Brand Loyalty Smartphone Model Based on The Moderation Effect of Brand Trust on Perceived Quality and Product Innovation Using Structural Equation Modeling

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Abstract:
Background: *Changes and developments in technology make changes in consumer behavior, starting from how to access information about products to making purchasing decisions. The industry that has the characteristics of high competition, with the phenomenon of rapid technological development and dynamic changes in consumer behavior is the smartphone industry. The number of smartphone users around the world has increased tremendously. The phenomenon that occurs is that consumers are getting smarter and more free to choose and buy the smartphone they like. The high number of smartphone users and the emergence of various new smartphone brands, the competition for smartphone products is very high, both in the world in Indonesia, where the use of smartphone technology is currently a part of the lives of Indonesian people, as well as Surabaya which is the second largest in the world Indonesia.*
Materials and Methods: *Therefore, it is necessary to comprehensively study brand loyalty which includes the moderating effect of brand trust on perceived quality and product innovation on brand love using Moderating Structural Equation Modeling (MSEM).*
Results: *The results show that the brand loyalty model with moderating effect of brand trust on perceived quality and product innovation on brand love is a fit model based on the Goodness of Fit (GoF) criteria and the assumption of normal, non singular multivariate data, no outliers and no multicollinearity. fulfilled.*
Conclusion: *Effect Brand trust as a moderator provides a significant increase in the influence of Brand Love on Brand Loyalty. Brand Love with awesome indicators and eager to have a dominant influence on Brand Loyalty, then Product Innovation with indicators Equipped with new features that are meaningful to customers and updated with new models giving a dominant influence on Brand Love. Brand Trust moderating Perceived Quality and Product Innovation on Brand Love has a significant and reinforcing effect. The dominant indicator in Brand Loyalty is to consider repurchasing a smartphone with my chosen brand when I need a smartphone and keep liking it even though there are other brands of smartphones.*
Key Word: *smartphone; brand loyalty; brand trust; brand love; perceived quality; product innovation; MSEM.*

I. Introduction

The development of the world of communication technology at this time is very fast and continues to experience renewal. The smartphone industry has the characteristics of high competition, with the phenomenon of the rapid development of technology and the dynamic changes in consumer behavior. People are starting to make smartphones as a very effective communication interaction tool and also as a trend or lifestyle, social identity in society and a means of daily communication.

Technological developments and innovations have more or less influenced changes in consumer preferences, and for example in the phenomenon of the fall of well-established large brands where consumers switch to liking other brands, this is experienced by Nokia and Blackberry (Pertiwi & Yusuf, 2021). The shift of Blackberry users to other brands is because the applications on Blackberry World are considered very lagging and lack popular applications, while smartphones that use the Android operating system have abundant application support thanks to the support of the Google Play Store. Brand loyalty becomes a very crucial aspect when companies enter a market full of competition and technological changes and changes in consumer tastes are so fast, because consumer attachment to a brand can make consumers reject a strategies and offers made by brand competitors (Aaker, 1991). Brand loyalty has several important strategic benefits for companies, such as

gaining high market share, supporting brand extension, and reducing marketing costs (Atilgan et al., 2005). Furthermore, Kotler & Lane (2012), suggest that brand loyalty is the most important driver of brand equity because loyalty is the only element of brand equity that is related to profit and purchase volume in the future. The phenomenon that occurs is that consumers are getting smarter and more free in choosing and buying the smartphones they like, and this phenomenon is summarized in the media liputan6.com which says that the main criteria for consumers choosing smartphones are product quality and innovation (Liputan6.com, 2019). Lee & Back (2009), said that product quality, and product innovation are strong antecedents for establishing loyalty in high-tech product markets. Loureiro & Kaufmann (2012), when developing, labeling and managing wine brands, winemakers should focus on positive emotions towards wine, planning for a pleasant experience with wine, and creating an image of trust. Lubis, P. H. Y. S (2015), said that a better brand image will have an impact on increasing brand love for car consumers in Aceh.

Several studies suggest a variable that is a key factor in building relationship marketing, the variable is brand trust (Morgan & Hunt, 1994). Brand trust is the ability of a brand to be trusted (brand reliability), which is based on consumer confidence that the product is able to fulfill the promised value and good intentions of the brand (brand intention) which is based on consumer confidence that the brand is able to prioritize the interests of consumers (Delgado, 2003). Several studies have stated that brand trust has a significant effect on brand loyalty (Chinomona, 2017, Sahin, Zubayadi & Alan, 2012). Aprilia, 2021 states that service quality on customer loyalty through trust has a positive and significant effect. The results of this study also attracted the attention of the authors to examine and further develop the effect of brand trust as a moderator on brand love. Ranjbarian, et. al, (2013). implies that product engagement and self-brand alignment influence brand love and user brand love affects affective continuance and commitment.

The method related to latent variables is Structural Equation Modeling (SEM) (Mulaik, 2009; Raykov & Marcoulides, 2006; Hair et.al., 2006; Bollen, 1989). Furthermore, related to SEM moderating, among others: N Rusdi et. al., (2018), moderating entrepreneurship at corporate reputation in business performance using partial least squares. N Rusdi et. al, (2021), stated that the influence of emotion in moderating risk perception on risk taking is reinforcing. Wibisono et.al., (2018), Performance Assessment of Teaching Workloads by Moderating Motivation of Emotional Intelligence.

This study comprehensively examines brand loyalty which includes the moderating effect of brand trust on perceived quality and product innovation on brand love using Moderating Structural Equation Modeling (MSEM). This research is expected to provide a discourse for marketing managers of smartphone manufacturers and their marketing networks in an effort to design their marketing strategies, especially in terms of improving product quality, innovating products and building brand trust and brand love for smartphone consumers in an effort to achieve and increase smartphone consumer brand loyalty.

II. Material And Methods

The data used in this study is primary data from a survey on student smartphone users in the Surabaya area. Data were collected by distributing questionnaires to be filled out and the measurement scale used was the Likert scale. Smartphone users are one of the 5 (five) market leader brands in the smartphone industry in the world (last 3 years), including: Samsung, Huawei, Apple, Xiaomi, VIVO and have used it for at least one year. The analytical method used is the Moderating Structural Equation Model (MSEM), which uses the maximum likelihood estimation (MLE) model for 100-200 samples or 5-10 times the estimated number of parameters (Hair et al., 2010). Exogenous variables consist of perceived quality (X1) (Aaker, 1991) and product innovation (X2) Stock (2011) variables, the moderating variable is brand trust (Z) (Delgado, 2003) and the intervening variable is brand love (Y1) (Delgado , 2003), and the endogenous variable, namely brand loyalty (Y2) (Sharma et.al, 2013, Bannett et al, 2002). The conceptual framework is presented as follows.
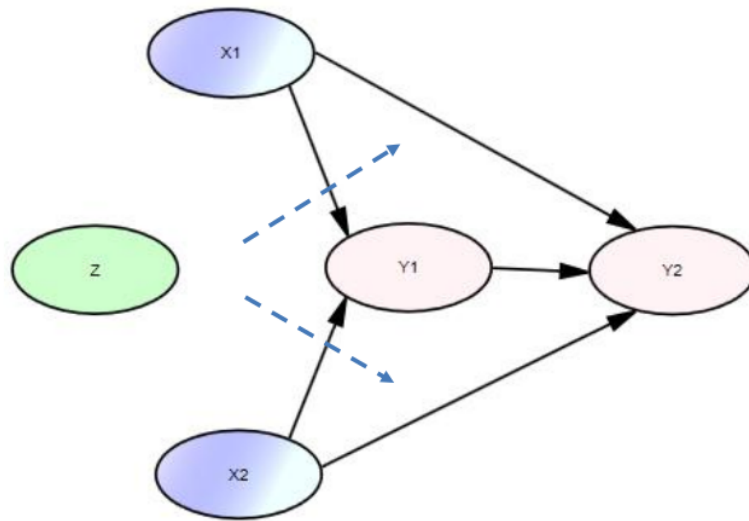
Figure 1.

Conceptual model of brand loyalty (Y2) which contains the moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1)

The stages of analysis carried out are the evaluation of the measurement model, goodness of fit and evaluation of the structural model. Evaluation of the measurement model, namely convergent validity, is used to determine the correlation between each indicator and its latent variables. Convergent validity can be seen from the standardize loading factor (λ) value greater than 0.5 is still acceptable. Composite reliability (C-R) is an indicator block that measures a construct and can be evaluated with a measure of internal consistency. Composite reliability (C-R) is an acceptable level of reliability if the coefficient of the latent variable is greater than 0.6, calculated by the following formula.

$$C - R = \frac{\left(\sum_{k=1}^{K_j} \lambda_{jk} \right)^2}{\left(\sum_{k=1}^{K_j} \lambda_{jk} \right)^2 + \sum_{k=1}^{K_j} (1 - \lambda_{jk})^2} \tag{1}$$

Evaluation of the structural model in MSEM used the Ping method, a method that can be used to assess the moderating effect (Ping, 1996). The Ping method has two stages, namely

- ❖ Stage - 1:
  - ❖ Perform estimates without entering interact variables so that only estimating the model,
  - ❖ The estimation results of this model are used to calculate the loading factor value of the interaction latent variable (λ interaction) and the error variance value of the interaction latent variable indicator.
- ❖ Stage - 2:
  - ❖ After the interaction value and q value are obtained from the first stage, then these values are entered into the model with the interaction latent variable.
  - ❖ The result of manual calculation of the interaction factor loading is used to determine the value of the interaction loading parameter value, while the manual result of the interaction variable error variance calculation is used to determine the interaction variable error variance.

III. Result

The measurement model consists of a validity test and a reliability test. In detail the validity and reliability of each latent variable are presented in Table 1.

Table 1.
Indicator Validity Value and Latent Variable Reliability

Laten Variables	Indicators	p variance error	Loading (λ)	λ^2	$1 - \lambda^2$	C-R
Perceived Quality (X1)	Has a variety of unique features that suit the needs of today's consumers (X1.1)	0.000	0.538	0.289	0.711	0.685
	Can work well from time to time (X1.2)	0.000	0.606	0.367	0.633	
	In accordance with specifications (X1.3)	0.000	0.577	0.333	0.667	
	Durable (X1.4)	0.000	0.639	0.408	0.592	
Product Innovation (X2)	Updated with new models (X2.1)	0.000	0.636	0.404	0.596	0.667
	Equipped with new features that are meaningful to customers (X2.2)	0.000	0.725	0.526	0.474	
	Innovative in terms of product design (X2 .3)	0.000	0.532	0.283	0.717	
Brand Trust (Z)	trust with quality (Z1.1)	0.000	0.549	0.301	0.699	0.768
	reliable (Z1.2)	0.000	0.790	0.624	0.376	
	providing honest information to consumers (Z1.3)	0.026	0.819	0.671	0.329	
Brand Love (Y1)	feel comfortable (Y1.1)	0.000	0.551	0.304	0.696	0.669
	awesome (Y1.2)	0.000	0.675	0.456	0.544	
	excited to own (Y1.3)	0.000	0.673	0.453	0.547	
Brand Loyalty (Y2)	Still like Even though there are other brand smartphones (Y2.1)	0.000	0.629	0.396	0.604	0.628
	Considering choosing a smartphone with my preferred brand even though there is an adjustment to price increases (Y2.2)	0.000	0.537	0.288	0.712	
	Considering buying a smartphone again with my preferred brand when I need a smartphone (Y2.3)	0.000	0.633	0.401	0.599	

Table 1 shows that the latent variables Perceived Quality (X1), Product Innovation (X2), Brand Trust (Z), Brand Love (Y1), and Brand Loyalty (Y2) provide a loading factor and Composite Reliability (CR) value above the cut off value, so that it can be said to be valid and reliable. Composite Reliability (C-R) on Perceived Quality (X1) is 0.685, Product Innovation (X2) is 0.667, Brand Trust (Z) is 0.768, Brand Love (Y1) is 0.669, and Brand Loyalty (Y2) is 0.628. Likewise for each indicator, all the p-values of the variance error are less than 0.05, so all indicators are reliable. Perceived Quality (X1) is formed by indicators Has various unique features that are in accordance with current consumer needs (X1.1) (0.538), Can work well from time to time (X1.2) (0.606), In accordance with specifications (X1.3)) (0.577), Durable (X1.4) (0.639). Product Innovation (X2) is formed by indicators Updated with new models (X2.1) (0.636), Equipped with new features that are meaningful to customers (X2.2) (0.725), Innovative in terms of product design (X2 .3) (0.532). Brand Trust (Z) is formed by indicators of trust with quality (Z1.1) (0.549), reliable (Z1.2) (0.790), providing honest information to consumers (Z1.3) (0.819). Brand Love (Y1) is formed by the indicators feel comfortable (Y1.1) (0.571), awesome (Y1.2) (0.675) and excited to own (Y1.3) (0.673). Brand Loyalty (Y2) is formed by the indicator Still like Even though there are other brand smartphones (Y2.1) (0.629), Considering choosing a smartphone with my preferred brand even though there is an adjustment to price increases (Y2.2) (0.537) and Considering buying a smartphone again with my preferred brand when I need a smartphone (Y2.3) (0.633).

After testing the validity and reliability of each latent variable, several prerequisites that must be met in structural modeling are the assumption of normal multivariate, the assumption of the absence of multicollinearity or singularity and outliers. The results of testing the normality of the data on all research variables give a multivariate Critical Ratio value of 1.442 and this value lies outside -1.96 to 1.96, so it can be said that the data has a multivariate normal distribution. Singularity can be seen through the determinant of the covariance matrix. The results of the study give the value of the Determinant of sample covariance matrix of 0.020. This value is not close to zero, so it can be said that there is no singularity problem in the analyzed data. Multicollinearity can be seen through the correlation between the latent variable Perceived Quality (X1) and Product Innovation (X2) of 0.101 with p = 0.095 greater than the significance level = 0.05, so it can be said that there is no multicollinearity. Outliers are observations that appear with uniariate or multivariate extreme values. Outlier test results in this study are presented at the Mahalanobis distance or Mahalanobis d-squared. The Mahalanobis value which is greater than the Chi-square table or p value < 0.001 is said to be an outlier observation. In this study there is no outlier data, it can be said that there is no outlier.

Furthermore, the path diagram of the brand loyalty model with brand trust moderation in stage 1 is presented as follows.
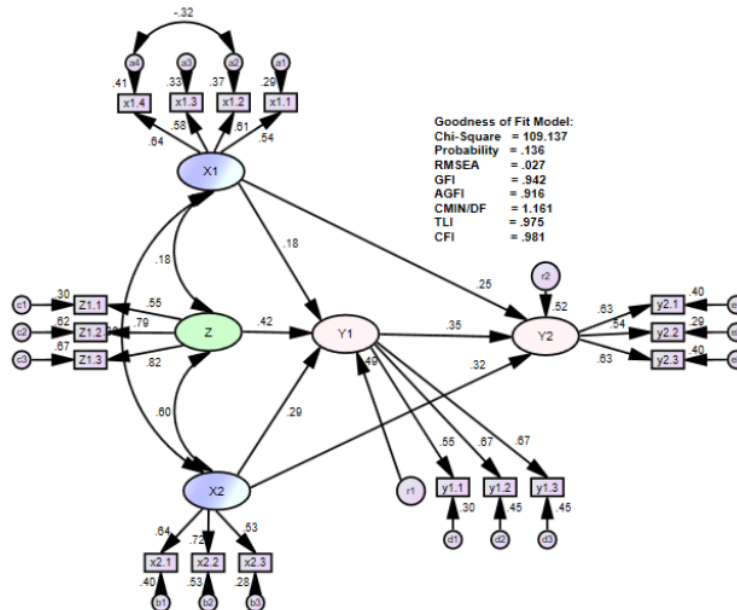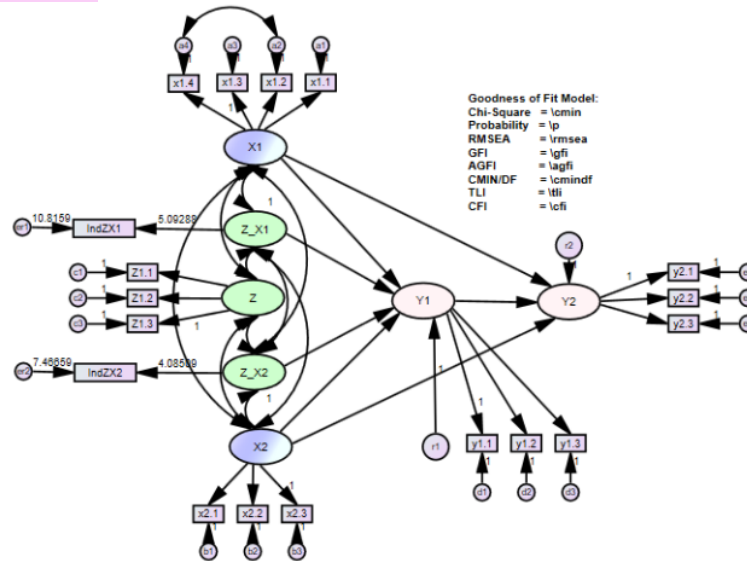
Figure 2.
Model Path Diagram of brand loyalty (Y2) which contains the moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) (Stage - 1)

The path coefficient test in Figure 1 in detail is presented in the following table.

Table 2.
Test results of brand loyalty model (Y2) with moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) Stage 1

Variables	Coefficient	Critical Rasio (C.R)	Probability (p-value)	Description
Perceived Quality (X1) → Brand Love (Y1)	.178	1.963	.050	Significant
Product Innovation (X2)→ Brand Love (Y1)	.288	2.193	.028	Significant
Perceived Quality (X1) → Brand Loyalty (Y2)	.247	2.500	.012	Significant
Product Innovation (X2) → Brand Loyalty (Y2)	.321	2.379	.017	Significant
Brand Trust (Z) → Brand Love (Y1)	.417	3.440	.000	Significant
Brand Love (Y1) → Brand Loyalty (Y2)	.346	2.514	.012	Significant

Table 2, can be interpreted the direct effect of the moderating variable Brand Trust (Z) on Brand Love (Y1). Brand Trust (Z) has a positive and significant effect on Brand Love (Y1). This can be seen from the path coefficient which is positive at 0.417 with a T-Statistic value of 3.440 which is greater than t-table = 1.96, or the value of Prob = 0.000 is smaller than = 0.05. Thus Brand Trust (Z) has a direct effect on Brand Love (Y1) by 0.417, which means every time there is an increase Brand Trust (Z) it will increase Brand Love (Y1) by 0.417. This shows that Brand Trust (Z) is suspected as a moderating variable that strengthens the influence of Perceived Quality (X1) and Product Innovation (X2) on Brand Love (Y1). The Moderating Structural Equation Modeling (MSEM) model in stage-1 is used to obtain the Interaction and Variance Error lamps, which are presented as follows.

Table 3.
Lambda Interaction and Variance Error Model brand loyalty (Y2) with moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) In Stage 1

Z Moderating Y1 to Y2	Z		X1		Z		X2	
	Loading	Variance	Loading	Variance	Loading	Variance	Loading	Variance
Indicators	0.549	0.651	0.538	0.768	0.549	0.651	0.636	0.684
	0.790	0.245	0.606	0.622	0.790	0.245	0.725	0.549
	0.819	0.213	0.574	0.724	0.819	0.213	0.532	0.766

			0.639	0.623					
Varians	0.435		0.362			0.435		0.302	
Lamda_Interaction_Z_Y1	5.09288					4.08509			
Variance _error_Z_Y1	10.8159					7.46659			

Based on Table 3, the value of Lambda Interaction and Variance Error moderating latent variable of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) can be presented in the form of a path diagram as follows.

Figure 3.
Conceptual Framework Model Path Diagram brand loyalty (Y2) which contains the moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) (Stage 2)
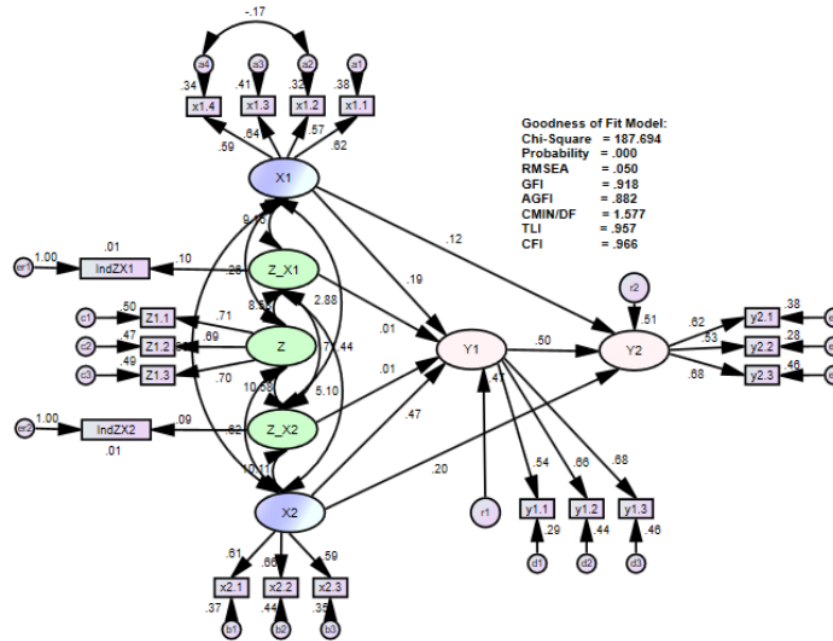So the results of the analysis are presented as follows.

Figure 4.

Model Path Diagram of brand loyalty (Y2) which contains the moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) (Stage 2)

The results of testing the structural model with the AMOS program in full can be seen in the following table.

Table 4.

Test results of brand loyalty model (Y2) with moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) Stage 2

Goodness of Fit (GoF)	Cut – Off Value	The calculation results	Description
Chi – Square	Expected small from Chi-Square Table	187.694	χ^2 with df 119 is 145.461 marginal
Significance Probability	≥ 0,05	0.000	marginal
RMSEA	≤ 0,08	0.050	Good
GFI	≥ 0,90	0.918	Good
AGFI	≥ 0,90	0.882	marginal
CMIN/DF	≤ 2,00	1.577	Good
TLI	≥ 0,90	0.957	Good
CFI	≥ 0,90	0.966	Good

From the appropriate model, each path coefficient can be interpreted through the following structural equation.

$$Y1 = 0.191\ X1 + 0.468\ X2 + 0.006\ Z\_X1 + 0.008\ Z\_X2$$
$$Y2 = 0.119\ X1 + 0.203\ X2 + 0.501\ Y1$$

With,
X1   : perceived quality
X2   : product innovation
Y1   : brand love
Y2   : brand loyalty
Z   : brand trust
Z_X1 : interaction of brand trust with perceived quality
Z_X2 : interaction of brand trust with product innovation

The path coefficient tests in Figure 4 and the above equations in detail are presented in the following table:

Table 5.
Test results of brand loyalty model (Y2) with moderating effect of brand trust (Z) on perceived quality (X1) and product innovation (X2) on brand love (Y1) Stage 2

Variables	Coefficient	Critical Rasio (C.R)	Probability (p-value)	Description
Perceived Quality (X1) → Brand Love (Y1)	.191	2.319	.020	Significant
Product Innovation (X2)→ Brand Love (Y1)	.468	4.479	.000	Significant
Brand Trust (Z)* Perceived Quality (X1) → Brand Love (Y1)	.006	2.601	.009	Significant
Brand Trust (Z)* Product Innovation (X2)→ Brand Love (Y1)	.008	2.783	.005	Significant
Perceived Quality (X1) → Brand Loyalty (Y2)	.119	2.081	.037	Significant
Product Innovation (X2) → Brand Loyalty (Y2)	.203	2.085	.037	Significant
Brand Love (Y1) → Brand Loyalty (Y2)	.501	3.561	.000	Significant

Table 5, the interpretation of each path coefficient is as follows:
- Perceived Quality (X1) has a positive and significant effect on Brand Love (Y1). This can be seen from the path coefficient which is positive at 0.191 with a C.R value. of 2.319 and obtained a significance probability (p) of 0.020 which is smaller than the significance level (α) which is determined at 0.05. Thus Perceived Quality (X1) has a direct effect on Brand Love (Y1) by 0.191, which means that every time there is an increase in Perceived Quality (X1), it will increase Brand Love (Y1) by 0.191.
- Product Innovation (X2) has a positive and significant effect on Brand Love (Y1). This can be seen from the path coefficient which is positive at 0.468 with a C.R. of 4.479 and obtained a significance probability (p) of 0.000 which is smaller than the specified significance level (α) of 0.05. Thus Product Innovation (X2) has a direct effect on Brand Love (Y1) by 0.468, which means that every time there is an increase in Product Innovation (X2), it will increase Brand Love (Y1) by 0.468.
- Brand Trust (Z)* Perceived Quality (X1) has a positive and significant effect on Brand Love (Y1). This can be seen from the path coefficient which is positive at 0.006 with a C.R value. of 2.601 and obtained a significance probability (p) of 0.009 which is smaller than the specified significance level (α) of 0.05. Thus Brand Trust (Z) moderates Perceived Quality (X1) on Brand Love (Y1) which is reinforcing by 0.006, which means that every increase in Brand Trust (Z) followed by Perceived Quality (X1) will strengthen the influence of Brand Love (Y1).
- Brand Trust (Z)* Product Innovation (X2) has a positive and significant effect on Brand Love (Y1). This can be seen from the path coefficient which is positive at 0.008 with a C.R value. of 2.783 and obtained a significance probability (p) of 0.005 which is smaller than the significance level (α) which is determined at 0.05. Thus Brand Trust (Z) moderates Product Innovation (X2) towards Brand Love (Y1) which is reinforcing by 0.005, which means that every increase in Brand Trust (Z) followed by Product Innovation (X2) it will strengthen the influence of Brand Love (Y1).
- Perceived Quality (X1) has a positive and significant effect on Brand Loyalty (Y2). This can be seen from the path coefficient which is positive at 0.119 with a C.R value. of 2,081 and obtained a significance probability (p) of 0.037 which is smaller than the specified significance level (α) of 0.05. Thus Perceived Quality (X1) has a direct effect on Brand Loyalty (Y2) by 0.119, which means that every time there is an increase in Perceived Quality (X1), it will increase Brand Loyalty (Y2) by 0.119.
- Product Innovation (X2) has a positive and significant effect on Brand Loyalty (Y2). This can be seen from the path coefficient which is positive at 0.203 with a C.R. of 2.085 and obtained a significance probability (p) of 0.037 which is smaller than the significance level (α) which is determined at 0.05. Thus Product Innovation (X2) has a direct effect on Brand Loyalty (Y2) by 0.203, which means that every time there is an increase in Product Innovation (X2), it will increase Brand Loyalty (Y2) by 0.203.
- Brand Love (Y1) has a positive and significant effect on Brand Loyalty (Y2). This can be seen from the path coefficient which is positive at 0.501 with a C.R value. of 3,561 and obtained a significance probability (p) of 0.000 which is smaller than the significance level (α) which is determined at 0.05. Thus Brand Love (Y1) has a direct effect on Brand Loyalty (Y2) by 0.501, which means that every time there is an increase in Brand Love (Y1), it will increase Brand Loyalty (Y2) by 0.501.

IV. Conclusion

Based on data analysis and discussion, it can be concluded as follows:

- The brand loyalty model with a moderating effect of brand trust on perceived quality and product innovation on brand love is a fit model based on the Goodness of Fit (GoF) criteria other than that the assumptions have been met.
- The effect of Brand trust as a moderator gives a significant increase in the influence of Brand Love on Brand Loyalty.
- The dominant indicator in Perceived Quality is durable and can work well from time to time.
- Product Innovation is formed by indicators equipped with new features that are meaningful to customers and Updated with new models.
- Brand Trust is formed by indicators providing honest and reliable information to its consumers.
- Brand Love is shaped by awesome indicators and eager to own.
- Brand Loyalty is formed by the indicator of considering buying again a smartphone with my chosen brand when I need a smartphone and Still liking it even though there are other brand smartphones.
- Brand Love has a dominant influence on Brand Loyalty, then Product Innovation on Brand Love.
- Brand Trust moderates Perceived Quality and Product Innovation towards reinforcing Brand Love.

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