

# The Effect of Innovation Factors to Customer Loyalty by Structural Equation Model

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**Abstract**—Innovation is being view from four areas of innovation, product, service, technology, and marketing. Whereas customer loyalty is composed of customer expectation, perceived quality, perceived value, corporate image, customer satisfaction, customer trust/confidence, customer commitment, customer complaint, and customer loyalty. This study aimed to investigate the influence of innovation factors to customer loyalty to GSM in the telecom companies where use of products and services. Structural Equation Modeling (SEM) using to analyze innovation factors. It was found the factor of innovation have significant influence on customer loyalty.

**Keywords**—Innovation, telecommunication, customer loyalty, SEM

## I. INTRODUCTION

INDONESIA is one of a high growth rate country in telecommunications. Until year 2008 it was in the third position in Asia market, which is ranked of 15th of 20 countries Internet user in the world, with active users as much as 25 million people. Currently it has 11 pieces operators or providers, namely Telkom, Telkomsel, Indosat, Bakrie Telecom, Excelcomindo, Mobile-8, Smart, Sampoerna IT, NTS and Hutchinson. Most of the market share of GSM telecommunications market is held by three main operators, namely SingTel, Indosat and Excelcomindo.

These conditions make the telecommunications market becomes more competitive, with increasingly strong competition, which led to increasing levels of churn rate (customer transfer) and decreased of ARPU (Average Revenue Per-Unit) of the operator. Nowadays, customers not only see the benefits of a telecommunications provider based on the rates offered, but also quality of service, innovation, and the signal coverage owned by the provider. These three factors will affect the level of satisfaction received by each customer. For that reason, the telecommunication provider needs to develop innovative products and services, with better quality in order to retain more customers[1].

According to Luecke and Katz, innovation is the introduction or development of a new product or method, which gives a positive impact. Innovation is the embodiment, combination, or synthesis of knowledge which is original, relevant, and gives added value to the product, process, or service.

Innovation can cover many areas of business processes, such as product, process or service, technology, organization, marketing, and strategy of the company[2]. Innovation as new processes run by the organization is a sustainable business cycle. This cycle consists of several phases such as awareness, appreciation, adoption, diffusion, and implementation[3].

Diffusion of innovation is a process by which innovation is communicated through certain channels of information and in a certain period of time, to the members of a particular social system that regulates relationships between individuals[2].

In this study, we will be focused on the diffusion of the innovation process itself. There are some attributes that are often used to measure the advantages and disadvantages of an innovation, namely: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability[4]- [6].

Loyalty is faithfulness that arises without any forces, but comes from consciousness itself based on experience which felt in the past. Loyalty happened from satisfied customers. In the ECSI model (European Customer Satisfaction Index)[7],[8], customer loyalty arised as a result of customer satisfaction on quality, value, expectations, and company image.

According to Marie-Christine Plichon Lichtlé and Véronique, customer loyalty (attitudes and behavior) comes from the commitment and trust / confidence of customers, which is formed as a result of a feeling satisfied with the purchase or consumption of a goods[9].

Innovation, customer satisfaction and loyalty is often referred as latent variables, then to analyze it, can use the Structural Equation Modeling (SEM) method which can be explained by several indicators (manifest variables) to be observed directly through a survey to the respondents[10]- [13].

The questionnaire consists of three parts, the first is about customer satisfaction to the performance of innovation, which includes products, services, technology, and marketing innovation.

The second section about the level of customer agreement on statements related to customer expectations, quality, value, satisfaction, company image, customer trust, commitment, complaints, and customer loyalty. Both parts are represented by 41 statements of questionnaire that uses 5-point Likert scale [14]. The third part is about the respondent's personal data.

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and customization, ease of service of Indosat, technological excellence, as well as attractive promotions [5],[8]. While compatibility of innovation is the degree of suitability of an innovation to the experience and value of customers, which significantly affects the willingness to adopt an innovation measured from the conformance to customer requirements, market developments, lifestyle, work patterns, services needs, habits, and social culture of the customer [5],[8].

Questionnaires have been conducting a pilot test on 50 respondents with construct reliability (Chronbach  $\alpha$ ) greater than 0.70 (the standard measure of reliability).

From the total of 418 questionnaires distributed, there were 410 valid questionnaires that are considered adequate, consist of 53% women respondents and 47% male. The majorities of customers are aged between 17-25 years (89%) and have a residence in South Jakarta (25%), East Jakarta (20%), and Depok (West Java) (20%). Whereas based on the product used, 86% are IM3 users, 11% Mentari users, and only 3% who use Matrix. Most respondents use a Indosat GSM for SMS (67%), Internet (15%), and Phone (13%). In addition, most respondents also spent a pulse < Rp100.000 (US \$10.5), - per month (74%).

This study uses Structural Equation Modeling (SEM) with LISREL 8.80 to evaluate the measurement model and structural model of research. SEM can be described as follows:

- Structural model

$$\eta = B\eta + \Gamma\xi + \zeta \quad (1)$$

- Measurement model

Measurement model for y

$$y = \Lambda y\eta + \varepsilon \quad (2)$$

Measurement model for x

$$x = \Lambda x\xi + \delta \quad (3)$$

with:

- $\eta$  (eta) is  $m \times 1$  latent endogenous variables
- $\xi$  (ksi) is  $n \times 1$  latent exogenous variables
- $\zeta$  (zeta) is  $m \times 1$  latent errors in equations
- Y is  $p \times 1$  observed indicators of  $\eta$
- X is  $q \times 1$  observed indicators of  $\xi$
- $\varepsilon$  (epsilon) is  $p \times 1$  measurement errors for y
- $\delta$  (delta) is  $q \times 1$  measurement errors for x
- B (beta) is  $m \times m$  coefficient matrix for latent endogenous variables
- $\Gamma$  (gamma) is  $m \times n$  coefficient matrix for latent exogenous variables
- $\Lambda y$  (lambda y) is  $p \times m$  coefficient matrix relating y to  $\eta$
- $\Lambda x$  (lambda x) is  $q \times n$  coefficient matrix relating x to  $\xi$

There are five main stages in the analysis which are model specification, model identification, model estimation, model fit test, and model respecification.

In this study, the estimation performed using Robust Maximum Likelihood Estimator (RMLE), and use 16 goodness of fit index to test the suitability of estimation model with existing data. These measures are: Statistics Chi-square,  $\chi^2$  (the smaller, more fit,  $P > 0.05$ ), scaled NCP (small value

and narrow interval), Goodness-of-Fit Index (GFI, values are  $> 0.9$ ), Root Mean Square Residual (RMR, the value  $\leq 0.05$ ), Root Mean Square Error of Approximation (RMSEA, value  $\leq 0.08$ ), Expected Cross-Validation Index (ECVI, the closer to Saturated ECVI, better for the model), Tucker-Lewis Index or Non-Normed Fit Index (NNFI, value  $\geq 0.9$ ), Normed Fit Index (NFI, value  $\geq 0.9$ ), Adjusted Goodnes of Fit Index (AGFI, value  $\geq 0.9$ ), Relative Fit Index (RFI, value  $\geq 0.9$ ), Incremental Fit Index (IFI, value  $\geq 0.9$ ), Comparative Fit Index (CFI, value  $\geq 0.9$ ), Normed Chi-Square (lower limit: 1, upper limit: 2 or 3 & a more lenient 5), Akaike Information Criterion (AIC, the closer to Saturated AIC, better for the model), Consistent Akaike Information Criterion (CAIC, the closer to Saturated CAIC, better for the model), and Critical "N" (CN, value  $\geq 200$ ).

## II. RESULTS AND DISCUSSION

There are two important parts related to the measurement model and structural model of the research.

### A. Measurement model

The measurement model was analyzed by using confirmatory factor analysis. Based on the model fit test, it was found that the measurement model has a good fit with the data, as shown in Table 1, where 10 of the 16 goodness of fit index show that the measurement model was fit to the data. In Table 2, we can see that the 39 indicators used (Observed variables) has a good validity with standard factor loading ranged from 0.52 - 0.96, indicating a strong relationship between the 39 indicators and the measured concept (latent variables), while the two indicators ("I will immediately recharge my GSM card if its active period had expired" and "I will tolerate the rate increase proposed ") have a standard factor loading  $< 0.5$ , thus eliminated from the model. Composite reliability, can be seen in Table 3 ranged between 0.91 - 0.98 indicated good reliability of the measurement model, and the value of extract variants between 0.56 - 0.95 (greater than 0.5) indicates that the variation of observed variables can be explained by the variation of latent variable significantly.

### B. Structural Model

The structural model was analyzed using SEM to see the relationship between factors that have influence in the model. At the first estimation, the structural model showed a lot of insignificant relationships, so the model was re-evaluated. There were four relationships influence (path) being removed, from the two innovation attributes (relative advantage and compatibility) to customer satisfaction and loyalty, and there are additional paths from the two innovation attributes (relative advantage and compatibility) to the customer trust. After being re-evaluated estimation results showed the structural models have a good fit between the data and model. In the final estimation results shown in Table 3, the nine main hypothesis of the study (which consists of 50 sub-hypotheses), there are six hypotheses fulfilled. Meanwhile, three other hypotheses are not which are:  $H_1$ ,  $H_5$  and  $H_6$ . Hypothesis 1 is not met because the two attributes of innovation (relative advantage and compatibility) and customer complaints do not have a significant direct effect on customer loyalty.

Hypothesis 5 is not met due to the fact that the two attributes of innovation (relative advantage and compatibility) and customer expectations have no significant direct influence on customer satisfaction. While Hypothesis 6 is not met because of the fact that the two attributes of innovation (relative advantage and compatibility) and corporate image has no significant direct effect on perceived value.

Two attributes of innovation (relative advantage and compatibility) has no significant direct influence on satisfaction and loyalty to customers it will not immediately become dissatisfied or disloyal simply because the innovations.

TABLE I  
FACTOR LOADING OF MEASUREMENT MODEL

Observed Variable	RelAd	Compat	PerValue	PerQual	CustExp	CorpImg	CustSati	CustTrus	CustComm	CustComp	Loyalty
1	0,52	0,66	0,91	0,89	0,89	0,71	0,93	0,9	0,95	0,95	0,44*
2	0,69	0,66	0,93	0,88	0,95	0,86	0,9	0,87	0,96	0,95	0,43*
3	0,7	0,72	0,74	0,81	0,87	0,86	0,88	-	-	-	0,65
4	0,79	0,68	-	-	-	-	-	-	-	-	0,7
5	0,68	0,73	-	-	-	-	-	-	-	-	0,93
6	0,7	0,74	-	-	-	-	-	-	-	-	0,85
7	0,53	0,76	-	-	-	-	-	-	-	-	-

\* not valid

Two attributes of innovation (relative advantage and compatibility) has no significant direct effect to the perceived value. It should be noticed, most of customers are among the young, who use mobile services for SMS and Internet. They are not too familiar with other services such as Call Centers, Mobile Banking, Payment Point (convenience and security), Cell Broadcast, Network technology (mobile broadband), and other support services. They are less able to feel the other benefits provided, such as security and customization services, service reliability, ease of service, as well as the development of network technology. In addition, they are also not too concerned with products, services, technology, marketing and media in accordance with social and cultural habits. The insignificant effect of innovation attributes to perceived value caused by customers cannot totally be able the benefits directly.

Company image does not directly affected to the perceived value because of social programs which runs by company such as CSR and corporate performance which will not provide benefits directly to customers, but the image built is to attract customers.

Expectations do not provide a direct impact to customer satisfaction. Logically customer expectations will affect the level of satisfaction. Therefore, assessment needs to be done, because expectations and customers satisfaction is in a conditional relationship.

Complaint has no significant impact on customer loyalty. The majority of customers come from young people who have a tendency to use telecommunications services such as SMS, internet, telephone and BB services. The loyal customers would not be concerned about this complaint, because of their reluctant to switching barriers such as rate differences, troubles caused by the replacement of number, etc.

In addition, from table 3 it can be seen the attributes of innovation (relative advantage and compatibility) has a significant effect to customer perceived quality, customer expectations, company image, and customer trust.

TABLE II  
REALIBILITY OF MEASUREMENT MODEL

No	Latent Variable	Construct Reliability (≥ 0,7)	Variance Extracted (≥ 0,5)	Result
1	Relative Advantage	0.9	0.56	Good Reliability
2	Compatibility	0.92	0.63	Good Reliability
3	Perceived Value	0.94	0.84	Good Reliability
4	Perceived Quality	0.94	0.84	Good Reliability
5	Cust. Expectation	0.96	0.89	Good Reliability
6	Corporate Image	0.91	0.78	Good Reliability
7	Cust. Satisfaction	0.96	0.89	Good Reliability
8	Cust. Trust	0.93	0.87	Good Reliability
9	Cust. Commitment	0.98	0.95	Good Reliability
10	Cust. Complaint	0.97	0.95	Good Reliability
11	Loyalty	0.92	0.74	Good Reliability

Based on these results, we can draw a conclusion that although the innovation factors directly do not affect the customer satisfaction and loyalty, eventhough still have a significant effect on customer satisfaction and loyalty through its influence on antecedents of customer loyalty.

TABLE III  
DIRECT INDIRECT AND TOTAL EFFECTS

Hypothesis	Determinant	Effect		Total Effect	Result	Hypothesis	Determinant	Effect		Total Effect	Result
		Direct	Indirect					Direct	Indirect		
<b>Customer Loyalty (R<sup>2</sup> = 0,73)</b>						<b>Customer Complaint (R<sup>2</sup> = 0,37)</b>					
H <sub>1a</sub>	RA	**	0,25	0,25	Not supported	H <sub>1a</sub>	RA	-	0,24	0,24	Supported
H <sub>1b</sub>	CP	**	0,24	0,24	Not supported	H <sub>1b</sub>	CP	-	0,25	0,25	Supported
H <sub>1c</sub>	CE	-	0,08	0,08	Supported	H <sub>1c</sub>	CE	-	0,16	0,16	Supported
H <sub>1d</sub>	PQ	-	0,13	0,13	Supported	H <sub>1d</sub>	PQ	-	0,26	0,26	Supported
H <sub>1e</sub>	PV	-	0,06	0,06	Supported	H <sub>1e</sub>	PV	-	0,12	0,12	Supported
H <sub>1f</sub>	CI	-	0,14	0,14	Supported	H <sub>1f</sub>	CI	-	0,27	0,27	Supported
H <sub>1g</sub>	CS	0,11	0,19	0,30	Supported	H <sub>1g</sub>	CS	0,61	-	0,61	Supported
H <sub>1h</sub>	CT	-	0,46	0,46	Supported	<b>Customer Satisfaction (R<sup>2</sup> = 0,79)</b>					
H <sub>1i</sub>	CCI	0,80	-	0,80	Supported	H <sub>1i</sub>	RA	**	0,40	0,40	Not supported
H <sub>1j</sub>	CC	-0,02**	-	-0,02	Not supported	H <sub>1j</sub>	CP	**	0,41	0,41	Not supported
<b>Customer Commitment (R<sup>2</sup> = 0,33)</b>						<b>Perceived Quality (R<sup>2</sup> = 0,76)</b>					
H <sub>2a</sub>	RA	-	0,27	0,27	Supported	H <sub>2a</sub>	RA	0,09**	0,31	0,31	Not supported
H <sub>2b</sub>	CP	-	0,24	0,24	Supported	H <sub>2b</sub>	CP	0,34	0,09	0,43	Supported
H <sub>2c</sub>	CE	-	0,07	0,07	Supported	H <sub>2c</sub>	PV	0,21	-	0,21	Supported
H <sub>2d</sub>	PQ	-	0,11	0,11	Supported	H <sub>2d</sub>	CI	0,42	0,02	0,44	Supported
H <sub>2e</sub>	PV	-	0,05	0,05	Supported	<b>Customer Expectation (R<sup>2</sup> = 0,56)</b>					
H <sub>2f</sub>	CI	-	0,11	0,11	Supported	H <sub>2f</sub>	RA	0,28	-	0,28	Supported
H <sub>2g</sub>	CS	-	0,26	0,26	Supported	H <sub>2g</sub>	CP	0,50	-	0,50	Supported
H <sub>2h</sub>	CT	0,57	-	0,57	Supported	<b>Corporate Image (R<sup>2</sup> = 0,65)</b>					
<b>Customer Trust (R<sup>2</sup> = 0,84)</b>						<b>Perceived Quality (R<sup>2</sup> = 0,76)</b>					
H <sub>3a</sub>	RA	0,29	0,18	0,47	Supported	H <sub>3a</sub>	RA	0,29	0,13	0,42	Supported
H <sub>3b</sub>	CP	0,24	0,18	0,42	Supported	H <sub>3b</sub>	CP	0,21	0,23	0,44	Supported
H <sub>3c</sub>	CE	-	0,11	0,11	Supported	H <sub>3c</sub>	CE	0,47	-	0,47	Supported
H <sub>3d</sub>	PQ	-	0,19	0,19	Supported	<b>Customer Expectation (R<sup>2</sup> = 0,56)</b>					
H <sub>3e</sub>	PV	-	0,09	0,09	Supported	H <sub>3e</sub>	RA	0,28	-	0,28	Supported
H <sub>3f</sub>	CI	-	0,20	0,20	Supported	H <sub>3f</sub>	CP	0,50	-	0,50	Supported
H <sub>3g</sub>	CS	0,44	-	0,44	Supported	<b>Corporate Image (R<sup>2</sup> = 0,65)</b>					
<b>Corporate Image (R<sup>2</sup> = 0,65)</b>						<b>Perceived Quality (R<sup>2</sup> = 0,76)</b>					
H <sub>4a</sub>	RA	0,40	-	0,40	Supported	<b>Customer Trust, CCI = Customer Commitment, CC = Customer Complaint</b>					
H <sub>4b</sub>	CP	0,44	-	0,44	Supported	**P < 0,05					

In fact, Table 3 shows the total effect of the innovation attributes (relative advantage and compatibility, 0.49) was higher when compared with the effect of several antecedents of loyalty, as customer expectations (0.08), perceived quality (0.13), perceived value (0.06), customer satisfaction (0.30), company image (0.14), consumer trust (0.46), and customer complaints (-0.02). Except for a commitment from the customers (0.80). Its proves that the loyalty of Indosat's customers were more determined by the commitment, trust, satisfaction, relative advantages of Indosat (competitiveness, completeness of service, service reliability, saving in time and effort, broadband technologies, and attractive promotions) and compatibility of its services toward their life style, work

patterns, needs, market trends, behavior, and socio-cultural community.

### III. CONCLUSION

Innovation has no direct significant effect on improving customer loyalty, but has a significant effect on customer loyalty through its influence on antecedents of loyalty. Companies need to pay attention to innovation activities for enhancing customer loyalty, in order to increase the value (revenue and market share) of the company.

This study can help the managers to control the innovation activity, make a better innovation strategy, and build the effective innovation portfolio.

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