



Structural Equation Modeling for Analyzing the Relationships among Packaging, Perceived Quality, Customer Satisfaction, and Business Competitiveness in Food Products

Dian Handayani¹, Fitriana Era Madani² and Dania Siregar¹

¹Study Program of Statistics, Universitas Negeri Jakarta (INDONESIA)

² Research Division, SWA Media Group (INDONESIA)
dianh@unj.ac.id

Abstract. Customer satisfaction is one of the important things which should be taken into account by food manufacturer to win the business competition. There are some factors which can contribute to customer satisfaction. This study aims to analyze the relationships between packaging, perceived quality, customer satisfaction, and business competitiveness in food products by using structural equation modelling. The categories of food products which are specified in this study are instant noodles in cup packaging, wafer cookies and malkist biscuits. Based on the Top Brand Index (TBI) 2021, Pop Mie, Tango Wafer and Roma Malkist Crackers have the largest TBI from categories of instant noodles in cup packaging, wafer cookies and malkist cookies respectively. We specify the criteria for our sample respondents are those who have purchased at least twice for Pop Mie, Tango Wafer and Roma Malkist Crackers. The sample respondents are from Jakarta, Bogor, Depok, Tangerang and Bekasi. Data collection was carried out by administering online questionnaire during June 2021. The results indicate that perceived quality has a significant direct effect on customer satisfaction and has a significant indirect effect on business competitiveness. Product packaging has significant direct effect to customer satisfaction, but it is not significant as indirect effect to business competitiveness ($\alpha = 0.05$). The variability of customer satisfaction which can be explained by perceived quality and product packaging is 88%. Meanwhile, the variability of business competitiveness that can be explained by customer satisfaction is 64%.

Keywords: diagonally weighted least square, direct effect, indicator variable, indirect effect, latent variable

1 Introduction

The food industry is one of the manufacturing sectors that contributes greatly to economic growth in Indonesia [1]. The number of food industries is increasing over time so that it can create competitiveness. Customer satisfaction is one of the important

things which should be taken into account by the food manufacturers to win the business competition [2]. Several factors can affect customer satisfaction, including perceived quality and packaging. Perceived quality can be defined as the consumer's perception of the overall quality or superiority of the product or service [3]. Meanwhile, packaging and designs are some effectively ways which could differentiate a certain product from competitors [4].

Studies on consumer satisfaction in the food and beverage industry have been widely carried out. Most of these studies focus on the food industry that serves dishes directly (food service) [5],[6],[7]. Our research, on the other hand, concern on packaged food products.

The food products that we investigate in this research are those which are categorized as Top Brand. We specified Top Brand products because they can represent that many people have satisfied with the products. Furthermore, they also can indicate that the marketing of the products is successful. The categories of food products which are specified in this study are instant noodles in cup packaging, wafer cookies and malkist biscuits. Based on the Top Brand Index (TBI) 2021, *Pop Mie*, *Tango Wafer* and *Roma Malkist Crackers* have the largest TBI from categories of instant noodles in cup packaging, wafer cookies and malkist cookies respectively. Thus, we select Pop Mie, Tango Wafer and Roma Malkist Crackers as the food products that would be analyzed in this research.

Structural equation modeling (SEM) was used to analyze the relationships among our latent variables: perceived quality, packaging of a product, customer satisfaction and business competitiveness. The significant of direct effect as well as indirect effect among the latent variables are examined. Furthermore, the key indicators from each latent variable are also identified. Confirmatory factor analysis (CFA) is used to confirm some indicator variables which can measure the latent variables appropriately [10], [11]. On the other hand, structural regression analysis was used to analyze the structural relationship among the latent variables [12]. Finally, path analysis was used as a tool for visualizing the relationship between indicators and latent variables, as well as it is also used for showing direct and indirect effects between latent variables [11].

2 Data and Method

Data collection was carried out by administering online questionnaire during June 2021. The criteria of sample respondents are those who have consumed at least twice for top brand's food products, especially for Roma Malkist Crackers, Pop Mie, and Tango Wafers. At the end of June 2021, the total of sample respondents that have been collected was 313 respondents. They are from Jakarta, Bogor, Depok, Tangerang and Bekasi (Jabodetabek). The characteristics of our respondents are shown in Table 1.

Table 1. Description of respondents

Characteristics		Percentage
Gender	Female	70
	Male	30

Domicile	Jakarta	31
	Bogor	15
	Depok	14
	Tangerang	26
	Bekasi	14
Age	< 15	0.3
	15-19	20
	20-24	61
	25-29	5
	30-34	3
	> 34	10
Education	Primary school	0
	Middle school	0.3
	High school	19
	Diploma	9
	Undergraduate	69
	Postgraduate	2
	Other	0.6
Occupation	Student	74
	Private/BUMN Employees	7
	Civil servants/Police /Army	4
	Housewife	6
	Entrepreneur	5
	Other	5

2.1 Structural Equation Modeling (SEM)

Structural equation modeling (SEM) is a set of equations (or models) which represent inter-relationship among observed and unobserved/latent variables. Latent variables (constructs or factors) are variables that cannot be observed or measured directly. They can be measured through some indicators/observed (or manifest variables). Latent variables that are influenced by other latent variables are called endogenous whereas latent variables that affect and are not influenced by other latent variables are called exogenous. SEM consists of measurement model and structural model. Measurement model establishes the relationship between latent variable and some observed variables. On the other hand, structural model represents the relationship among latent variables. By using SEM, the significance about direct effect as well as indirect effect of a certain latent variable to other latent variables can be examined [13],[10]. The steps for conducting SEM are: model specification, model identification, model estimation, model testing and fit evaluation [10].

Model Specification

There are four latent variables that are of concern in this study namely: perceived quality, packaging, customer satisfaction, and competitiveness. Perceived quality can be

defined by consumer perceptions of the overall quality of a product [3]. Meanwhile, packaging and design are the ways which are effectively to differentiate products from competitors [4]. Satisfaction is known as a feeling of pleasure and fulfillment of expectations [14]. Competitiveness can be defined by an ability of manufacture to produce goods which is better than other manufactures [15]. The perceived quality is measured by five manifest (indicator) variables, packaging is measured by four indicators, customer satisfaction is measured by four indicators and competitiveness is measured by four indicators. As a result, there are 17 manifest variables in our research. Table 1 shows the latent variables and manifest (indicator) variables which have been considered in this research.

Table 2. Latent and Manifest (Indicator) variables

Perceived Quality (latent variable)		
	How do you rate the taste of this product?	PQ1 (X1)
	How would you rate the type of ingredients used and the percentage of the composition of the ingredients used in this product?	PQ2 (X2)
Indicators	How would you rate the nutritional value of this product, especially in terms of its benefits? Such as adding energy, health, sweetness, freshness.	PQ3 (X3)
	How do you rate the durability of this product after opening the packaging?	PQ4 (X4)
	How would you rate the overall quality of this product?	PQ5 (X5)
Source: [16],[17]		
Packaging (latent variable)		
	How good is the role of packaging based on raw materials and various forms of packaging in ensuring product quality?	P1 (X6)
Indicators	How good is the role of packaging in providing convenience and comfort when used?	P2 (X7)
	How good is the role of packaging based on material quality and shape in protecting this product?	P3 (X8)
	How are the looks of the packaging based on the color, design, and appearance of this product?	P4 (X9)
Source: [4]		
Customer Satisfaction (latent variable)		

Indicators	How satisfied are you with this product in fulfilling your needs?	CS1 (Y1)
	How satisfied are you with this product in fulfilling your wants?	CS2 (Y2)
	How satisfied are you with the overall quality of this product?	CS3 (Y3)
	How satisfied are you with the packaging of this product?	CS4 (Y4)

Source: [18], [19], [16]

Competitiveness (latent variable)

Indicators	How would you rate product quality based on taste, composition, nutritional value, overall durability when compared to competitors?	C1 (Y5)
	How do you rate this product packaging based on the variety of shapes, sizes, variety of materials, attractiveness, appearance, design, overall color when compared to competitors?	C2 (Y6)
	How do you rate a product's image based on its brand (tradition, reputation) compared to competitors?	C3 (Y7)
	How do you rate the level of marketing communication for this product based on interest, how impressive, intensity of advertising, sales promotion when compared to competitors?	C4 (Y8)

Source: [16]

Berliansyah & Suroso [20] have investigated that the quality of food and beverages has a significant positive effect on consumer satisfaction. Kapoor & Kumar [4] have examined that 90% of their sample respondents feel that the packaging of food product influences them to select (or to use) the product [4]. Suchánek & Králová [16] shows that consumer satisfaction has an indirect effect on the competitiveness of the product business.

The relationship between indicator variables and latent variables in SEM can be represented by using statistical model or path diagrams [11]. In our study, the model (or the path diagram) shows the relationships between latent variables of consumer satisfaction, perceived quality, packaging, and business competitiveness, as well as the relationships between latent variables and their indicators. The path diagram which depicts the relationship among observed and latent variables is given by Figure 1.

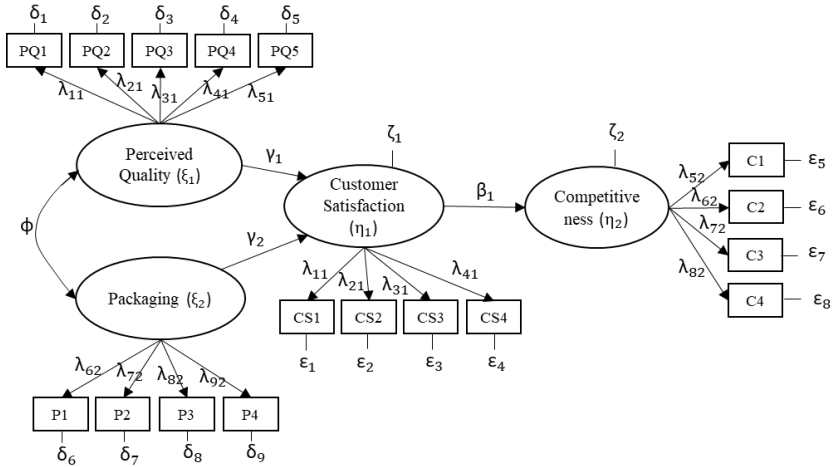


Fig. 1. Path diagram

The hypothesized relationships which are tested in this research: the perceived quality and packaging affect customer satisfaction, and customer satisfaction affects business competitiveness. The hypothesizes are formulated as:

- H0: There is no direct effect of perceived quality on consumer satisfaction
 H1: There is a direct effect of perceived quality on consumer satisfaction.
- H0: There is no direct effect of packaging on consumer satisfaction.
 H1: There is a direct effect of packaging on consumer satisfaction.
- H0: There is no direct effect of consumer satisfaction on business competitiveness.
 H1: There is a direct effect of consumer satisfaction on business competitiveness
- H0: There is no indirect effect of perceived quality on business competitiveness.
 H1: There is an indirect effect of perceived quality on business competitiveness.
- H0: There is no indirect effect of packaging on business competitiveness.
 H1: There is an indirect effect of packaging on business competitiveness.

Model Identification

This step is to determine whether the specified model can produce a unique parameter estimates. There are two general requirements for identifying a structural equation model [12], i.e. the degree of freedom of the model must be at least zero ($df \geq 0$) and each latent variable (including error) must be scaled. The degree of freedom is given by:

$$df = \frac{p(p+1)}{2} - \text{number of parameters} \quad (1)$$

where p is the observed variable. While the determination of the scale on the error and factor using the limit method of unit loading identification (ULI) with a constant setting of 1.0. Based on the results of the df calculation, the model in this study has a degree of freedom of 92 (overidentified) with $p = 17$ and the number of parameters = 61.

Model Estimation

Parameter estimation in SEM is based on the principle of minimizing the fit function, which is a function of the difference between the sample variance-covariance matrix (S) and the population-covariance matrix [$\Sigma(\theta)$] based on the specified model [11]. The parameter estimation method used in this study is the diagonally weighted least square (DWLS) method because the observed variables are measured on an ordinal scale. DWLS is a parameter estimation method that is used when some or all of the observed variables are not normally distributed and/or the data is of categorical [11]. This method does not assume a specific probability distribution (distribution-free) and has unbiased estimation properties, as well as complete statistics [21].

Model Testing and Fit Evaluation

There are three kinds of model evaluation, i.e. evaluation of the overall fit of model, evaluation of the fit of measurement model, and evaluation of the fit of structural model [22]. Evaluation of the overall fit of model is implemented by using the goodness of fit index (GOFI) criteria, i.e. p -value χ^2 with cut-off value is ≥ 0.05 , standardized root mean square residual (SRMR) with cut-off value is ≤ 0.08 , root mean square error of approximation (RMSEA) with cut-off value is ≤ 0.06 . Evaluation of the fit of the measurement model using CFA to test the validity and reliability of the measurement model. The validity test can be assessed from the standardized factor loading and/or its comparison with the measurement error. The criteria for a good standardized factor loading is ≥ 0.63 or \geq measurement error δ/ϵ . In addition, it can also be assessed from the z significance test [23] [24]. Meanwhile, the reliability test is determined from the omega value with cut-off value $\omega \geq 0,7$ and average variance extracted (AVE) with cut-off value ≥ 0.5 . Evaluation of the fit of the structural model can be implemented by using significance test and coefficient of determination [24].

3 Results

Figure 2 presents the distribution of the percentage of respondents who have selected Roma Malkist Crackers, Pop Mie, and Tango Wafers.

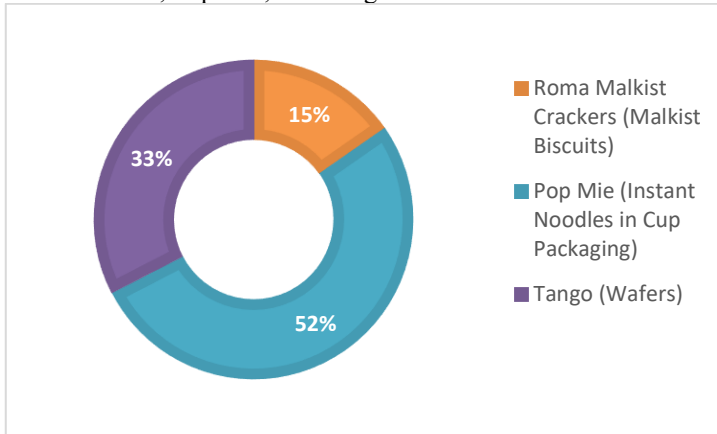


Fig. 2. Consumer-selected brands

Based on Figure 2, it can be seen that the brand which was selected by most of respondents is Pop Mie. It is from the category of instant noodles in cup packaging and it was elected by 52% of the 313 total respondents in this study. This shows that Pop Mie is the respondent's favorite product is.

3.1 Measurement Model

Validity and reliability tests were carried out on the measurement model. The measurement model in this study is split into three models. The measurement model (a) consists of exogenous latent variables perceived quality and packaging and their indicators. It is assumed that perceived quality and packaging are correlated. The measurement model (b) only consists of endogenous latent variables of consumer satisfaction and its indicators. The measurement model (c) only consists of the endogenous latent variable of business competitiveness and its indicators. The three measurement models have fitted. The results of the validity and reliability tests are as follows:

Table 2. Validity and reliability test results

Latent Variables	Indicators	Validity		Reliability	
		Std λ	δ/ε	Omega (ω)	AVE
	Quality based on taste (PQ1)	0.734	0.462	0.761	0.516

Perceived Quality (PQ)	Quality by type of material and composition (PQ2)	0.718	0.484		
	Overall Quality (PQ5)	0.703	0.506		
Packaging (P)	The role of packaging in ensuring quality (P1)	0.870	0.243	0.778	0.636
	The role of packaging in protecting the product (P3)	0.744	0.447		
Customer Satisfaction (CS)	Satisfaction based on needs fulfillment (CS1)	0.823	0.322		
	Satisfaction based on desire fulfillment (CS2)	0.753	0.433	0.847	0.581
	Overall satisfaction rating with product quality (CS3)	0.850	0.277		
	Overall satisfaction rating with packaging (CS4)	0.648	0.580		
Competitiveness (C)	Comparison of overall product quality with competitors (C1)	0.816	0.334		
	Overall packaging comparison with competitors (C2)	0.687	0.528	0.768	0.530
	Comparison of brand image with competitors (C3)	0.652	0.574		

It can be seen from Table 3, the indicators which have large correlation (contribution) with perceived quality are PQ1, PQ2, and PQ5. They are valid to measure perceived quality whereas PQ3 and PQ4 are not valid. PQ1, PQ2, and PQ5 also can be called by the key indicators of perceived quality. The key indicators of packaging are P1 and P3. All of indicators that have been considered to measure customer satisfaction (CS1, CS2, CS3 and CS4) are the key indicators and they are valid to measure customer satisfaction. The key indicators which are valid to measure the business competitiveness are C1, C2, and C3.

3.2 Structural Model

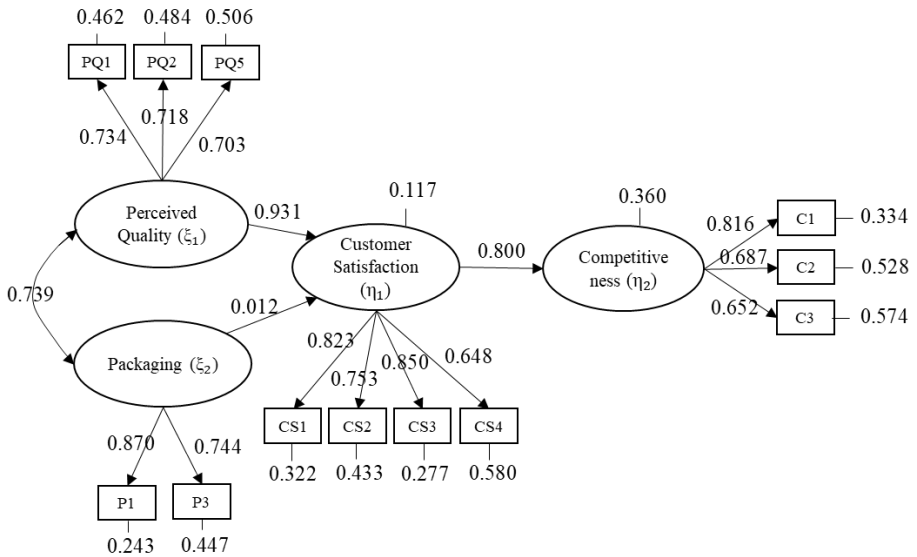


Fig. 3. Parameter estimation results in path diagrams

The structural model in Figure 3 contains a measurement model that has been previously analyzed. Measurement models that are presented in Figure 3 involve only indicators which are valid and reliable. In addition to the measurement model, there are also estimation results of the structural model parameters. This structural model needs to be re-evaluated for the overall fit of the model using GOFI. The model has a good fit: $p\text{-value } \chi^2 = 0.452$, SRMR = 0.051, RMSEA = 0.006. All the fit indices were better than the recommended ones ($p\text{-value } \chi^2 \geq 0.05$, SRMR ≤ 0.08 , RMSEA ≤ 0.06). Table 4 represents the results from testing hypothesis about the relationship between latent variables.

Table 3. Causal effect

Exogenous Latent Variables	Causal effect		
	Direct effect on customer satisfaction	Indirect effect on competitiveness	Total
Perceived Quality	0.931	$0.931 \times 0.800 = 0.745$	2.476
Packaging	0.012	$0.012 \times 0.800 = 0.009$	0.821

Based on Table 4, it can be seen that at the 5% significance level, there is a significant direct effect between perceived quality on consumer satisfaction and a significant indirect effect on business competitiveness. This shows that the better the perceived quality of the product, it will increase consumer satisfaction with a product which then

increases business competitiveness as well. This effect can answer the 1st and 4th hypotheses. Meanwhile, the direct effect of packaging on consumer satisfaction and the indirect effect on business competitiveness is not significant. This effect can answer the 2nd and 5th hypotheses. Finally, there is a significant direct effect between customer satisfaction and business competitiveness. This effect can answer the fifth hypothesis. All these direct and indirect effects can answer all hypotheses. In addition to direct and indirect effects, the structural model with the coefficient of determination is as follows:

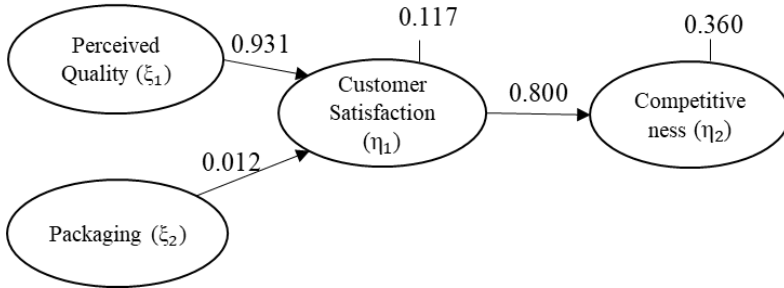


Fig. 4. Structural model in path diagram

Based on the Figure 4, the regression equation formed:

$$\text{Customer satisfaction} = 0.931 * \text{Perceived quality} + 0.012 * \text{Packaging} + 0.117 \tag{2}$$

In equation (2), it can be interpreted that with an equation error of 0.117, every one-unit increase in the perceived quality variable will increase the consumer satisfaction variable by 0.931 with a constant packaging variable. Then, every one-unit increase in the packaging variable will increase the consumer satisfaction variable by 0.012 with the perceived quality variable being constant. Both perceived quality and packaging latent variables have a direct influence on consumer satisfaction but only perceived quality has a significant effect on consumer satisfaction. This shows that consumers in the food industry in this study do not make product packaging an assessment of satisfaction with a product. In contrast, consumers are very concerned about product quality as an assessment of satisfaction with a product, especially product quality based on taste, type of ingredients, and composition of food products. That is, the better the quality of food products, especially based on taste, type of ingredients, and composition, as well as the role of packaging in ensuring product quality, the higher the consumer's satisfaction with a product. In addition to the regression coefficient, there is a coefficient of determination R² of 88%, which means that 88% of the variance of consumer satisfaction is explained by perceived quality and packaging and 12% of other variables not examined.

$$\text{Competitiveness} = 0.800 * \text{Customer satisfaction} + 0.360 \tag{3}$$

In equation (3), it can be interpreted that with an equation error of 0.360, every one-unit increase in the consumer satisfaction variable will increase the business competitiveness variable by 0.800. This shows that consumer satisfaction in the food industry,

especially consumer satisfaction based on the overall perceived product quality, has a significant influence on the business competitiveness of a brand. That is, the more consumers feel satisfied with a product, it will also increase the competitiveness of the brand's business. In addition to the regression coefficient, there is a coefficient of determination R^2 of 64%, which means that as much as 64% of the variance of business competitiveness is explained by consumer satisfaction and 36% of other variables not examined.

4 Conclusions

PQ1, PQ2, and PQ5 are the key indicator variables for measuring perceived quality. P1 and P3 are the key indicators for measuring packaging. CS1, CS2, CS3, and CS4 are the key indicators for measuring consumer satisfaction. On the other hand, C1, C2, and C3 are the key indicators for measuring business competitiveness.

At the 5% level of significance, there is a significant direct effect of perceived quality on consumer satisfaction and a significant indirect effect of perceived quality on business competitiveness. Direct effect of packaging on consumer satisfaction is not significant. Furthermore, indirect effect of packaging on business competitiveness is not significant.

Acknowledgements

This research was supported by a grant from the Public Service Agency (Badan Layanan Umum) of Universitas Negeri Jakarta.

References

1. Kementerian Perindustrian, "Industri makanan dan minuman jadi sektor kampiun," 2019. [Online]. Available: <https://kemenperin.go.id/artikel/20298/Industri-Makanan-dan-Minuman-Jadi-Sektor-Kampiun->
2. Prakarsa, L. M., Tarigan, J.: Pengaruh kepuasan pelanggan terhadap kinerja keuangan melalui loyalitas pelanggan sebagai variabel intervening pada berbagai sektor perusahaan di Indonesia. In: *Bus. Account. Rev.*, vol. 4, no. 1, pp. 362–372 (2016)
3. Aaker, D. A.: Managing brand equity. In: *J. Mark.*, vol. 56, no. 2, p. 125 (1991)
4. Kapoor, S., Kumar, L. N.: Does packaging influence purchase decisions of food products? A study of young consumers of India. In: *Acad. Mark. Stud. J* (2019)
5. Hadiwidjaja, R. S., Dharmayanti, D.: Analisa hubungan experiential marketing, kepuasan pelanggan, loyalitas pelanggan starbucks coffee di Surabaya Town Square. In: *J. Manaj. Pemasar.*, vol. 2, no. 2, pp. 1–11 (2014)
6. Wibisono, O. N., Widjaja, D. C.: Analisa pengaruh kualitas produk dan kualitas layanan terhadap kepuasan pelanggan dan loyalitas pelanggan di Pisa Kafe Surabaya. In: *J. Ekon. Bisnis*, p. 11 (2017)
7. Wu, P., Huang, C., Chou, C.: Service expectation, perceived service quality, and customer satisfaction in food and beverage industry. In: *Int. J. Organ. Innov* (2014)

8. K. G. Joreskog and D. Sorbom, "LISREL 8: Structural equation modelling with the SIMPLIS command language," *Hove London Sci. Softw. international*, 1996.
9. M. D. Sammel, L. M. Ryan, and J. M. Legler, "Latent variable models for mixed discrete and continuous outcomes," *J. R. Stat. Soc. Ser. B*, vol. 59, no. 3, pp. 667–678, Jul. 1997.
10. R. E. Schumacker, *A Beginner's Guide to Structural Equation Modeling*. 2004.
11. R. H. Hoyle, *Handbook of Structural Equation Modeling*. The Guilford Publications, 2012.
12. R. B. Kline, "Principles and practice of structural equation modeling, 3rd edition.," in *Methodology in Social Sciences*, 2011.
13. E. E. Rigdon and R. H. Hoyle, "Structural Equation Modeling: Concepts, Issues, and Applications," *J. Mark. Res.*, 1997.
14. M. Zairi, "Managing customer dissatisfaction through effective complaints management systems," *TQM Mag.*, 2000.
15. M. E. Porter, *Competitive Advantage: Creating and Sustaining Superior Performance*. 1998.
16. P. Suchanek and M. Kralova, "Customer satisfaction, loyalty, knowledge and competitiveness in the food industry," *Econ. Res. Istraz.*, vol. 32, no. 1, pp. 1237–1255, 2019.
17. D. A. Garvin, "Competing on the eight dimensions of quality," *Harv. Bus. Rev.*, vol. 65, no. 6, pp. 101–9, 1987.
18. G. A. J. Churchill and C. Surprenant, "An investigation into the determinants of customer satisfaction," *J. Mark. Res.*, vol. 19, no. 4, pp. 491–504, 1982.
19. H. Han and K. Ryu, "The roles of the physical environment, price perception, and customer satisfaction in determining customer loyalty in the restaurant industry," *J. Hosp. Tour. Res.*, vol. 33, no. 4, pp. 487–510, 2009.
20. R. A. Berliansyah and A. Suroso, "The influence of food & beverage quality, service quality, place, and perceived price to customer satisfaction and repurchase intention," *J. Res. Manag.*, vol. 1, no. 1, 2018.
21. I. P. Sari, E. Setiawan, and Nusyirwan, "Ketakbiasan dalam model CFA (Confirmatory Factor Analysis) pada metode estimasi DWLS (Diagonally Weighted Least Squares) untuk data ordinal," 2013.
22. T. Raykov and G. A. Marcoulides, *A first course in structural equation modeling*. Lawrence Erlbaum Associates, 2000.
23. C. DiStefano and B. Hess, "Using confirmatory factor analysis for construct validation: An empirical review," *J. Psychoeduc. Assess.*, vol. 23, no. 3, pp. 225–241, 2005.
24. K. Gana and G. Broc, *Structural equation modeling with lavaan*. 2019.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

