many backlashes. Crane was develop the strategic responses to the green supply chain management backlash. There are four strategies respon including passive greening, muted greening, niche greening and collaborative greening [45]. Those responses can be applied in the different term of the firm.

Green supply chain management has several part such as eco orientation, green supply chain management strategy, green supply chain management strategy, green supply chain management consequences and green supply chain management function. The green supply chain management function include products, promotion, retailing and distribution and others issues like branding, positioning and international marketing [46].

On of unction of green supply chain management is to build brand trust. Trust is built because there is hope that other parties will act according to the needs and desires of consumers. Human trust is not only can be showed to others, but also for invesible objects like a brand. In [47] was defined brans trust as customer's willingness to rely on the brand interm of facing the risk which caused by the expectation that the brand will cause positive outcomes.

Customer engagement is a psycological state of mind that leads to frequent interaction with the brand, customer engagement is a long term relationship that arise from utilitarian motivations [48]. In [49] was defined the customer engagement as the marketing activity which oriented on the action and customers' psychology. This is reflected on the customers' interaction with other customers or the company on a forum to get product information or anticipated the risks that will be accepted if he/she consume the products.

3. Methodology/Materials

3.1. Data Collecting Method

This research will be conducted at the Real Estate Indonesia (REI) Yogyakarta chapter. REI was selected because their develop a green housing concept on their product which is related to this research. The focus in this research will be the customer engagement on the company which incooperated eith REI Yogyakarta.

There are two types of data collecting that will be used in this research such as questionnaire and expert judgement. Questionnaire are spreading to the customers who ever bought and know about the company products. The questionnaire contents about 22 questions related to the issue. The questionnaire are fulfiled by Likert scale that start from 1 to 5. Then, after the SEM result is done. This study need the data that come from the expert judgement to process the simulation.

This research used hybrid Structural Equation Modeiling (SEM) and System Dynamics. SEM will be processed by using AMOS 22. There are several step in SEM method, those step include development of theoretical models, development of path diagram, conversion of path diagram into the equation, model input & estimation, identification, model evaluation, and model interpretation. While the significant variables are obtained by the SEM result. Since SEM only will calculate the strengthen of relationship between the variables and its indicators. Next, it will be processed by using powersim 9 to predict the customer engagement value.

3.2. Conceptual Model (framework)

Based on the researchs that have been done before, the conceptual model will be made to facilitate research. The conceptual model that will be made is about the relationship of exogenous variables and its indicator to the endogenous variables. The endogenous variable is customer engagement. The the exogenous variable will be explained below.

The value of customer engagement is affected by some variable. So [50] divided the variables into five including :

1. Enthusiasm

This represents an individual's strong level of excitement and interest regarding the focus of engagement, such as brand. Most of the researches said that enthusiasm give a positive affecting state both for the work engagement and customer engagement.

2. Attention

The researchers was constantly said attention as the key dimension of engagement. Attention can be said as an invisible material resource that can be allocated in multiple ways by a person. Someone with high engaged will focus on the attention of a brand.

3. Absorption

Absorption represents effortless concentration, loss of self-consciousness, distortion of time, and intrinsic enjoyment. Absorption means while the customer spending time toward a brand, the time will passing quickly.

4. Interaction

This referred to both of online and offline participation with the customer. This interaction including sharing and exchang the ideas. If the engagement increase, the probability of the customer involvement to the company activities will be higher.

5. Identification

Identification will appear when the customer describe themself as the brand or the product. The customer with high identification toward a brand will called themself as the brand.

The following hypotheses have been formulated to test the effect of customer engagement toward brand trust :

(H1) Customers' enthusiasm has an influence on customer engagement.

(H2) Customers' attention has an influence on customer engagement.

(H3) Customers' absorption has an influence on customer engagement.

(H4) Customers' interaction has an influence on customer engagement.

(H5) Customers' identification has an influence on customer engagement.

Beside the variables that increase the value of customer engagement. This research also require to add negative variable. According to the research that have been done by [51], there are about five negative variable that contributed in the engagement such as irritation, community intimacy, time, community changes and subjectivity. Iritation means the activity that come from other customer can also be perceived unfavorly. This variable is related to the misbehavior and perceived disturbances. Based on the explanation above, the hypothesis can be proposed that :

(H6) Irritation are negatively affect the customer engagement.

As the additional, So [52] with other researchers add three variables also give positive impact of the customer engagement value. Those three variables refer to the service brand evalutioan including the perception of value for money and customer satisfaction with the puchase. Based on the explanation above, the hypotheses can be proposed that :

(H7) Customer satisfaction has an influence on customer engagement.

(H8) Service quality has an influence on customer engagement.

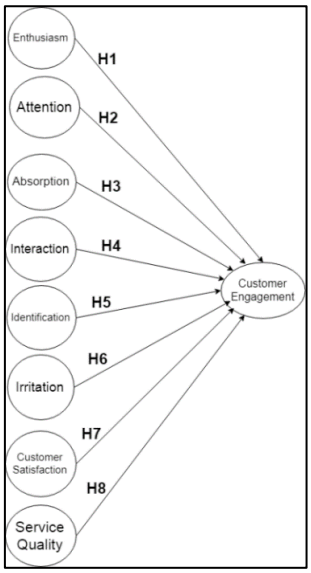

Figure 2. Conceptual Research Model

4. Results and Findings

4.1. Data Collecting

The data collecting is conducted by spreading the online questionnaire using google form. The target respondents of the questionnaire is the customers of property industry which incorporiate with REI Yogyakarta, and questionnaire that distributed to consumers consist of 22 statements. The number of respondents in this questionnaire totaled 400 consumers who had already bought or knew about property industry. The characteristics of respondents who have filled out the questionnaire can be seen in the Table 1 below.

Table 1. Characteristic of Respondents

Characteristic	Total	Percentage
Gender		
Female	194	48.5%
Male	206	51.5%
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 Employee	135	33.75%
Others	69	17.25%
	118	29.5%

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 Theoretical Models

Based on the objective that already determined by the researcher, it can be built a theory-based model. The theories aims as the idea of the SEM application. The theories contains about several variables that needed in this research. The explanation of variables will be shown in the table 2 below.

Table 2. Variable 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 variable that will be processed. Each of variables have its indicator. The indicator can be shown in the table 3 below.

Table 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 Yogyakarta, I feel happy.	X8	AB2
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 participate 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	
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? Poor – Excellent	X20	SQ1
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

No	Variable	Attributes	Variable	Instruments code
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 element such as the construct and the relationship between them. In terms of AMOS application, the construct represent the variable and its sign is oval. Besides, the observed variable sign is 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 2 below.

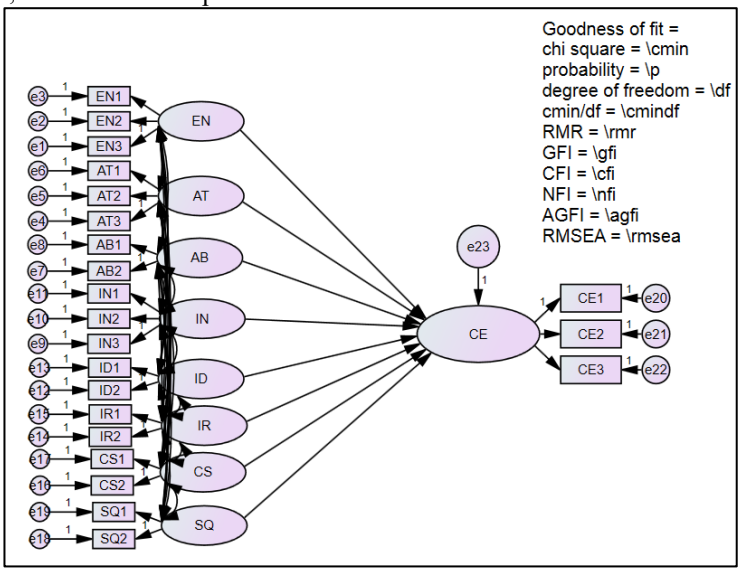

Figure 2. Path Diagram of Customer Engagement

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. Strucutral Equation Model

This equation is to express the causality relationship between various constructs

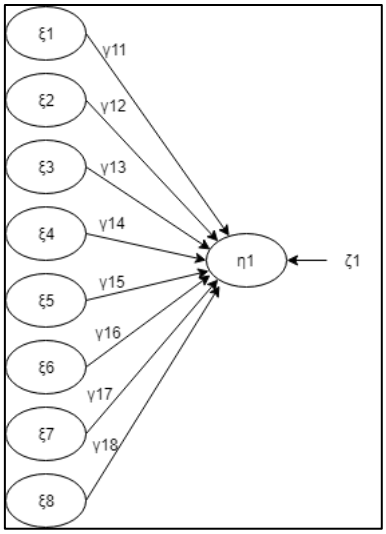

Figure 3. Structural Equation Model

The formulation of structural equation model can be define 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

This measurement is divided between two types as follows :

1) Measurement equation model for endogenous variable

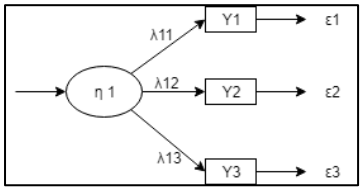

Figure 4. Endogenous Variables

The figure 4.3 above is shown about the structural equation model for the endogenous variable. The endogenous variable in this research is customer

engagement. The formulation for the endogenous variable defines as :

$$Y1 = \lambda_{11}\eta_1 + \varepsilon_1$$
$$Y2 = \lambda_{21}\eta_2 + \varepsilon_2$$

2) Measurement equation model for endogenous variable

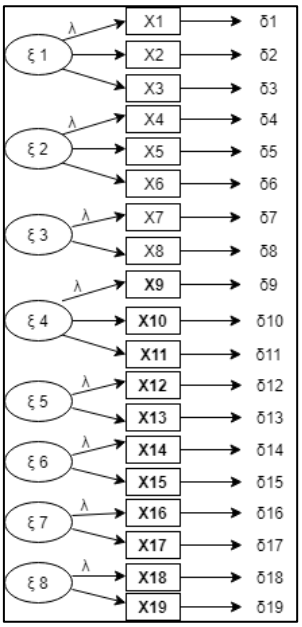

Figure 5. Exogenous Variables

The figure 5 above is shown about 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 defines as :

$X1 = \lambda_{11}\xi_1 + \delta_1$; $X2 = \lambda_{21}\xi_1 + \delta_2$; $X3 = \lambda_{31}\xi_1 + \delta_3$; $X4 = \lambda_{42}\xi_2 + \delta_4$;$X5 = \lambda_{52}\xi_2 + \delta_5$; $X6 = \lambda_{62}\xi_2 + \delta_6$; $X7 = \lambda_{73}\xi_3 + \delta_7$; $X8 = \lambda_{83}\xi_3 + \delta_8$; $X9 = \lambda_{94}\xi_4 + \delta_9$; $X10 = \lambda_{104}\xi_4 + \delta_{10}$; $X11 = \lambda_{114}\xi_4 + \delta_{11}$; $X12 = \lambda_{125}\xi_5 + \delta_{12}$; $X13 = \lambda_{135}\xi_5 + \delta_{13}$; $X14 = \lambda_{146}\xi_6 + \delta_{14}$; $X15 = \lambda_{156}\xi_6 + \delta_{15}$; $X16 = \lambda_{167}\xi_7 + \delta_{16}$; $X17 = \lambda_{177}\xi_7 + \delta_{17}$; $X18 = \lambda_{178}\xi_8 + \delta_{17}$; $X19 = \lambda_{198}\xi_8 + \delta_{19}$

4.2.3. Model Input and Estimation

There are two type 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 offer clear comparisons between different population or 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 catagorized as Generalized Least Square (GLS) for its proposed model. The number of indicator is 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.

4.2.4. Identification

The problem that usually appear in the identification is the incapability of the model to produce good estimation. AMOS 22 as the tools to calculate SEM provide 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.

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 come 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.

4.2.5. Model Evaluation

a. Feasibility test of measurement model

Feasibility test of measurement also known as confirmatory factor analysis (CFA). This measurement has two measurement such as realibility and validity. The aims of this measurement is 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 measure well for each indicator. A variable is truly measured by each indicator if it has a variance extracted value (AVE) ≥ 0.5 and construct reliability (CR) ≥ 0.7. Here is the analysis of SEM output for data quality test can be shown in Table 4

Table 4. 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
		BT2	0.817	0.667	0.333		
		BT3	0.865	0.748	0.252		
		∑	2.475	2.045	0.955		
		∑2	6.126				

b. Test model assumptions

There several test that have to be done before it turn into structural model. Those test are normality and outlier assumption.

1) Normality assumption

According to the resutl that obtained by AMOS 22, it can be said that most of the data are normally distrubuted. This 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 kutosis value,almost all of the value are normally distributed excluding IR2.

The abnormal indictors that occur on the data will be affected the value of chi-square(increase) and probability(decrease). Abnormal data is appear because of the data obtained by the customer who has their own perpective 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 [53].

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 defines as multivariate outlier data if the p <0.001. In this research, there are 22 variable 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 variable is about 48.26794. It means, if the mahalanobis distance value is higher than 48.26794 then the data define as the outlier. Based on result, 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 has a significant effect. This structural model also specify as the hypothesis test. The result of structural model can be seen in the figure 6 below.

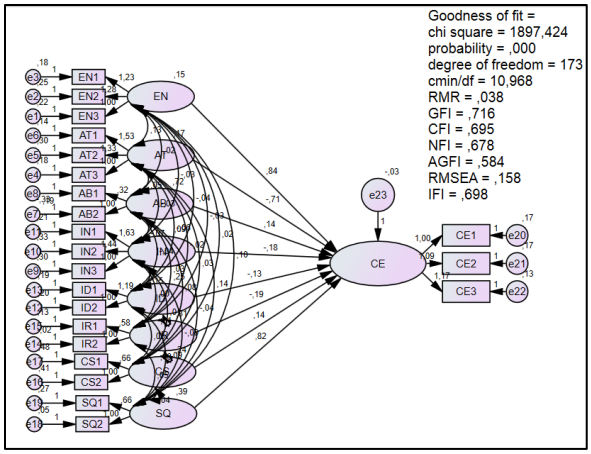

Figure 1. Structural Model of Customer Engagement

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 5. Goodness of Fit

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

Based on [54], it stated that some of the accepted goodness of fit indicates can represent the model as accepted model. It means the model that used for this research is accepted.

4.3.Hypothesis testing

The last stage of testing data 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 is 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 6. 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 variable. New model can be seen on t he figure 7 below.

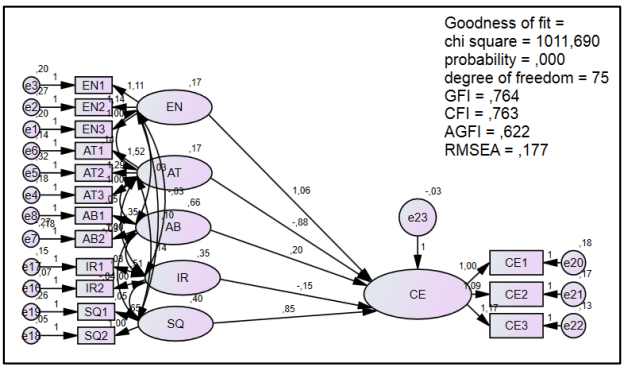

Figure 2. Recommendation Model and Its result of Customer Engagement

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

Table 7. 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 hypothesis on thevariables 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 factor which are interconnected. The relationship in CLD will not contains about the relationship for each variables but it also build the loop. The variables on the CLD will be adopted by the SEM result which is five accepted variables. The endogenous variables in the SEM which is customer engagement will be the internal factor. Bulid 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 serveice quality. The figure below will show about CLD that will be used in this research.

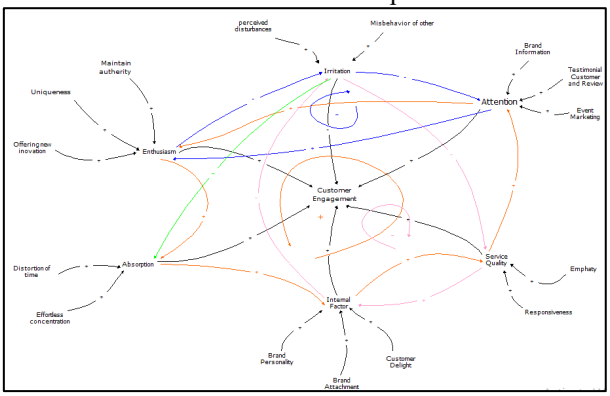

Figure 3. Causal Loop Diagram of Customer Engagement

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.

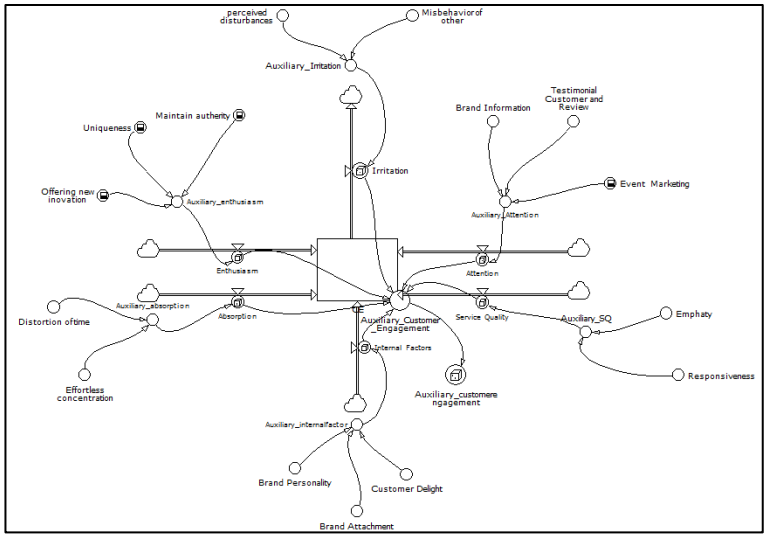

Figure 4. Flowdiagram of Customer Engagement

4.5.2. Flow diagram modelling

1. Input data

The inputantion data that will be used in this research will be in the same model as the SEM, the number of variables and indicaros will be as same as the recommendation model in the SEM calculation.Input data is defined as the data that has constant value. the data was obtained by the questionnaire and the interview toward three expert in the Real Estate Indonesia on the Yogyakarta city. The likert scale that have been done by the interview with the expert judgement is in the range of 1 to 5. The data that come 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 expalin about the input data within its value on the variables and indicators :

Table 8. Input Data

No	Variable	EP1	EP2	EP3	Geomean	
S1	**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
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 by the mathematical, the parameter and also by the inputation data that already done in the previous stage. The data inputation come from the interview with the expert jugdements. Before the formulation is inputed into the model, it should be defined the unit first. The definition that will be used defined the unit as “values”. The “values” is defined as unit because the research is the qualitative research. The qualitative research have no units, therefore values is defines 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 variables.

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

The variables (indicators) that already defined, then it is connected with the additional auxiliary just like in the figure 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 be shown about the if function application on the definition box.

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 with IF function, next will be connected to other auxiliary with the RANDOM and ROUND function. The function of RANDOM and ROUND aims 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 start 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.

The last connection flow for the auxiliary is the auxiliary for the customer engagement (can be seen on the figure 9). This auxiliary is needed as the final result of the model. Customer Engagement in the level cannot be given the definition, 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 be shown the result of the model that already simulated for ten years :

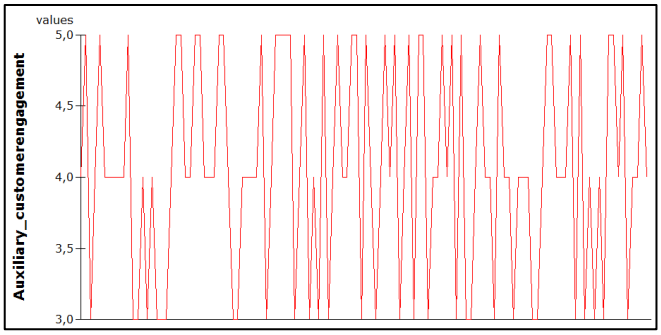

Figure 10. The Graphic of simulation result of Customer Engagement

Based on the figure 10 above, it can be concluded that for the ten years, the transformation of the customer engagement value on the REI Yogyakarta is not always increase and also it is not always 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 the 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 has small value. The comparison can be seen on the figure 11 below.

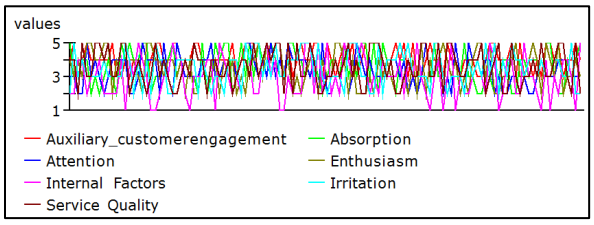

Figure 11. The Customer Engagement Value compared with Its Variables

Each of the variables has its own value. this simulation also provide variables value. the variables here are enthusiams, attention, absorption, irritation and service quality.

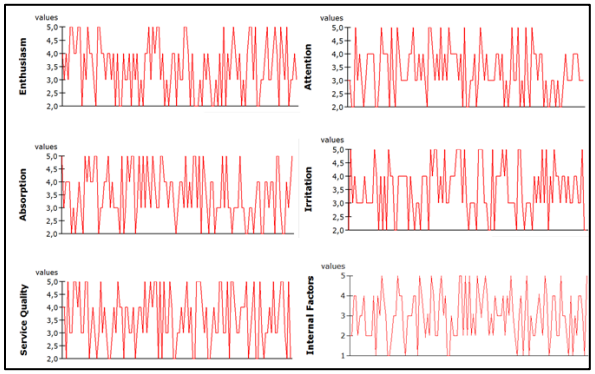

Figure 12. Variables Values

The figure 12 above shows about the variables value. Based on the result, most of the variables has the minimum value of 2 and maximum value of 5, except the internal factor has the minimum value about 1. This research is simulated the customer engagement value for ten years.

5. Discussion

This research require to build a model, the model that already built in the very beginning of the research is conceptual model for the endogenous and exogenous variables of customer engagement. This research is a continuance research of the other researches. This research has additional indicators and variables within one endogenous variable, eight exogenous variables and twenty two variables. The endogenous variable is customer engagement. Those exogenous variables are enthusiam, attention, absorption, interaction, identification, irritation, customer satisfaction and service quality. All of the variables and indicator used in the conceptual model will be processed by using Structural Equation Modelling (SEM) within the AMOS 22® Software as the tools to calculate the SEM calculation.

The questionnaire was spreaded to 750 of the customer and in the total there are 400 questionnaires that already fulfiled by the customer. This data is met the requirement of the minimum data for SEM application. The data that already got from the questionnaire then processed by the AMOS 22® Software. Based on the result of feasibility test on the measurement model, the almost all of the data are valid and reliable. It is because the result of critical ration is more than 0.7 and the result of AVE is more than 0.5. However, there are two variables are not valid and reliable such as Interaction and Customer Satisfaction. Based on the normality test, almost all of the data are normally distributed, but there are several indicators that is not normally distrbuted such as CS1,CS2, AB2, EN2 and IR2. For the outlier test, there is no outlier in the data because the maximum number of CHIINV for this study is 49.72823 and all of the mahalanobis d-square is smaller than the maximum number.

The feasibility test of structural model contains about the result of the probability, cmin/df, chi-square, GFI, RMSEA, RMR, AGRI, IFI, CFI and NFI. According to the result that generated by the AMOS 22 Software, three out of ten goodness of fit indicates are accepted, the others seven are rejected. Those accepted indicates are probabilty, cmin/df and RMR. It is because those three are fulfilled the requirement. Based on the test, the model can be said as the accepted model because it is stated that some of the accepted goodness of fit indicates can represent the model as accepted model [26].

Based on the hypothesis testing, five out of eight exogenous variables have an influence to the customer engagement. This means, only five hypothesis that accepted.Based on the data in the table 4.10, the hypothetsis on the conceptual model which. H1, H2, H3, H6 and H8 are accepted. This can be proved that only five accepted variables by look at the result of critical ratio and probability. The requirement for the critical ratio and probability are >1.96 and <0.05. Because all of the variables are no accepted, then the AMOS 22 Software give a recommendation as the new model. The new model contains with five accepted variables such as **Enthusiasm, Attention, Absorption, Irritation and Service Quality**.

After the accepted variables already identified. Next stage is to simulate the model. First, the system dinamics simulation are needed to build the Causal Loop Diagram (CLD) for the model. CLD are made to define the relationship in each related variables. There are six variable that including in the CLD such as Enthusiam, Attention, Absorption, Irritation, Service Quality and internal factor. The relationship is defined by the direct interview with the expert judgement. On the CLD, it contains about the positive and negative relationship. In this study, the model has three loop relation within one positive loop and two negative loop.

After the CLD already identified, then the flow diagram is built. On the flow diagram, it is required to input the data on the definition box on all of the variables and indicators. The inputation data come fromthe three expert judgements. The expert in this study is the developer, financial manager and marketing in the REI Yogyakarta. The result of the qualitative interview is represented as the scale number from 1 to 5.

The data inputation from the expert judgement is calculated first by using Micsrosoft Excel. The function to generated the data is GEOMEAN. Next, the data will be inputed in the definition box. The data need to be uniform while it turns into the definition box. To make it more efficience, it is assumed that the data has a unit of <<values>>, <<values>> is choosen as the unit because the data used in this research is a information data that does not have specific unit like meter, newton dan many more. While the data already inputted and given by the formulation, the model can be simulated. This study simulate the customer engagement value for 10 years. Based on the result of simulation, it can be concluded that the customer engagement value is not always increase and decrease. The minimal value is 3 and maximum value is 5. Based on the figure 10, there is no stability on the customer engagement value. for the ten years of simulation, the data show that the value of CE will always change, although there are some condition where minimum two month and maximum four month that the value has same value which can be called as the constant value. This result can be benefitial for the REI Yogyakarta to build a decision to make the customer engagement value still constantly high.

After the simulation result was provided by the Powerim 9 Software, it can be built the scenarion design. Scenation design aims to make a decision for solve the situantion. Figure 11 shows about the customer engagement value compared with other variables. Figure 11 tells us that the customer engagement value will decrease while other variables have small value too. Based on the result, the decision maker can make a great decision by look at the graphic change. Therefore, this discussion will also build the scenario design. The scenario design can be the recommendation action for the company keep their customer engagement value become constantly in the high value.

Based on the enthusiasm value on the figure 12, scenario design can be built as to increase the values into more than 3. The values can be increased by improving the uniqueness, new innovation and also maintainance. Attention value is need to be imporved. Because this simulation show that small values of the attention will be affected to the customer engagement value. The values can be higher if the company improve their brand information like promoted the product more often, turn into event marketing in the public event and educate the customer about the product so they will give a good feedback related to the product testimonial and review. Small values on the absorption give the influence to the

customer engagement. REI Yogyakarta have to improve their absorption values. As the scenario design, this values can be improved within give the comfortable zone to the customer, then they will not need much effort to consentrate while the customer use the product also it will not need much time. Scenario design for the irritation is to decreasing the irritation value. irritation means the distrction either come through the word of mouth also can be from the misbehavioral of other customers. The scenario design for this case is to improve the service quality values. The service quality is about how the company offering the service well to the customer. This can be improve if the company deserve the good emphaty and responsiveness. Internal factors are actually come from the customers' perspectif. As the scenarion design, this have to improve to make the customer engagement has higher values.

6. Conclusion

Green supply chain through customer engagement aids improved customer/stakeholder retention or loyalty resulting to economic development, positive image building, innovation and better resource utilization. Based on the calculation above, a conclusion can be drawn to answer the problem identification. It is stated in the following statement. The conceptual model of this research already build. The model contains of one endogenous variable which is customer engagement and five exogenous variables such as enthusiasm, attention, absorption, irritation and service quality.

Green supply chain management practices are important for the continuous success of business, communities and countries. Customer engagement can play an important part to enhance the sustainable supply chain management practices. Sustainability cannot be handled in segregated manner and has to be part of operations and decision-making throughout the entire lifecycle with integrated supply chain, and customer engagement can be a driver to create the change needed which will be success for the business and customers all along. The significant relationship between endogenous and exogenous variables can be define that H1, H2, H3, H6 and H8 are accepted. Those variables are enthusiasm, attention, absorption, irritation and service quality. Wheres, H4, H5 and H7 is rejected. The rejected variables are intention, identification and customer satisfaction.

It has been obtained the results of a simulation on the customer engagement values which can be the reference for the decision makers to build appropriate decision making. As the recommendation for the further research , it is necessary to re-identify exogenous variables that have not been found and affect the value of customer engagement

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