Structural Equation and Empirical Research on Consumers' Comprehensive Innovation and FMCG Brand Loyalty

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Abstract: The purpose of this research was to put forward a concept of Consumers' Comprehensive Innovation and study how it affects Fast Moving Consumer Goods (FMCG) brand loyalty. The hypothesis was proposed and verified by structural equation and SPSS data analysis. In order to explore the influencing factors of Consumers' comprehensive innovation on brand loyalty. This can improve the enterprise to make the right product research and development and strategic methods for the market. The result shows that Consumers' Comprehensive Innovation should be measured from four dimensions: personal consumer innovation, consumer social innovation, consumer attitudes to a new product, and consumer behavior toward new products. The study also shows that Consumers' Comprehensive Innovation plays a positive role in regulating brand reputation and brand loyalty, and between customer trust and brand loyalty. Therefore, the Consumers' Comprehensive Innovation is a critical moderating variable that affects brand loyalty.

1. Introduction

The FMCG industry is iteratively fast. Customer relationship management has become an essential planning part of the marketing strategy, one of which is maintaining customer brand loyalty. Perceived quality and brand reputation influence each other. [1, 2] Whereas brand reputation and perceived quality are controversial to the path of brand loyalty. Aaker [3] believes that brand reputation will directly affect brand loyalty; Bloemer [4] believes that brand reputation indirectly affects brand loyalty. Regarding the latter, one view believes that perceived quality directly affects brand loyalty [5], while another believes that perceived quality can only indirectly affect brand loyalty [6].

Consumer innovation in the virtual brand community helps customers put forward opinions and suggestions on products to improve product quality and promote brand loyalty.[7] However, no relevant literature was retrieved on the relationship between consumers' innovation and brand loyalty. Therefore, it is proposed that the Consumers' comprehensive innovation is Consumers' inherent psychological characteristics, attitude, and behavior characteristics towards new products. And the comprehensive innovation of consumers can play a positive role in brand loyalty.

Only by clarifying the above issues is it possible to study the influence mechanism of perceived quality and brand reputation on brand loyalty and further study the influence path between consumer's comprehensive innovation and brand loyalty.

2. Methods

2.1 Factors

This question selects the four factors of consumers' comprehensive innovation, brand loyalty, brand reputation, perceived quality based on the above considerations.

2.1.1 Consumer's comprehensive innovation and its related factors

This research explores the relative relationship between Consumers' comprehensive innovation and Brand loyalty in the FMCG. It takes the sales of liquid foundation products in the Greater China

region as the research object and combines the above research methods and conclusions. The design scale is as follows.

In 1995, the innovation scale proposed by Roehrich [8] included hedonic innovation and social innovation. In 1996, Baumgatner [9] proposed a two-dimensional exploratory buying behavior scale, including Consumers' exploratory information searching behavior and exploratory buying behavior. In 2009, Tellis [10] proposed that consumer innovation has three measurement dimensions: unwillingness to accept new products, enthusiasm for new products, and openness to new things. The above three viewpoints all have a research basis, but a single study only starts from a limited perspective, and none of them comprehensively evaluates the impact of consumer innovation. The evaluation of consumer innovation includes not only consumer opinions and consumer behavior but also more profound reasons.

Therefore, this article believes that it is necessary to put forward the concept of comprehensive innovation of consumers for future understanding and application. Only a comprehensive measurement of consumer innovation can fully reflect its characteristics.

Table 1. Consumers' Comprehensive Innovation Scale

	Number	Factors	Item	Reference
Consumers' Comprehensive Innovation,	1	Consumers' personal innovation	Like new ideas, new concepts, and new things; like to seek excitement; like new experiences; dare to take risks to try new products.	Roehrich Tellis [8]
	2	Consumers' social innovation	Like being different, dress very fashionable, and have a say in the circle of friends or fan groups.	Roehrich Kim [8]
	3	Consumers' attitudes towards new products	Always have a very positive attitude towards new products; very support enterprises to develop new products; can tolerate new products with some future defects or defects.	Tellis Manning [10]
	4	Consumers' behavior towards new products	Will learn about new product information in various ways; try/buy new products if there is an opportunity.	Baumgartner Tellis [9]

2.1.2 Brand Loyalty and Factors

Brand loyalty is measured from the following four dimensions: praise brand, preferred brand, recommended purchase, and affordability of price increases.[11]

2.1.3 Brand Reputation and Factors

Brand reputation is measured from the following four dimensions: brand awareness, brand reputation, brand integrity, and brand industry status. [11]

2.1.4 Perceived Quality and Factors

Perceived quality is measured from the following five dimensions: product function, performance, product economy, product reliability, and product safety. [11]

2.2 Hypothesis

The hypothesis shown in the following table is made in this article based on the above four factors.

Table 2. Hypothesis

Number	Hypothesis
1	Consumers' comprehensive innovation plays a positive role in regulating the relationship between perceived quality and brand loyalty.
2	Consumers' comprehensive innovation plays a positive role in regulating the relationship between brand reputation and brand loyalty.
3	Perceived quality directly affects brand loyalty.
4	Brand reputation directly affects brand loyalty.

2.3 Conceptual structure model

Draw the Conceptual model of quality and brand impact on loyalty (QBL) in the figure below based on the above hypothesis.

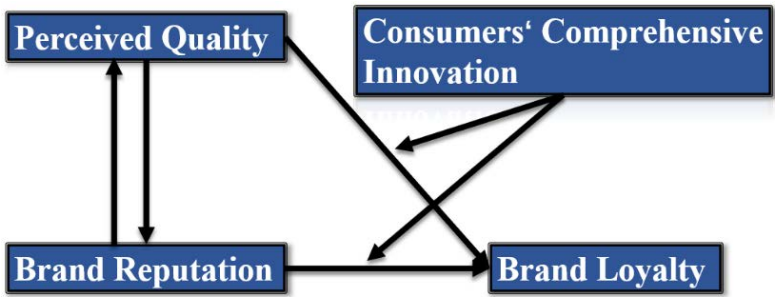

Figure 1. Model QBL

3. Empirical analysis

3.1 Questionnaire

This research contains two questionnaires. The Consumer Comprehensive Innovation Interview Questionnaire is designed to study the influencing factors of consumers' comprehensive innovation and construct its scale. The Comprehensive Innovation and Loyalty Survey Questionnaire of Cosmetic Brand Consumers is to verify the establishment of the hypothetical relationship of the model and confirm whether the model hypothesis is true or not with actual data.

The first questionnaire is an interview questionnaire, in which the valid number is 175. It contains 4 interview questions and 20 multiple choices. The second questionnaire consists of a Consumers' Comprehensive Innovation scale, a perceived quality scale, a brand reputation scale, and a brand loyalty scale. There are 23 measurement items in total. The questionnaire survey is conducted online for young people across China. A total of 324 questionnaires were distributed in this survey, of which 311 were valid.

4. Result and Discussion

4.1 Consumers' Comprehensive Innovation

4.1.1 Reliability Analysis

The reliability analysis checks the consistency of the variables included in the questionnaire on each item by the Cronbach's Alpha reliability coefficient. Devellis believes that the acceptable threshold of variable reliability is Cronbach's Alpha coefficient>0.7.

Table 3. Reliability Analysis

Cronbach's Alpha	N of Items
.928	14

Table 4. Reliability Analysis of Consumers' Comprehensive Innovation

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Cronbach's Alpha if Item Deleted
Pursue freshness	43.29	91.867	.740	.923
Like excitement	43.89	91.735	.787	.918
Dare to take risks	44.61	91.078	.817	.924
Willing to consume	44.92	90.828	.690	.935
Unconventional	44.32	90.741	.698	.936
Out of the ordinary	44.91	91.307	.707	.923
Pursue fashion	44.33	90.303	.757	.925
Opinion leader	44.65	92.731	.748	.920
Like new products	44.05	92.159	.791	.925
Support innovation	44.74	90.262	.718	.921
Tolerate defects	44.12	90.808	.798	.918
Learn about new products	44.15	91.573	.781	. 925
Be the first to try	44.15	91.537	.781	. 925
Be the first to buy	44.16	91.250	.730	. 926

If the two items of Willing to Consume and Unconventional in Table 4 are deleted, the reliability of Consumers' Comprehensive Innovation will be higher than 0.928. Therefore, these two items should be deleted and the remaining 12 items should be retained.

4.1.2 Exploratory factor analysis

KMO and Bartlett's Sphericity Test were conducted to perform exploratory factor analysis (SPSS 23.0). The results are shown in Table 5.

Table 5. KMO and Bartlett Test

Kaiser-Meyer-olk in Measure of Samping Adequacy.		.970
Bartlett's Test of Sphericity	Approx. Chi-Square	1.039E3
	df	66
	Sig.	.000

Table 6. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings				Rotation Sums of Squared Loadings	
	Total	Variance %	Cumulative%	Total	Variance %	Cumulative%	Total	Variance %	Cumulative%
1	5.823	56.265	56.265	5.823	56.265	56.265	2.994	22.865	22.865
2	1.325	12.268	68.533	1.325	12.268	68.533	2.328	20.861	43.726
3	.737	6.986	75.519	.737	6.986	75.519	2.178	19.854	63.580
4	.582	5.368	80.887	.582	5.368	80.887	2.154	19.589	83.156
5	.463	4.106	84.993						
6	.336	3.700	88.693						
7	.269	2.968	91.661						
8	.220	2.059	93.720						
9	.189	1.920	95.640						
10	.166	1.612	97.252						
11	.145	1.381	98.633						
12	.143	1.367	100.00						

The Bartlett's sphere test results are statistically significant (KMO=0.970>0.7, Sig.<0.001), indicating that the questionnaire data meets the prerequisite requirements of factor analysis.

The four principal components are extracted by using the principal component method and the fourth power maximum rotation method according Table 6.

Table 7. Rotated Principal Component Matrix

Item	Component			
	1	2	3	4
Pursue freshness	.891	.241	.146	.339
Like excitement	.879	.352	.288	.128
Dare to take risks	.780	.303	.375	.275
Out of the ordinary	.402	.794	.263	.308
Pursue fashion	.358	.854	.321	.321
Opinion leader	.270	.688	.105	.222
Like new products	.321	.112	.872	.384
Support innovation	.259	.198	.865	.280
Tolerate defects	.141	.283	.783	.313
Learn about new products	.230	.228	.254	.745
Be the first to use	.321	.231	.342	.868
Be the first to buy	.252	.256	.293	.882

As shown in Table 7, the factor loading matrix after rotation can be obtained through the maximum rotation of the fourth power. The factor loads of the following 12 items are all greater than 0.5.

The results show that the items governed by factor 1 are Pursuit of Freshness, Like Excitement, and Dare to Take Risks; the items governed by factor 2 are Out of The Ordinary, Pursuit of Fashion, Opinion Leader; the items governed by factor 3 are Like New Products, Support Innovation, and Tolerate Defects; the items governed by factor 4 are to Learn about New Products, Be the First to Use, and Be the First to Buy.

Factor 1 is Consumers' Personal Innovation. Factor 2 is Consumers' Social Innovation. Factor 3 is Consumers' Attitudes towards New Products. Factor 4 is Consumers' Behavior towards New Products. The Consumers' Comprehensive Innovative should be measured from these four dimensions.

4.1.3 Convergent Validity Test

Table 8. Convergent Validity Test of Consumers' Comprehensive Innovation Scale

Dimension	Item	Standardized loadings	SE	AVE
Consumers' personal innovation	Pursue freshness	.891	.087	0760
	Like excitement	.879	.077	
	Dare to take risks	.780	.087	
Consumers' social innovation	Out of the ordinary	.794	.073	0.611
	Pursue fashion	.854	.097	
	Opinion leader	.688	.088	
Consumers' attitudes towards new products	Like new products	.872	.079	0.707
	Support innovation	.865	.085	
	Tolerate defects	.783	.086	
Consumers' behavior towards new products	Learn about new products	.745	.077	0.695
	Be the first to use	.868	.079	
	Be the first to buy	.882	.088	

Table 9. Pearson Correlation Coefficient of Consumers' Comprehensive Innovation scale

	Consumers' personal innovation	Consumers' social innovation	Consumers' attitudes towards new product	Consumers' behavior towards new products
Consumers' personal innovation	1			
Consumers' social innovation	.753**	1		
Consumers' attitudes towards new products	.637**	.737**	1	
Consumers' behavior towards new products	.685**	.649**	.729**	1

**Correlation is significant at the 0.01 level (two-tailed)

Table 8 shows that the consumers' comprehensive innovation scale has good convergent validity (AVE>0.5).

Table 9 can determine that the scale has better discriminative validity (The correlation coefficients<0.85.).

4.2 Moderating effect analysis

4.2.1 Descriptive analysis

The descriptive analysis of the essential characteristics of 311 valid samples is shown in table 10, including gender, monthly income, product type, and product price.

Table 10. Descriptive analysis of the basic characteristics of participants

Characteristics	Stratification	Number	Percentage (%)
Gender	Male	140	45
	Female	171	55
Monthly income	≤￥3000	31	10
	￥3000~￥5000	110	35.4
	￥5000~￥10000	107	34.4
	≥￥10000	63	20.3
Product type	Long lasting concealer	52	16.7
	Gentle skincare	88	28.3
	lightweight moisturizers	68	21.9
	Matte	78	25.1
	Dewy	25	8
Price	￥0~200	61	19.6
	￥200~500	79	25.4
	￥500~1000	103	33.1
	￥≥1000	68	21.9

4.2.2 Reliability Analysis

The reliability analysis checks the consistency of the variables included in the questionnaire on each item by the Cronbach's Alpha reliability coefficient. Devellis believes that the acceptable threshold of variable reliability is Cronbach's Alpha coefficient>0.7.

This study conducted a reliability analysis on the four dimensions of consumers' comprehensive innovation, perceived quality, brand reputation, and brand loyalty. The results are shown in Table 11.

Table 11. Reliability Analysis

Component	Items	CITC	Cronbach's Alpha if item deleted	Cronbach's Alpha
Consumers' Comprehensive Innovation	Consumers' personal innovation	.743	.816	.865
	Consumers' social innovation	.723	.825	
	Consumers' attitudes towards new products	.697	.835	
	Consumers' behavior towards new products	.697	.697	
Perceived Quality	product function	.765	.846	.883
	performance	.724	.856	
	product economy	.635	.877	
	product reliability	.716	.858	
	product safety	.753	.849	
Brand Reputation	brand awareness	.685	.821	.855
	brand reputation	.666	.826	
	brand integrity	.655	.829	
	brand industry status	.672	.825	
	Overall	.669	.825	
Brand Loyalty	praise brand	.691	.803	.847
	preferred brand	.662	.816	
	recommended purchase	.653	.82	
	affordability of price increases	.734	.785	

The Cronbach's Alpha coefficient of consumers' comprehensive innovation (0.865), perceived quality (0.883), brand reputation (0.855), and brand loyalty (0.847) are all greater than the threshold of 0.7. The results show that the variables have good internal consistency. The CITC is greater than 0.5, which proves that the planned questions meet the research requirements. Deleting any question will not cause an increase in Cronbach's Alpha. In summary, the variables have good reliability.

4.2.3 Exploratory factor analysis

KMO and Bartlett's Sphericity Test were conducted to perform exploratory factor analysis (SPSS 23.0). The results are shown in Table 12.

Table 12. KMO and Bartlett's test

Kaiser-Meyer-olk in Measure of Samping Adequacy.		.903
Bartlett's Test of Sphericity	Approx. Chi-Square	2771.868
	df	153
	Sig.	.000

The Bartlett's sphere test results are statistically significant (KMO=0.903>0.7, Sig.<0.001), indicating that the questionnaire data meets the prerequisite requirements of factor analysis.

Table 13. Rotated Principal Component Matrix

Items	Component			
	Perceived Quality	Brand Reputation	Consumers' Comprehensive Innovation	Brand Loyalty
PQ1	.803	.191	.156	.186
PQ5	.802	.086	.12	.252
PQ2	.8	.089	.114	.192
PQ4	.785	.117	.2	.142
PQ3	.71	.158	.088	.188
BR4	.096	.787	.001	.149
BR2	.104	.781	.087	.089
BR5	.091	.767	.195	.122
BR3	.144	.759	0	.164
BR1	.158	.755	.111	.194
CIOC1	.137	.087	.84	.125
CIOC3	.152	.012	.82	.042
CIOC4	.09	.056	.82	.1
CIOC2	.189	.207	.803	.101
BL4	.152	.202	.069	.835
BL1	.24	.168	.086	.779
BL2	.26	.124	.103	.755
BL3	.247	.229	.148	.708
Characteristic value	3.418	3.242	2.899	2.711
Variance percentage	18.991	18.014	16.105	15.063
Accumulation %	18.991	37.005	53.11	68.173

The scale has good structural validity.

4.2.4 Confirmatory factor analysis

There are 4 dimensions in total, namely consumers' comprehensive innovation, perceived quality, brand reputation, and brand loyalty. A total of 18 measurement questions are included. After performing confirmatory factor analysis, the following figure and table are obtained.

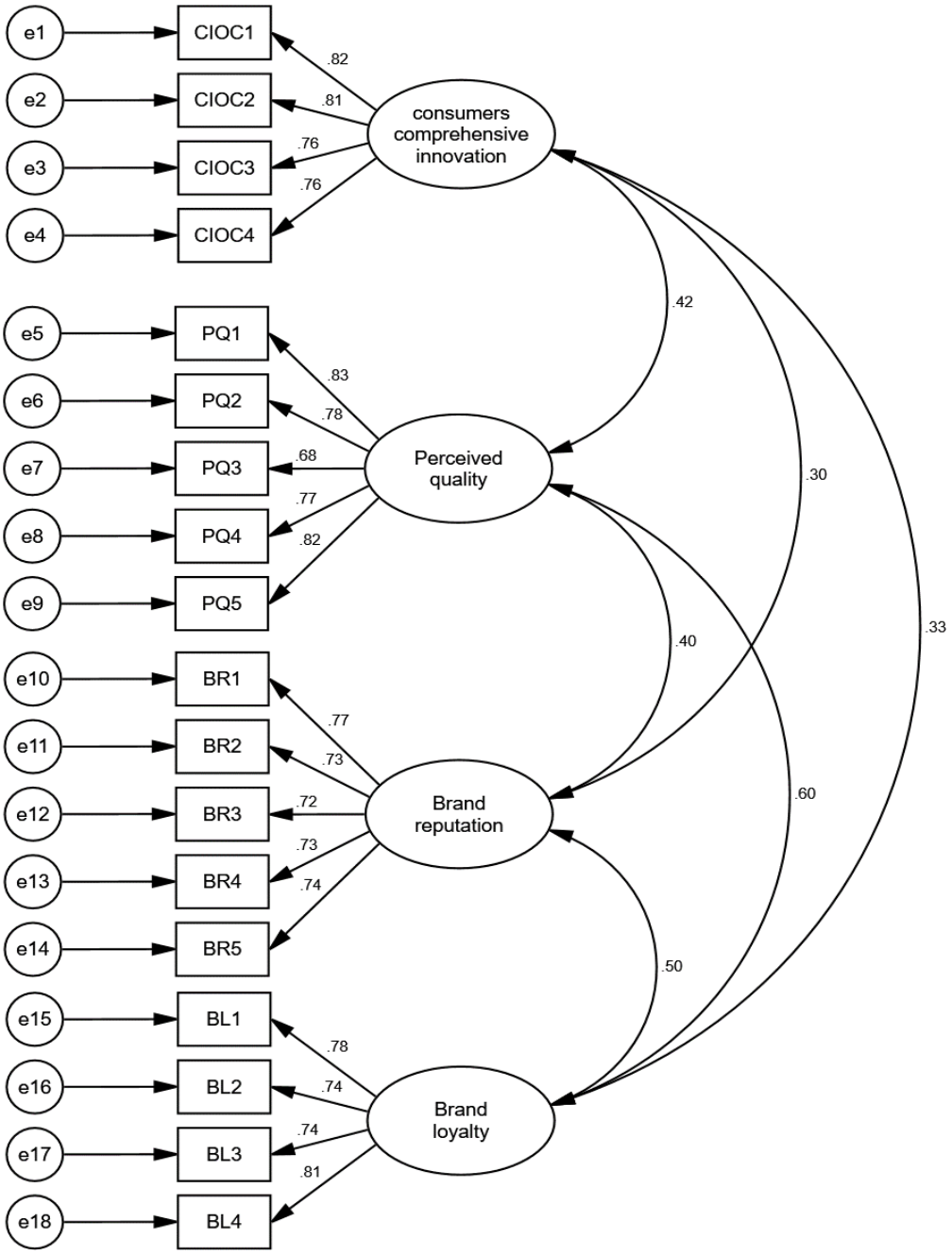

Figure 2. CFA

Table 14. Model Fit in The Confirmatory Factor Analysis

Item Model fitting index	Optimal standard	statistic	Fit
CMIN	——	140.508	——
DF	——	129	——
CMIN/DF	<3	1.089	Good
RMR	<0.08	.05	Good
GFI	>0.8	.955	Good
AGFI	>0.8	.94	Good
NFI	>0.9	.950	Good
IFI	>0.9	.996	Good
TLI	>0.9	.995	Good
CFI	>0.9	.996	Good
RMSEA	<0.08	.017	Good

CMIN/DF<3 (1.089, Table X). GFI, AGFI, NFI, TLI, IFI, CFI are all> 0.9. RMR<0.08 (0.05, Table X). RMSEA<0.08 (0.017, Table X). Each fitting index is in line with the research standard, so it can be considered that the model fits well.

Table 15. Convergent Validity Test

Factor	Questions	Factor loading	CR	AVE
consumers' comprehensive innovation	CIOC1	.817	.865	.617
	CIOC2	.805		
	CIOC3	.758		
	CIOC4	.759		
perceived quality	PQ1	.829	.884	.605
	PQ2	.781		
	PQ3	.684		
	PQ4	.77		
	PQ5	.817		
brand reputation	BR1	.766	.856	.543
	BR2	.726		
	BR3	.719		
	BR4	.733		
	BR5	.738		
brand loyalty	BL1	.776	.849	.585
	BL2	.736		
	BL3	.739		
	BL4	.806		

The normalization factor loads of all the measurement indexes shown in Table X is> 0.6. CR were 0.865, 0.884, 0.856, 0.849 (>0.7). AVE were 0.617, 0.605, 0.543, 0.585 (>0.5). In summary, it shows that each variable has good convergence validity.

4.2.5 Discriminative validity

Table 16. discriminant validity

	perceived quality	brand reputation	consumers' comprehensive innovation	brand loyalty
perceived quality	.778			
brand reputation	.350**	.737		
consumers' comprehensive innovation	.360**	.242**	.785	
brand loyalty	.527**	.430**	.288**	.765

**, P<0.01 Bold font means square root of AVE

4.2.6 Regression Analysis

Table 17. Regression Analysis

	Brand Loyalty	
	M1	M2
	β	β
R^2	.059	.361
△ R^2	.059	.302
F	4.797**	28.647***

*, p<0.05; **, p<0.01; ***, p<0.001

Model 2 in Table 17 shows that perceived quality has a significant positive effect on brand loyalty (β=0.405, p<0.05), and the hypothesis holds (R^2=0.361). In addition, brand reputation has a significant positive impact on brand loyalty (β=0.277, p<0.05).

4.2.7 Explore the role of consumers' comprehensive innovation in the impact of perceived quality on brand loyalty.

Table 18. Adjustment Test

	Brand Loyalty			
	M1	M2	M3	M4
	β	β	β	β
Consumers' Comprehensive Innovation X Perceived Quality				.127*
R^2	.059	.295	.307	.32
△ R^2	.059	.236	.012	.013
F	4.797**	25.526***	22.47***	20.358***

*, p<0.05; **, p<0.01; ***, p<0.001

Model 4 in Table 18 shows that consumer comprehensive innovation has a positive effect on the impact of perceived quality on brand loyalty (β=0.127, p<0.05). Consumers' comprehensive innovation plays a significant positive role in the interaction of the other two. The hypothesis set by the researcher is established.

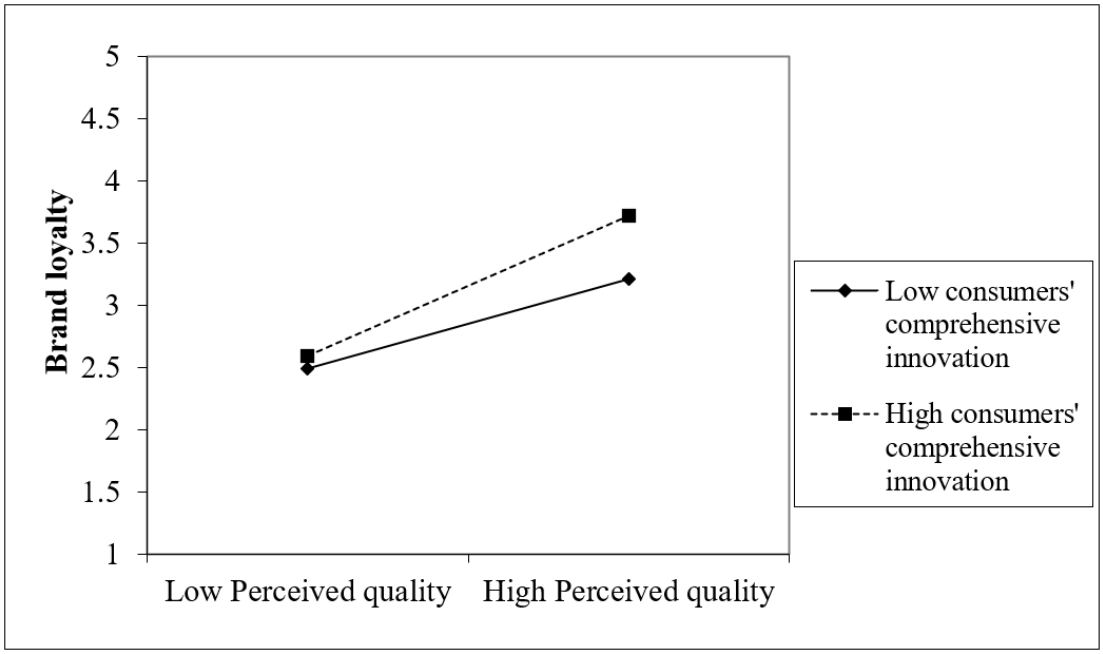

Figure 3. Consumers' Comprehensive Innovation X Perceived Quality

4.2.8 Explore the role of consumers' comprehensive innovation in the impact of brand reputation on brand loyalty.

Table 19. Adjustment Test

	Brand loyalty			
	M1	M2	M3	M4
	β	β	β	β
Consumers' Comprehensive Innovation X Brand Reputation				.18**
R^2	.059	.224	.259	.288
△ R^2	.059	.165	.035	.029
F	4.797**	17.612***	17.718***	17.478***

*, p<0.05; **, p<0.01; ***, p<0.001

Model 4 in Table 19 shows that consumer comprehensive innovation has a positive effect on the impact of brand reputation on brand loyalty ($\beta=0.18$, $p<0.05$). Consumers' comprehensive innovation plays a significant positive role in the interaction of the other two. The hypothesis set by the researcher is established.

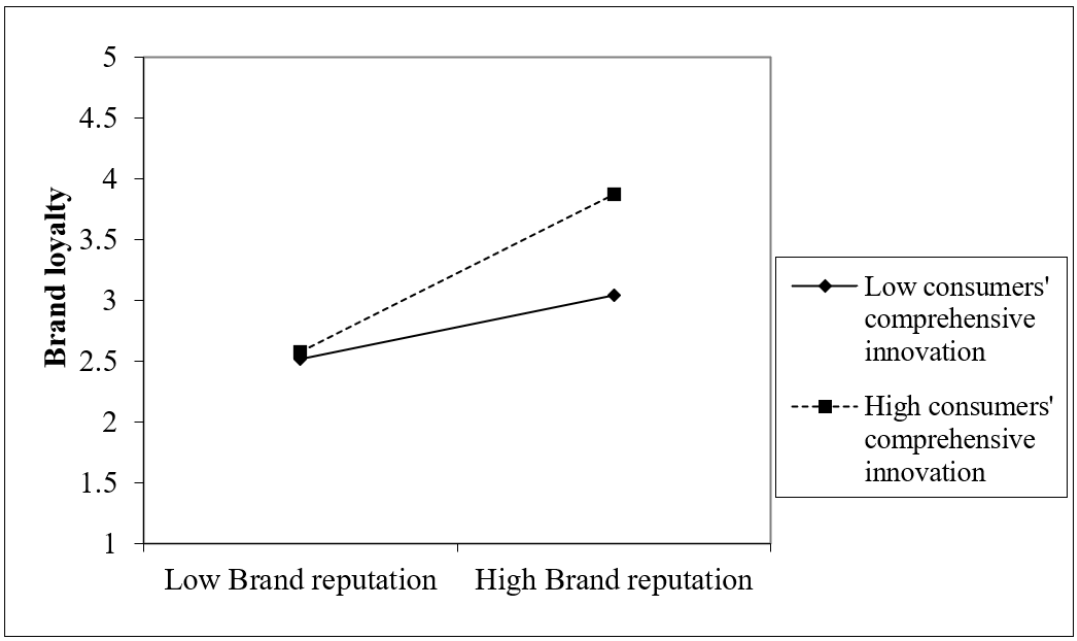

Figure 4. Consumers' Comprehensive Innovation X Brand Reputation

5. Conclusion

The research uses liquid foundation as the research background with China recent conditions and puts forward 4 theoretical hypotheses through literature analysis, in-depth interviews, questionnaire surveys, reliability analysis, validity analysis, correlation analysis, regression analysis, factor analysis, structural equation model and other methods. Paper also conducts applicability verification in the liquid foundation category in the fast-moving consumer goods industry.

This research proposes and verifies the Consumers' Comprehensive Innovation Scale. The Consumers' Comprehensive Innovation includes the following four dimensions: consumers' personal innovation, consumers' social innovation, consumers' attitudes towards new products, and consumers' behavior towards new products. The study determines that perceived quality and brand reputation directly and positively affect brand loyalty. The research is based on this and demonstrates that consumers' comprehensive innovation plays a positive role in the relationship between brand reputation and brand loyalty, and consumer comprehensive innovation plays a positive role in perceived quality and brand loyalty. The consumers' comprehensive innovation is an important moderating variable that affects brand loyalty. FMCG can increase brand loyalty by satisfying consumers' comprehensive innovation.

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