*Journal of Scientific Research and Reports*

***Volume 29, Issue 1, Page 38-47, 2023; Article no.JSRR.96443***
***ISSN: 2320-0227***

# Exploring and Validating Performance Measurement Domains of Community Pharmacists Using Structural Equation Modeling: Implications and Recommendations for Research

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***Authors' contributions***

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

***Article Information***

DOI: 10.9734/JSRR/2023/v29i11726

**Open Peer Review History:**
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/96443

***Original Research Article***

***Received: 16/11/2022***
***Accepted: 28/01/2023***
***Published: 04/02/2023***

## ABSTRACT

**Background:** Structural equation modeling (SEM) is a widely used quantitative technique among social and management science researchers. Self-reported questionnaires are in prevalent use among researchers in pharmacy management. But validity and measurement invariance measures of questionnaires are not commonly reported in research studies.
**Objectives:** To determine the construct validity and invariance validity of the research instrument. To provide guidelines for applying confirmatory factor analysis (CFA) in pharmacy management research.
**Methods:** A cross-sectional study with an anonymously structured questionnaire randomly administered to six hundred community pharmacists in southwestern, Nigeria. The CFA algorithm in SEM software was used to develop a measurement model and test hypotheses.
**Results:** The measurement model satisfied the model and construct validity benchmarks. The measurement invariance parameters were adequate.

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**Conclusion:** The study concluded that the theoretically developed constructs- economic, operational, and social performance were valid representations of theory. Mandatory inclusion of validity and measurement invariance test reporting in pharmacy management research is advocated.

*Keywords: Behavioral research; confirmatory factor analysis; social pharmacy; measurement invariance; model fit; multigroup analysis; structural equation modeling; pharmacy management.*

## ABBREVIATIONS

***EFA*** : *Exploratory factor analysis,*
***CFA*** : *Confirmatory factor analysis,*
***GoF*** : *Goodness of fit,*
***SRMR*** : *Standardized root mean squared residual,*
***RMSEA*** : *Root mean square error of approximation,*
***SEM*** : *Structural equation modeling,*
***CFI*** : *Comparative fit index,*
***TLI*** : *Tucker fit index,*
***CR*** : *Composite reliability,*
***AVE*** : *Average variance explained,*
***HTMT*** : *Heterotrait Monotrait,*
***KAP*** : *Knowledge, Attitude, and Practice,*
***CB-SEM*** : *Covariance-based structural equation modeling,*
*MI* : *Measurement invariance,*
***Δ*** : *Absolute change or difference*

## 1. INTRODUCTION

Structural equation modeling (SEM) techniques have achieved huge popularity and applicability in research in several disciplines such as psychology, administrative sciences, management science, marketing, ecology, and sociology. Several authors have provided guidelines and recommendations on the use of SEM in evaluating the validity of constructs and models [1-9]. However, the availability of guidelines for the use of SEM among researchers in social, behavioral, and administrative pharmacy is still nascent and evolving [10-13]. SEM is a group of multivariate quantitative statistical techniques with a broad range of capabilities for developing and testing relationships between variables. They are beneficial for small sample sizes, ensure the robustness of research findings, and for creating and authenticating a*priori* theoretical models [14,15]. SEM provides more robust estimations of variables and parameters compared to linear and multiple regression methods. Although there is limited use of SEM in pharmacy research, existing studies tend to omit or do not report model fit evaluation, construct validity measures, and measurement invariance estimations [8,16].

Structural equation models enable researchers to provide a robust analysis of possible multivariate relationships between variables in research, in which assessment of knowledge, attitudes, and perception (KAP) of respondents is essential. Hence, researchers must ensure parsimony, measurement adequacy, and theoretically valid constructs. Therefore, the use of confirmatory factor analysis (CFA) and measurement invariance is a suggested methodology to adopt [12,17-19]. Measurement invariance testing is a core requirement in cases of instrument bias suspicion and in situations where data is collected over two or more time points (longitudinal studies). This is of particular relevance because most studies in social pharmacy are targeted at informing practice and policy [20,21]. Therefore, policymakers are keen to have empirical evidence that is valid and generalizable. This strengthens the need for invariance and CFA studies. This study used multigroup structural equation modeling to validate the performance domains of community pharmacists and also measure the equivalence of the measures across gender subgroups of the study population.

The applicability of SEM to KAP and longitudinal studies in pharmacy practice provides more impactful results or estimations as it considers the contribution of the indicator items responsible for a construct. This is different from the traditional method of creating composites of indicators to form constructs for regression analysis [8,22].

### 1.1 Performance Management Evaluation among Community Pharmacists

Performance evaluation among community pharmacists is an evolving area; therefore it is relevant to have well-developed and replicable performance assessment measures. That may apply to both individual and group assessments. From extant literature, performance measures comprise three main themes: a) economic

performance measures, b) social performance measures, and c) operational performance measures. The economic performance measures are associated with monetary and financial indicators or outcomes influencing businesses such as sales revenue growth, turnover rates, profitability, resource availability, and expense control [18,23-25]. Social performance measures or outcomes address the impact of the business on society, social relations with local communities they serve, and customer acquisition and retention. The key indicators include business collaboration, customer satisfaction, customer engagement, and customer loyalty [25-28]. Operational performance measures address the factors influencing the effectiveness and efficiency of daily work operations in the community pharmacy such as technology utilization to improve operational efficiency, procedural efficiency in inventory use and control, and optimization of daily workflow operations [25-27]. Consequently, to enhance the applicability and use of measurement scales, there is the need to ascertain the theoretical (*apriori*) basis of performance domains of community pharmacists as developed from literature using confirmatory factor analysis (CFA).

Therefore, the purpose of the study is to 1) determine the model fit, construct validity (convergent and discriminant), and invariance validity of the self-reported performance measures of community pharmacists: 2) To provide basic guidelines and recommendations for applying confirmatory factor analysis in pharmacy practice research using SEM.

## 1.2 Research Questions

The research questions of the study include:

1. Does the proposed measurement model fit the data?
2. What is the convergent and discriminant validity of the research instrument measuring performance domains of community pharmacists?
3. Is the measurement model of the research tool invariant across gender?

## 1.3 Hypotheses Development

### 1.3.1 Confirmatory factor analysis and construct validity

CFA in SEM is useful for confirming the factor structure of exploratory factor analysis and *apriori* measures of constructs [13,19]. CFA estimates provide model fit estimates that confirm the hypothetical model as being a true reflection of the sample population. Typically, fit indices are expressed as standardized root mean squared residual (SRMR), and root mean square error of approximation (RMSEA) with recommended cutoff at $p<0.08$ and other goodness of fit (GoF) measures to ascertain the fit of the model to the data [2,16]. CFA is a requirement to assess construct validity (convergent and discriminant validity measures) because a statistically fit model does not imply a valid model. Convergent validity measures include reliability coefficients such as composite reliability (CR), average variance extracted (AVE), and Cronbach alpha.

On the other hand, discriminant validity seeks to establish that the constructs being measured are independent or separate from other constructs (no presence of overlapping meanings). Here, Fornell & Larcker and Heterotrait Monotrait (HTMT) criteria estimates provide clarity and separability of constructs. Here, the square root of the AVE of the constructs should be higher than the correlations between the constructs. HTMT is a current improvement on Fornell & Larcker criterion, as it is sensitive and more robust to the distinctiveness of constructs using a correlation matrix [2,19].

H1: There is an adequate model fit of the measurement model

H2: There is construct validity of the research instrument [constructs or latent variables]

### 1.3.2 Measurement invariance criterion

Measurement Invariance testing is a statistical measure used to determine if the measurement instrument is conceptually understood equivalently across subgroups of the study or target population [21,29,30]. Measurement invariance algorithm in analysis of moment structures [31] software enables researchers to confirm if researcher questions are equally understood by subgroups in the target population.

Oamen et al [20] advocated the incorporation of measurement invariance testing and reporting in pharmacy practice research studies. This is salient considering that developed research questionnaires are used to elicit opinions and perceptions from heterogeneous populations as well as homogeneous groups. Thus, it is

important to ascertain that the questionnaire items are equivalently or similarly understood by the different subgroups in the study population. This eliminates the possibility of the instrument and reporting bias [20].

Measurement invariance criteria were based on chi-square test statistic/degree of freedom ($\chi^2$/df), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and root mean square error of approximation (RMSEA) measures for configural invariance. And subsequent analysis requires the absolute change in comparative fit index (ΔCFI) to be less than 0.01 difference between models for metric, scalar, and residual invariance using configural invariant model as a baseline [20,29,32].

H3: There is measurement invariance or equivalence of the research instrument [configural, metric, scalar, and residual invariance] between male and female respondents.

## 2. METHODS

A cross-sectional, self-reported questionnaire-based study involving 600 practicing community pharmacists situated in the southwestern part of Nigeria using the simple random sampling method. Data collection took place between July to October 2022. The optimal sample size adequate for a structural equation modeling study was computed using Daniel Soper calculators for SEM studies [33]. The *a-priori* calculator was computed based on the number of latent variables (n=3), the number of observed or indicator variables (n=9), the probability at 1%, moderate effect size (0.2), and the statistical power of 80% [33]. The recommended sample size was 404 is required to achieve valid and reliable SEM results. However, a larger sample population of 600 was obtained to achieve the generalizability and robustness of the results. As a self-reported study, the perspective of analysis was based on the perception of the community pharmacist. The STROBE checklist for reporting cross-sectional studies was adopted for the reporting of this paper [34].

### 2.1 Measurement and Operationalization of Variables

Performance Measures (PMS) were measured using a 5-point Likert scale structure- very good (1), above average (4), average (3), below average (2), and very poor (1). Based on theory, the economic performance domain was measured by measurement items: growth of sales revenue in the last 1 year (PMS1); improvement in profitability in the last 1 year (PMS2); and reduction of overhead and expenses in the last 1 year (PMS3) [23, 24]. Operational performance was measured by 3 indicators- improvement in work operations using technology (PM5); accuracy and reliability of inventory management processes (PM6); efficiency and effectiveness of daily work operations (PM7) [26,27]. Social performance was also measured by 3 indicators- an improved collaboration with colleagues in the past 1 year (PMS4); growth in my client's satisfaction in the last 1 year (PMS8), and level of customer loyalty in the past 1 year (PMS9) [25, 35,36].

#### 2.1.1 Data analysis

Confirmatory factor analysis was to examine model fit, construct validity, and measurement invariance characteristics of the study model using Analysis of Moment Structures (AMOS) software version 24 using a maximum likelihood estimator [31]. AMOS software is a CB-SEM software for executing path model estimations.

## 3. RESULTS

### 3.1 Response Rate and Demographic Characteristics of Respondents

A total of 600 completed questionnaires were obtained out of 700 administered (response rate of 85.7%). A majority of the community pharmacists sampled were male (n=329, 54.8%) and female (n=271, 45.2%). The bulk of respondents were aged between 31-40 years (n=227, 37.8%) while 204 (34%) were aged above 40 years. The model of ownership revealed that a majority were sole proprietors (n=294, 49%), followed by partnership model (n=84, 14%), and pharmacist managers (n=222, 37%). Finally, 416 (69.3%) had between 1 to 10 years of community pharmacy practice experience, followed by 11 to 15 years (n=121, 20.2), and 63 (10.5%) had greater than 20 years of practice experience.

### 3.2 Common Method Bias

Common method bias (CMB) of self-reported measures was conducted to determine if the questionnaire or data collection instrument using a common Likert scale format introduced bias based on respondents' tendency to give similar

responses to all the questions [37] Harman's one-factor method was used and the CMB value was 49.18% which is less than the 50% cutoff value [38,39]. Hence, the dataset is suitable for further analysis.

### 3.2.1 Model fit and modification of the measurement model

The initial model presented with poor model fit indices; hence the measurement model was modified using the suggestions presented in the modification indices platform in the statistical software. The modification of the model was implemented by covarying the error terms of related indicators based on strong theoretical foundations involving only the indicators of the same construct. In this model, modification linkages were drawn between the error terms of PMS4 and PMS8 (e9 and e8) and PMS4 and PMS9 (e9 and e7) of the social performance construct. Also, similar linkages were drawn from the error terms of PMS5 and PMS7 (e6 and e4) of the operational performance construct as shown in Fig. 1. The modification of the measurement model was informed by the modification indices suggested by the software and relevant theoretical underpinnings [10,15,19]. The linkages of the error terms between indicators were justified based on; 1] the fact that the collaborative attitude of community pharmacists (PMS4) is associated with improved clients' satisfaction and loyalty denoted by PMS8 and PMS9 respectively [25]. Similarly, workflow improvement (PMS5} is related to enhanced efficiency and effectiveness of pharmacy operations [26].

### 3.2.2 Evaluation of model fit

The model fit estimates showed the ratio of chi-square test/degree of freedom; $\times^2$/df=4.468 ($\times^2$=93.827, degrees of freedom df=21) which is less than the benchmark of 5: RMSEA=0.076 which is below the cutoff value of 0.08. The SRMR value of 0.037 was adequate compared to the cutoff value of 0.08. The goodness of fit (GoF) indices of the hypothetical model was the comparative fit index (CFI) of 0.972, and the Tucker-Lewis index (TLI)= 0.952 (all above the strict benchmark value of 0.95) [40,41]. Hence, hypothesis (H1) was supported which implies that the hypothesized model is representative of the target population.

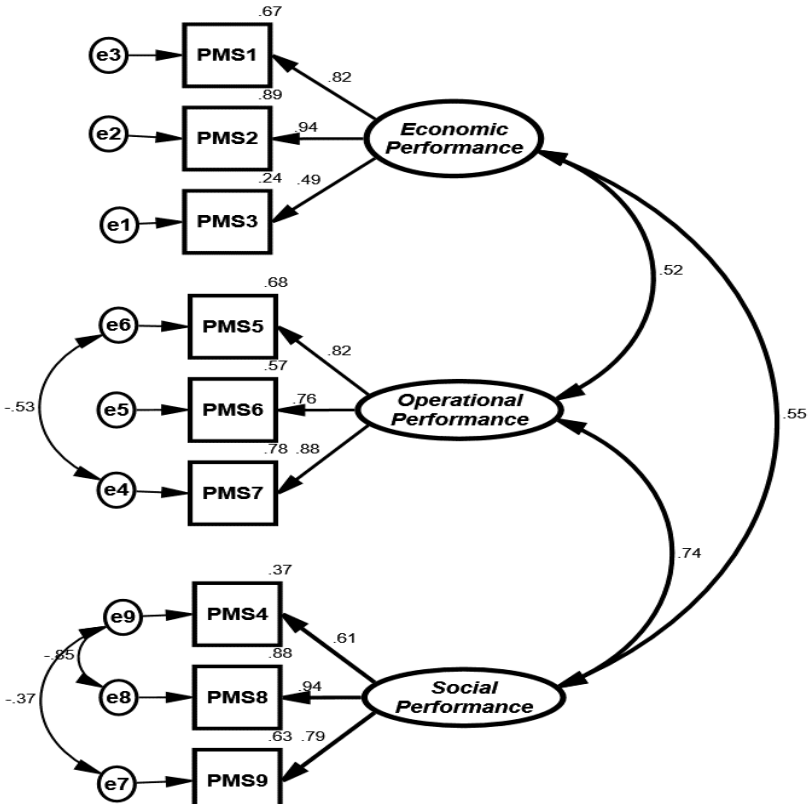


**Fig. 1. Measurement model showing standardized factor loadings and covariance**

**Table 1. Internal reliability coefficients (convergent validity) of indicators and constructs**

| Construct | Description | Factor loading* | CR | Cronbach | AVE |
|---|---|---|---|---|---|
| Indicators | | | | | |
| Economic Performance | | | 0.807 | 0.768 | 0.598 |
| PMS1 | Growth in yearly sales revenue | 0.817 | | | |
| PMS2 | Increased yearly profit | 0.944 | | | |
| PMS3 | Reduced cost of doing business | 0.486 | | | |
| Operational performance | | | 0.861 | 0.834 | 0.674 |
| PMS5 | Improved workflow | 0.824 | | | |
| PMS6 | Optimal stock management | 0.755 | | | |
| PMS7 | Improved work efficiency | 0.880 | | | |
| Social Performance | | | 0.831 | 0.714 | 0.628 |
| PMS4 | Collaborative work | 0.611 | | | |
| PMS8 | Enhanced customer satisfaction | 0.937 | | | |
| PMS9 | Enhanced client loyalty | 0.795 | | | |

**Standardized, CR=composite reliability, AVE=average variance explained*

Table 1 above, it showed that apart from PMS3 and PMS4, the standardized factor loadings of each indicator constituting each construct had values above 0.7. The decision criteria to accept indicators with factor loadings below 0.7 was based on two reasons: firstly, the researcher is at liberty can retain items below the value if they do not lower the CR and AVE values of the latent construct, and secondly, if it makes theoretical sense to retain the item [10,15].

### 3.2.3 Assessment of measurement model reliability and validity

The measurement model was then assessed for convergent and discriminant validity. To establish convergent validity, composite reliability (CR) and Cronbach alpha values for the constructs must be above the benchmark of 0.7 and the average variance extracted (AVE) above the baseline of 0.5 for the three constructs as shown in Table 1. Hence, convergent validity was established since the criteria were met.

To establish discriminant validity, the model was evaluated using Fornell & Larcker and Heterotrait Monotrait (HTMT) criteria as shown in Table 2. The HTMT ratio is less than the threshold of 0.9. While for Fornell & Larcker criterion, the square root of the AVE was greater than the inter-construct correlations. Hence, the Fornell & Larcker criteria were equally satisfied [2,40]. Therefore, hypothesis (H2) is supported by the study findings.

### 3.2.4 Evaluation of measurement invariance

The multigroup confirmatory factor analysis was used to assess measurement invariance validity of the questionnaire to establish-1] actual uniformity of understanding of the instrument by respondents based on the major grouping variable-Gender, and, 2] to provide a basis for realistic and valid group comparisons across gender [20,29,30]. Results revealed configural invariance (denoted as B1) across each group with satisfactory goodness of fit indices: □2/df, CFI, TLI, RMSEA. This implies that the model structure is equal, equivalent, or invariant across each group. Furthermore, as shown in Table 3, metric (B2), scalar (B2) and residual (B3) invariance measures were also established based on gender (B2: ΔCFI=0.002; B3: ΔCFI=0.001: B4: ΔCFI=0.003).

**Table 2. Discriminant validity of measurement model**

| Constructs | | Fornell & Larcker | | | Heterotrait Monotrait | | |
|---|---|---|---|---|---|---|---|
| **Performance Domains** | | **1** | **2** | **3** | **1** | **2** | **3** |
| **1** | Economic | **0.773*** | | | | | |
| **2** | Operational | 0.520 | **0.821*** | | 0.585 | | |
| **3** | Social | 0.546 | 0.737 | **0.792*** | 0.704 | 0.877 | |

**Denoted the square root of the AVE along the diagonal*

**Table 3. Measurement invariance testing across gender (Female-271, Male-329, N=600)**

| Model | RMSEA | X2/df | CF1 | TLI | Model diff. | Δ CFI | Δ TLI | Hypothesis (H3) |
|---|---|---|---|---|---|---|---|---|
| **B1: configural** | 0.055 | 2.839 | 0.971 | 0.950 | 0 | 0 | 0 | supported |
| **B2: metric** | 0.052 | 2.620 | 0.971 | 0.956 | **B1** | 0.000 | 0.000 | supported |
| **B3: scalar** | 0.047 | 2.312 | 0.972 | 0.964 | **B2** | 0.001 | 0.008 | supported |
| **B4: residual** | 0.045 | 2.216 | 0.970 | 0.967 | **B3** | 0.002 | 0.003 | supported |

** Δ=absolute difference of less than 0.01 between models is acceptable*

The results as shown in Table 3 showed that the performance questionnaire had configural, metric, scalar, and residual invariance based on gender. This is confirmed by model fit attributes being less than 0.01 baseline absolute difference. Therefore, hypothesis **H3** was supported. This implies that the measurement or research instrument was equivalently understood by male and female community pharmacists.

## 4. DISCUSSION

The study empirically tested the model fit, construct, and invariance validity of the theoretical questionnaire of self-reported performance of community pharmacists using the CB-SEM algorithm in AMOS.

The findings of the study were obtained using the illustrative step-by-step procedure for establishing the validity of theoretically developed constructs. The performance domains of community pharmacists-economic, operational, and social aspects were confirmed to be valid representations of theory as shown in Tables 1 and 2 [18]. This supports and opens more opportunities for the discovery of relationships that hitherto were not easily accessed. Furthermore, researchers are afforded the tools to capture causal relationships and determine the measures contributing to the effects. This is preferable compared to the use of composite scores of constructs that aggregate factor scores without due consideration for the effect of individual contributors.

Furthermore, KAP studies in pharmacy practice research would benefit from increased adoption of these techniques for three main reasons: firstly, improved extrapolation of findings to the general population. Secondly, a graphical display of results enables quick comprehension, and thirdly, the validity and reliability of constructs can be consistently estimated. Finally, longitudinal studies would benefit from CFA to validate instruments used over several time points.

The confirmation of measurement invariance of research instruments or questionnaires is of paramount relevance to researchers in pharmacy practice. This is revealed by the model showing adequate configural, metric, scalar, and residual invariance measures as shown in Table 3. This is because it establishes the suitability and applicability of the developed tool to assess perception based on gender which was the major grouping variable in this study [20,21]. This can be extended to other grouping variables covering demographic and cross-cultural characteristics such as tribe, region, country, health status, financial status, and years of experience amongst others. In other words, measurement variance or inequivalence is avoided. This measurement invariance or inequivalence introduces biased estimates and inference errors particularly if the distribution of demographic characteristics is disproportionately skewed to one attribute compared to the other [21,42,43]. The study using SEM provided additional evidence for researchers in pharmacy practice to support scale validation and the application of CFA to validate constructs in social and administrative pharmacy research.

### 4.1 Implications and Recommendation of the Study to Research

Based on study outcomes, the following considerations are recommended for researchers in pharmacy practice:

1. The use of CFA is essential to confirm the validity of the factor structure of constructs developed from apriori theory and the output of exploratory factor analysis [10,12,13,20].
1. Furthermore, the estimation of model fit (modification indices) provides the basis for model trimming in which indicators or items that do not contribute significantly to the constructs are removed to achieve an optimal model fit and a more parsimonious model [14,15]. Hence, respondents are given fewer questions compared to multiple questions in less parsimonious models.

2. Furthermore, establishing convergent and discriminant validity of latent variables or constructs is required to ensure the separability of indicators and constructs. Hence, the validity and uniqueness of research questionnaires are maintained [16].
3. For studies involving questionnaires involving demographic subgroups, pretest, and posttest measures, or data collected over two or more time points, it is essential to establish measurement invariance to ascertain the consistency or equivalence in the understanding of the tool used by the respondents [19].
4. CFA is also applicable for establishing the validity of a research instrument in another cultural group although validated in a different culture [16,32].

#### 4.1.1 Limitations of the study

Although the study affords the brevity of measurement, there is ample room for other performance measures to explore other domains. The study is cross-sectional in design, so there is a need to run a longitudinal study to evaluate potential changes in perception over time. Furthermore, the CB-SEM algorithm was executed using AMOS software. However, variance-based SEM or partial least squares SEM in software such as; WarpPLS®, and SMART PLS® could be used for executing confirmatory factor analysis and model validation [44,45].

## 5. CONCLUSION

Based on the evidence provided by the study, it is concluded that the theoretically developed constructs- economic, operational, and social performance domains were adequate and valid representations of the theory. Measurement Invariance testing affirmed comprehension of the tool by respondents across gender. Furthermore, it reinforces the need for researchers involved in scale development and questionnaire development to include the assessment of measurement invariance in their methodological process. The results of the study add substantially to questionnaire development and use in pharmacy practice research. The study recommends the mandatory inclusion of validity and measurement invariance tests in pharmacy practice research. The application of measurement invariance measures in questionnaire development is essential to generating valid and generalizable scales.

## ETHICAL APPROVAL AND CONSENT

Ethical approval with approval number HPRS/381/477 dated 22nd July 2022, was obtained from the Department of Health Planning, Research, and Statistics, Ministry of Health, Ogun State, Nigeria. Informed consent was obtained from respondents before the administration of the questionnaire**.**

## COMPETING INTERESTS

The authors have declared that no competing interests exist.

## REFERENCES

1. Ali F, Rasoolimanesh SM, Sarstedt M, Ringle CM, Ryu K. An assessment of the use of partial least squares structural equation modeling (PLS-SEM) in hospitality research. International Journal of Contemporary Hospitality Management; 2018.
   Available: https;//doi.org/10.1108/IJCHM-10-2016-0568.
2. Henseler J, Hubona G, Ray PA. Using PLS path modeling in new technology research: updated guidelines. Industrial management & data systems. 2016;116 (1):2-20.
3. Fan Y, Chen J, Shirkey G, John R, Wu SR, Park H. Applications of structural equation modeling (SEM) in ecological studies: an updated review. Ecological Processes. 2016;5(1):1-12.
4. Alavi M. Structural equation modeling (SEM) in health sciences education researches: An overview of the method and its application. Iranian Journal of Medical Education. 2013;13(656):519-530
5. Hair JF, Black WC, Babin BJ, Anderson RE. Multivariate data analysis: A global perspective. Pearson: Upper Saddle River, NJ; 2010
6. Hair JF, Sarstedt M, Ringle CM, Mena JA. An assessment of the use of partial least squares structural equation modeling in marketing research. Journal of the Academy of Marketing Science. 2012;40 (3):414-433.
7. Henseler J, Ringle CM, Sarstedt M. Testing measurement invariance of composite\s using partial squares. International Marketing Review. 2016;33 (3):405-43.
8. Lowry PB, Gaskin J. Partial least squares (PLS) structural equation modeling (SEM)

for building and testing behavioral causal theory: When to choose it and how to use it. IEEE Transactions on Professional Communication. 2014;57(2):123-146.
9. Sarstedt M, Ringle CM, Smith D, Reams R, Hair JF. Partial least squares structural equation modeling (PLS-SEM): Useful tool for family business researchers. Journal of Family Business Strategy. 2014;5(1):105-115.
10. Schreiber JB, Nora A, Stage FK, Barlow EA, King J. Reporting structural equation modeling and confirmatory factor analysis results: a Review. The Journal of Educational Research. 2006;99(6):323-338.
11. Schreiber JB. Update to Core reporting practices in structural equation modeling. Research in social and administrative pharmacy. 2017;13(3):634-643.
12. Carter SR. Using confirmatory factor analysis to manage discriminant validity issues in social pharmacy research. International Journal of Clinical Pharmacy. 2016;38(3):731-737.
13. Oamen TE. An exploratory factor analysis of work attributes of pharmaceutical sales workforce during Covid-19 lockdown. Journal of Contemporary Research in Social Sciences. 2021;3(1):11-27.
14. Byrne BM. Structural equation modeling with AMOS. Basic concepts, applications, and programming. New York London: Routledge Taylor & Francis Group; 2010
15. Collier JE. Applied structural equation modeling using AMOS: Basic to advanced techniques. Routledge; 2020.
16. Henseler J, Ringle CM, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing. 2015;43(1):115-135.
17. Brown T. Confirmatory Factor Analysis for Applied Research (2nd Ed.). New York, NY: Guilford Press; 2015.
18. Oamen TE, Lawal MB. The influence of economic and technology factors on performance outcomes of community pharmacists in Nigeria: A structural equation modeling study. Texila International Journal of Management. In press; 2023.
19. Schreiber JB. Issues and recommendations for exploratory factor analysis and principal component analysis. Research in Social and Administrative Pharmacy. 2020;17(5):1004-1011.
20. Oamen TE, Idiake J, Omorenuwa SO. Assessment of measurement invariance of psychometric tool for pharmaceutical sales executives: Implications for social and behavioral pharmacy research. Journal of pharmaceutical health services research. 2022;13(4);262-268. Available: https;//doi.org/10.1093/jphsr/rmac041
21. Putnick DL, Bornstein MH. Measurement invariance convention and reporting: The state of the art and future directions for psychological research. Development Review.2016;41:71-90. Available: https://doi.org/10.1016/j.dr.201606.004
22. Henseler J, Ringle CM, Sinkovics RR. The use of partial least squares path modeling in international marketing. Advances in International Marketing. 2009; 20:277-319.
23. Meressa HA. Growth of micro and small enterprises and its driving factors: empirical evidence from entrepreneurs in emerging regions in Ethiopia. Journal of Innovation and Entrepreneurship. 2020; 9:11.
Available: https:/doi.org/10.1186/s13731-020-00121-9.
24. Cavicchi C, Vagnoni E. Sustainable business models in hybrids; a conceptual framework for community pharmacies' business owners. Sustainability. 2020; 12:8125. Available: https://doi.org/10.3390/su12198125
25. Ranghchian M, Sehat S, Akhgari N, Mehralian G. Performance model of community pharmacies in low-middle income countries: A societal perspective. Journal of retailing and consumer services. 2018;40©:241-248.
DOI.10.101016/j.jretconser,2017.10.009
26. Wiklund J, Shepherd D. Entrepreneurial orientation and small business performance: A configurational approach. Journal of Business Venturing. 2005; 20:71–91.
27. Chang H.□T, Chi N- W. Human resource managers' role consistency and hr performance indicators: The moderating effect of interpersonal trust in Taiwan. International Journal of Human Resource Management. 2007; 18:665–683.
28. Miller TL, Grimes MG, McMullen JS, Vogus TJ. Venturing for others with heart and head: How compassion encourages social entrepreneurship. Academy of Management Review. 2012; 37:616–640.
29. Byrne BM. Testing for multigroup invariance using AMOS Graphics: a road

less traveled. Structural equation modeling: A multidisciplinary journal. 2004;11(2):272-301. Available: https://doi.org/10.1207/s15328007sem1102_8.
30. Cheung GW, Rensvold RB. Evaluating goodness of fit indexes for testing measurement invariance. Structural Equation Modeling. 2002;9(2):233-255.
31. Arbuckle JL. Amos (version 24) [Computer Program]. Chicago: IBM SPSS; 2014
32. Cheung MWL. Statistical methods-analyzing data on attitudes, knowledge, and behavior. Structural Equation Modeling. 2009; 1:1-49.
33. Soper DS. A-priori Sample Size Calculator for Structural Equation Models [Software]. 2022. Available: https://www.danielsoper.com/statcalc. [Accessed January 2022].
34. Von EE, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The strengthening of the reporting of observational studies in Epidemiology (STROBE) statement; guidelines for reporting observational studies. PLoS Medicine. 2007;4(10): e296.
35. Purbowo D, Sunaryo, Waluyowati NP. The effect of leadership on operational performance: The mediating role of quality improvement. International Journal of Research in Business and Social Science. 2022;11(1):108-116. Available: https://doi.org/10.20525/ijrbs.v11i1.1587.
36. José L, Fernández S, Ignacio L, Bernardo B, Cristóbal A. Assessing the economic impact of key operational factors on grow-out farms producing European sea bass under different scenarios of production, Aquaculture Economics & Management. 2022;26(2):232-250. Available: https://doi.org/10.1080/13657305.2021.1996481
37. Tehseen S, Ramayah T, Sajilan S. Testing and controlling for common method variance: a review of available methods. Journal of Management Sciences. 2017;4(2):146-175. Available: https://doi.org/10.20547/jms.2014.1704202.
38. Aguirre-Urreta MI, Hu J. Detecting common method bias: performance of Harman's single-factor test. ACM SIGMIS Database: The DATABASE for Advances in Information Systems. 2019;50(2): 45-70.
39. Kock N. Harman's single factor test in PLS-SEM: checking for common method bias. Data Analysis Perspectives Journal. 2020;2(2):1-6.
40. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Structural Equation Modeling. 1999; 6:1-55. Available: https://doi.prg/10.1080/10705519909540118
41. Kline RB Principles and Practice of Structural Equation Modeling, 4th Edn. New York, NY: Guilford Press; 2016.
42. Hair JF, Hult GTM, Ringle CM, Sarstedt M. A primer on partial least squares structural equation modeling (PLS-SEM). European Journal of Tourism Research. 2014;6(2): 211-213.
43. Milfont TL, Fischer R. Testing measurement invariance across groups: Applications in cross-cultural research. International Journal of Psychological Research. 2010; 3:111-121.
44. Kock N. WarpPLS User Manual (Latest Version: 8.0, 2022). Available: https://www.scriptwarp.com/warppls/#User_Manual; 2022.
45. Ringle CM, Wende S, Becker J-M. Smart PLS 4. Boenningstedt: Smart PLS. Available: https://www.smartpls.com; 2022.



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