

Evaluation of the Items to Measure Supply Chain Management Practice in the Manufacturing firms through Exploratory Factor Analysis: Evidence from Nigeria

Dr. Naimot Folake Popoola

ALFA University College, Malaysia

Email: naimatpf@gmail.com

Dr. Popoola Mufutau Olapoju

Innovative Assets Ltd

Email: popoolamufti@gmail.com

DOI Link: <http://dx.doi.org/10.6007/IJARBSS/v16-i9/28768>

Published Date: 26 September 2026

Abstract

The objective of this study is to carry out the validation of instruments for the items of supply chain management practice via the exploratory factor analysis (EFA). The data was collected through questionnaires which was administrated to employees in the manufacturing firms in Nigeria. 100 questionnaires were collected to perform the EFA. The outcomes divulge that the the Bartlett's Test of Sphericity is significant ($P\text{-Value} < 0.05$). Kaiser Meyer-Olkin (KMO) is exceptional as it surpasses the required value of 0.6. These two outcomes (Bartlett's Test is significant and $KMO > 0.6$) implies that the data is suitable in size. The Cronbach's Alpha test was higher than 0.7 for the all the items of the construct, this indicates that these items are all reliable. This study found a valid and reliable instrument to measure the items of supply chain management practice which could improve performances in manufacturing companies in Nigeria context. This study contributes to the field of supply chain by evaluating and testing items that fit for testing the construct of supply chain management practice.

Keywords: Exploratory Factor Analysis, Supply Chain Management Practice, Manufacturing Firms, Employees, Construct

Introduction / Background

Supply chain management practice refers to the complete set of activities which are carried out in the companies to advance the efficiency of the internal supply chain. Supply chain management practice comprises the manufacturing organizations actions meant to improve movement of raw materials from sources of supply, production, to delivery of finished products to customers, comprising obtaining and procurements, production schedule, order

process, inventory management, transportation, warehouse as well as consumer services (Ateke & Didia, 2017). Fundamentally, supply chain management encompasses planning, implementation, as well as the control procedures that allow the efficient flow of goods and services (Mohsen, 2023). Supply Chain Management is the discipline that converses suppliers and consumers from upstream to downstream to obtain lesser costs as well as higher values for consumers (Boateng, 2019).

Efficient supply chain management practices are important for the development as well as sustenance of products and services competition (Odita et al., 2022). Previous studies suggest that efficient supply chain management practice in manufacturing companies is significant for the growth of those companies. Effective supply chain management practices improve performance (Ateke & Nwiepe, 2017). Part of the way of attaining that competitiveness is by implementing a viable supply chain management practice (Hussain et al., 2018; Birasnav & Bienstock, 2019). This implies that better performance of the organization could be an indication of effective supply chain in manufacturing companies. Furthermore, it is significant for companies to use supply chain management practices which can influence the improvement performance (Ateke & Nwiepe, 2017). Better supply chain management processes influence the whole supply chain, its parts, or critical processes (Cuthbertson & Piotrowicz, 2018; Rok, 2021).

To endure, businesses could decrease expenses, improve qualities as well as provide rapid responses to consumers' want. Efficient supply chain management that entails the overall understanding of the regular transactions and collaborations with relevant stakeholders greatly determines organizational performance (Memia, 2018; Puska et al., 2020). Better performance of the organization could be an indication of effective supply chain in manufacturing companies. The manufacturing industry is essential to the advancement of Nigeria economy, however numerous companies in this industry are continuing to underperform financially, this result to their limitation in their contributions to the wider economy (National Bureau of Statistics, 2023). Manufacturing companies in developing Nation like Nigeria are encountering several issues and they are experiencing lower performance and profitability (Oyedokun et al., 2019; Oyewo et al., 2019, NBS 2023).

Since efficient supply chain management is vital for the performance of manufacturing organizations it could be vital to scrutinize the items to measure supply chain management practice which could advance performances in manufacturing firms especially in Nigeria context. Supply chain management has been examined by previous researches, however, there are limited studies in the literature that examine the suitability of items of the construct of supply chain management practices. Moreover, majority of previous studies on supply chain management are focused on developed Nations with limited attentions given to developing countries such as Nigeria. This show the necessity to understand the components of supply chain management practice constructs that could boost performance in manufacturing companies most especially in Nigeria. Hence, the main objective of this research is to perform instrument validation of the items of supply chain management practice construct through exploratory factor analysis.

Methodology

Quantitative method was employed in this study. The data for this study was collected by utilizing a self-administered method which is in line with several researchers. Moreover, 10 points of Likert scale was utilized as stated by Awang et al., (2016) that 10 points of Likert scale are more effectual than 5 points of Likert scale for operating the measurement model (Awang et al., 2016). Therefore, this research used the interval scale of 10, where the respondents select a statement among several statements from 1-10. The target respondents for this study were the manufacturing firms' employees. Mostly, 100 questionnaires were distributed to the respondents. The data were analyzed by utilizing Exploratory Factor Analysis to explore as well as to assess the dimensionality of the items that measure the construct of supply chain management practice.

Findings

As stated above, Exploratory Factor Analysis (EFA) was employed in this research to examine and evaluate the dimensionality of items that measure the construct of supply chain management practice in the study. Several researchers, for instance Awang (2010, 2012), Hoque et al. (2017, 2018), Noor et al. (2015), and Yahaya et al. (2018) stated that the scholar needs to use Exploratory Factor Analysis (EFA) method for each construct to determine if the dimensionality of items have changed from previous research where the dimensions were developed. The results of exploratory factor analysis (EFA) are discussed below.

The Exploratory Factor Analysis (EFA) Procedure for Supply Chain Management Practices (SCMP)

This SCMP construct has 17 items in the survey. The EFA results in Table 3.15 depict the descriptive-statistics for each item measuring Supply Chain Management Practices. This construct was measured by utilizing 17 items in the survey with the interval scale from 1 (strongly-disagree) to 10 (strongly-agree) with the given item statement (Awang et al., 2016; Hoque et al., 2018; Muda et al., 2018). The item statement, the mean and standard deviation of the score for each item is depicted in Table 3.15

Table 1

Construct Supply Chain Management Practices

Label	Item Statement	Mean	Std. Deviation
SC11	Selection of suppliers based on quality as the main criterion	7.99	1.535
SC12	Regular joint problem solving with suppliers	7.80	1.857
SC13	Help suppliers improve quality of products and services	7.61	1.846
SC14	Continuous improvement programs involving key suppliers	7.71	1.807
SC15	Planning and goal-setting activities involving key suppliers	8.49	1.427
SC16	New product or services development processes involving key suppliers	8.27	1.315
SC21	Frequent interaction with customers to set reliability, responsiveness and other standard for us	8.18	1.264
SC22	Frequent measurement and evaluation of customer satisfaction	8.35	1.055
SC23	Frequent anticipation of future customer expectations	8.19	1.149
SC24	Facilitate customers' ability to seek assistance from us	8.68	0.922
SC25	Periodic evaluation of the importance of the relationship with customers	8.51	1.079
SC31	Trading partners are informed in advance of changing needs	8.27	1.309
SC32	Trading partners share proprietary information with us	7.95	1.399

SC33	Trading partners keep us fully informed about issues that affect our business	8.47	1.085
SC34	Trading partners share business knowledge of core business processes with us	8.64	1.189
SC35	Trading partners exchange information with us that helps establishment of business planning	7.70	1.532
SC36	Trading partners and us keep each other informed about events or changes that may affect the other partner	8.09	1.338

The E.F.A. employing the extraction technique of Principal Component with Varimax (Variation Maximization) Rotation was conducted on these 17 items that measure the Supply Chain Management Practices construct. The outcomes in Table 3.16 show that the Bartlett's Test of Sphericity is significant ($P\text{-Value} < 0.05$). Additionally, the measurement of sampling adequacy by Kaiser-Meyer-Olkin (KMO) is excellent as it exceeds the require value of 0.6 (Noor et al., 2015; Muda et al., 2018, 2020; Bahkia et al., 2019; Fitriana et al., 2022; Anuar et al., 2023). These two outcomes (Bartlett's Test is significant and $KMO > 0.6$) show that the data is satisfactory in proceeding further with the data reduction process in EFA (Noor et al., 2015; Muda et al., 2018, 2020; Bahkia et al., 2019; Fitriana et al., 2022; Anuar et al., 2023).

Table 2

The KMO and Bartlett's Test Score

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.835
Bartlett's Test of Sphericity	Approx. Chi-Square	1692.488
	Df	136
	Sig.	.000

The Dimensions or Components and Total Variance Explained

The outcomes in Table 3.17 display that there are three dimensions or components that emerged from the E.F.A. process according to the computed Eigenvalue greater than 1.0. The eigenvalues range between 1.893 and 6.565. The variance-explained for component 1 is 38.618% component 2 is 17.532% and component 3 is 11.133% The total variance-explained to measure this construct is 67.282%. The total-variance explained is satisfactory as it exceeds the minimum 60% (Awang, 2010, 2012; Noor et al., 2015; Hoque et al., 2017, 2018; and Yahaya et al., 2018).

Table Error! No text of specified style in document.

Total Variance Explained

Total Variance Explained				Extraction Sums of Squared Loadings		
Component	Initial Eigenvalues		Cumulative %			
	Total	% of Variance		Total	% of Variance	Cumulative %
1	6.565	38.618	38.618	6.565	38.618	38.618
2	6.565	17.532	56.149	2.980	17.532	56.149
3	1.893	11.133	67.282	1.893	11.133	67.282

Extraction Method: Principal Component Analysis.

The scree plot in Figure 3.2 shows three dimensions or components which emerged from EFA process for this latent-construct. otherwise, the E.F.A. process had grouped 17 items into 3 dimensions or components. Every, dimension or component has its own set of measuring

items. The rotated component matrix determines precisely which items belonged to which component (Awang, 2010, 2012; Muda et al., 2018, 2020).

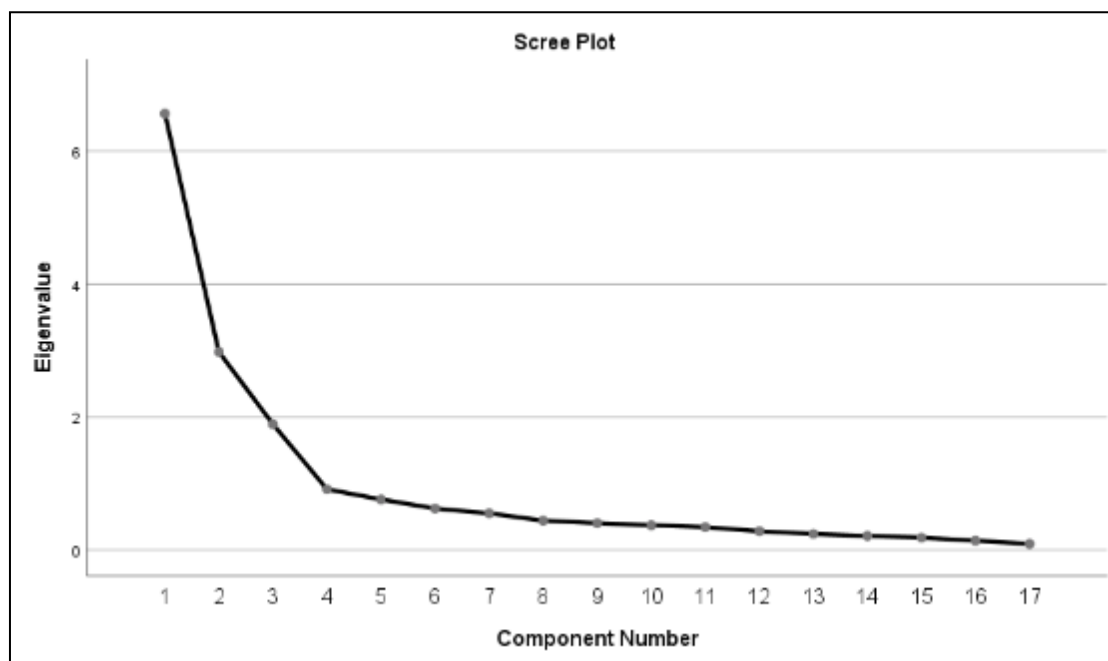


Figure 1 The Scree Plot shows three components emerged from the EFA procedure

The subsequent table, Table 3.18 depicts the three dimensions or components emerged as well as their corresponding items resulted from the E.F.A. process. The factor loading for each item must be greater than 0.6 so as to be retained (Noor et al., 2015; Muda et al., 2018, 2020; Bahkia et al., 2019; Fitriana et al., 2022; Anuar et al., 2023) as presented in Table 3.18.

Table 4

The components and their respective items

Rotated Component Matrix			
Label	Component		
	1	2	3
SC11	.660		
SC12	.902		
SC13	.812		
SC14	.812		
SC15	.745		
SC16	.769		
SC21			.784
SC22			.869
SC23			.779
SC24			.717
SC25			.706
SC31		.859	
SC32		.795	
SC33		.721	
SC34		.795	
SC35		.653	
SC36		.851	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

The Internal Reliability for the Instrument Measuring Supply Chain Management Practices (SCMP)

Lastly, the research needed to compute the value of Cronbach Alpha which reflects the Internal-reliability for the retained items to measure this latent-construct. The internal-reliability or internal-consistency specifies how strong the corresponding items are holding together to measure the corresponding construct. The value of Cronbach Alpha must be greater than 0.7 for the items to attain the Internal-reliability (Noor et al., 2015; Muda et al., 2018, 2020; Bahkia et al., 2019; Fitriana et al., 2022; Anuar et al., 2023). Table 3.19 depicts the Cronbach Alpha for every component. The Cronbach Alpha for every component is greater than 0.7 as shown in the Table 3.19 which indicate that these items are reliable.

Table 5

The Internal Reliability for the Supply Chain Management Practices Construct

Name of construct	Component	Number of Items	Cronbach Alpha
Supply Chain Management Practices	SC1	6	0.898
	SC2	5	0.873
	SC3	6	0.881

Conclusion

The outcomes divulge that the Bartlett's Test of Sphericity was lesser than 0.05 (<0.05) which is Significant (P-value < 0.05). Kaiser-Meyer-Olkin (KMO), Measure of Sampling Adequacy was higher than 0.6, (> 0.6), and this specifies that the sample is satisfactory in size. The total variance explained is suitable since it surpasses the minimum 60%. Cronbach's Alpha test was higher than 0.7 for the construct items, this suggest that these items are all consistent. This study found a valid and consistent instrument to measure the items of the construct of supply chain management practice which could increase performances in the manufacturing organizations in Nigeria perspective.

Contribution

This current research adds to the measurement of the construct of managing manufacturing flow in the domain of supply chain management by assessing and testing items that fit for examining the construct of supply chain management practice that might boost performances in manufacturing companies in Nigeria. Evaluating these items of the construct of supply chain management practice is a methodological contribution for the field of supply chain management. Furthermore, this study is one of the most recent studies to propose validated measuring items supply chain management practice.

References

- Awang, Z., Afthanorhan, A., & Mamat, M. (2016). The Likert scale analysis using parametric based Structural Equation Modeling (SEM). *Computational Methods in Social Sciences*, 4(1), 13.
- Anuar, N, Muhammad, M.M, Awang, Z (2023). Development and Validation of Critical Reading Intention Scale (CRIS) for University Students using Exploratory and Confirmatory Factor Analysis. *Asian Journal of University Education (AJUE)* Volume 19, Number 1, January 2023.
- Ateke, B. W., & Nwiele, N. M. (2017). Agile supply chain management practices and competitiveness of SMEs: A conceptualization. *International Journal of Social Sciences and Management Research*, 3(7), 1-10.
- Awang, Z. (2010). *Research Methodology for Business and Social Sciences*. Universiti Teknologi MARA. Malaysia
- Awang, Z. (2012). *Research methodology and data analysis*: Penerbit Universiti Teknologi, MARA Press.
- Bahkia, A. S., Awang, Z., Afthanorhan, A., Ghazali, P. L., & Foziah, H. (2019). Exploratory factor analysis on occupational stress in the context of Malaysian sewerage operations. Paper presented at the AIP Conference Proceedings.
- Bahkia, A. S., Awang, Z., Rahlin, N. A., Zulkifli, A. R. (2020). The Importance of Supportive Leadership in the Sewerage Operation Industry: A case of Indahwater Konsortium Private IWK). *Humanities & Social Science Reviews*, 8(3), 2020, 149-162. <https://doi.org/10.18510/hssr.2020.8317>.
- Birasnav, M. and Bienstock, J. (2019). Supply chain integration, advanced manufacturing technology, and strategic leadership: an empirical study. *Computers and Industrial Engineering*, 130, 142-157.
- Boateng, A. (2019). Supply chain management in the Ghanaian building construction industry: a lean construction perspective. 430–439. <https://doi.org/10.3311/CCC2019-060>.
- Cuthbertson, R., & Piotrowicz, W. (2018). Supply chain best practices: Identification and categorization of measures and benefits. *International Journal of Productivity and Performance Management*, 57(5), 389-404.
- Fitriana, N., Hutagalung FD., Awang Z., Zaid, SM. (2022). Happiness at work: A cross-cultural validation of happiness at work scale. *PLoS ONE* 17(1): e0261617. <https://doi.org/10.1371/journal.pone.0261617>.
- Hoque, A.S.M.M, Awang, Z., Jusoff, K., Salleh, F., and Muda, H (2017). Social Business Efficiency: Instrument Development and Validation Procedure using Structural Equation Modelling. *International Business Management*, 11(1), 222-231.
- Hoque, A. S. M. M., Siddiqui, B. A., Awang, Z. B., & Baharu, S. M. A. T. (2018). Exploratory Factor Analysis of Entrepreneurial Orientation in the Context of Bangladesh Small and Medium Enterprises (SMES). *European Journal of Management and Marketing Studies*.
- Hussain, Z., Jusoh, A.B., Sarfraz, M., & Wahla, K.U.R. (2018). Uncovering the relationship of chain management and firm performance: Evidence from textile sector of Pakistan. *Information Management and Business Review*, 10(2), 23-29.
- Memia, F. K. (2018). Influence of contemporary supply chain practices on performance of large manufacturing firms in Kenya (Doctoral dissertation, JKUAT-COHRED).
- Mohsen, B.M., (2023). Developments of digital technologies related to supply chain management. *Procedia Computer Science*, 220, pp.788-795.

- Muda, H., Baba, Z. S., Awang, Z., Badrul, N. S., Loganathan, N., & Ali, M. H. (2020). Expert review and pretesting of behavioral supervision in higher education. *Journal of Applied Research in Higher Education*.
- Muda, H., Loganathan, N., Awang, Z., Jusoh, H., & Baba, Z.S. (2018). *Application of Theory, Methodology and Analysis in Conducting Research. A Practical Guide to Quantitative Research and Thesis Writing*, UniSZA Publisher, ISBN: 978-967-2231-11-0
- National Bureau of Statistics. (2023). Annual report on Nigerian manufacturing sector. <https://www.nigerianstat.gov.ng>
- Noor, N. M., Aziz, A. A., Mostapa, M. R., & Awang, Z. (2015). Validation of the Malay version of the Inventory of Functional Status after Childbirth questionnaire. *BioMed research international*, 2015.
- Odita, A.O., Kifordu A.A., & Nwankwo C.N. (2022). Continuous Production and Competitive Advantage in Selected Aluminum Company in South-South. Nigeria, *International Journal of Business and Managerial Review*, 10(7), 1-12.
- Oyedokun, Tomomewo & Owolabi 2019. Cost control and profitability of selected manufacturing firms in Nigeria. *Journal of Accounting and Strategic Finance*, 21, 14-33.
- Oyewo, B. M., Oyedokun, G. E., & Azuh, A. E. (2019). The use of multi-perspective strategic performance measures by manufacturing firms: Benefits, determinants and challenges. *DLSU Business and Economics Review*, 29(1), 115-130.
- Puska, A., Kozarevic, S., & Okicic, J. (2020). Investigating and analyzing the supply chain practices and performance in agro-food industry. *International Journal of Management Science and Engineering Management*, 15(1), 9-16.
- Rok Lee (2021) The Effect of Supply Chain Management Strategy on Operational and Financial Performance Sustainability 2021, 13, 5138. <https://doi.org/10.3390/su13095138>
- Yahaya, T., Idris, K., Suandi, T., & Ismail, I. (2018). Adapting instruments and modifying statements: The confirmation method for the inventory and model for information sharing behavior using social media. *Management Science Letters*, 8(5), 271-282.