A MULTIGROUP ANALYSIS OF FACTORS INFLUENCING SUPPLY CHAIN SUSTAINABILITY

Geetanjali Shrivastava

Professor, Department of Commerce, The Bhopal School of Social Sciences, Bhopal, India. Email: geetanjalishrivastava@bsssbhopal.edu.in

ABSTRACT

This study examined the impact of business performance on supply chain sustainability in Bangkok, Thailand's hospitality industry. With the help of the Structural Equation Model, this study used measurement invariance of composite model (MICOM) and Multi Group analysis to determine the relationship between the independent and dependent variables across different genders. According to the findings, females believed that the relationship between the supplier and the purchasing department had a significant impact on business performance. They also believed that the relationship between the supplier and the purchasing department had a significant impact on supply chain sustainability, which is supported by the results of the entire set of data, which included both male and female respondents. Both genders are convinced that business performance has a significant impact on supply chain sustainability in Bangkok's hospitality sector. Based on the results of this study, the relationship between the buyer and the supplier needs to be strengthened for the supply chain to be stable.

Keywords: Supplier-Purchase Department relationship, Purchase Department Performance, Business performance, and supply chain sustainability.

INTRODUCTION

Supply chain management is the circulation of products and services as well as the process that is utilized to turn raw materials into finished products that are ready to be sold. The activities that take place along the supply chain are what ultimately lead to satisfied customers and a competitive position in the market (Hayes, 2019). The competitive environment may put pressure on businesses, which can have beneficial results such as improved quality and response, as well as lower costs. Management of the supply chain can also entail encouraging suppliers to flourish, become competent, and offer prices that are as competitive as is practically possible. To negotiate well, the purchasing department needs to have a good relationship with the supplier. The positive engagement will then have an effect on the supplier selection results. Also, the right suppliers will make it easier for the company to achieve its goals. When a supplier and an organization's purchasing department form a long-term, healthy relationship, they can share ideas and receive feedback from one another. The purchasing department's performance may be characterized as a gauge of the company's success and is therefore vital for the successful management of the supply chain. The performance of a company and each partner in the supply chain has an effect on the overall sustainability of the supply chain and the final product. So, the goal of this research is to find out what affects a company's performance and how that affects the sustainability of the supply chain in the hospitality industry in Bangkok, Thailand.

REVIEW OF LITERATURE

Supply chain management (SCM) facilitates the management of both upstream and downstream supplier and customer connections, allowing for the delivery of high-value goods and services at reduced costs (Christopher, 1998). By enhancing organizational efficiency and fostering more cooperative bonds amongst all the players in a supply chain, supply chain management can help businesses become more competitive. Kannan and Tan (2006) said a customer's relationship with vendors is key to a successful negotiation. Appropriate suppliers enable us to enhance business performance. Their relationship's success will lead to company performance growth. Axelsson (2014) suggested that companies today are not only focused on purchasing, but also on building relationships. Therefore, the relationship

between buyer and seller is the most crucial aspect of purchasing to increase a company's competitiveness and long-term success.

Azeem (2015) stated that the relevance of the buyer-supplier connection is growing as companies' desire to achieve a competitive advantage and increase their market share may also be influenced by their relationship with their suppliers. UK (2017) said that the organization's performance was linked to the services, products, and employees of the company. This can be a reflection or a fact about how well the business is doing.

Predictor

For the present research supplier and purchase department relationship, purchase department performance, and business performance, are taken as the three independent variables that might have an impact on the supply chain sustainability.
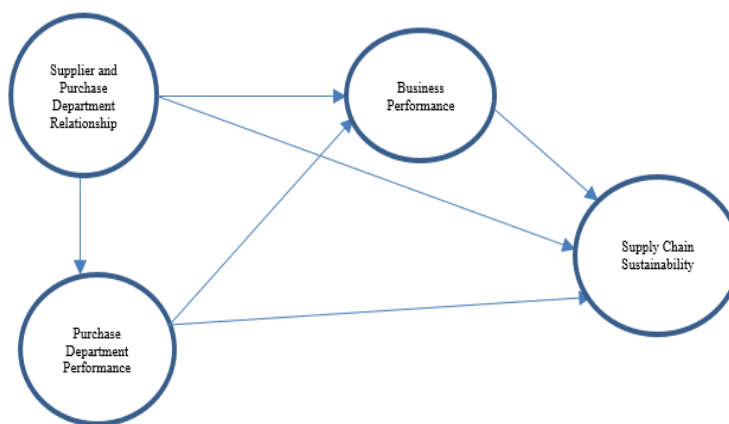
Figure 1: Conceptual Framework of factors influencing supply chain sustainability in the Hospitality Industry in Bangkok, Thailand.

From the conceptual framework, the research attempts to analyze six hypotheses:

H1: The impact of the supplier and purchase department relationship on purchase department performance does not significantly differ across gender.
H2: The impact of the supplier and purchase department relationship on business performance does not significantly differ across gender.
H3: The impact of supplier and purchase department relationship on supply chain sustainability does not significantly differ across gender.
H4: The impact of purchase department performance on business performance does not significantly differ across gender.
H5: The impact of purchase department performance on supply chain sustainability does not significantly differ across gender.

H6: The impact of business performance on supply chain sustainability does not significantly differ across gender.

METHOD
The study employed the descriptive research method, which aims to provide a comprehensive summary of the population under investigation. The study used convenience sampling, a type of non-probability method that relies on data collection from members of the population who are readily available to participate in the study (Saunders, 2012). The researcher collected data via Google Forms from respondents who worked in the hospitality industry in Bangkok for this study. The data was collected from June 2022 to July 2022. This study used measurement invariance of composite model (MICOM) and Multi Group analysis to determine the relationship between the independent and dependent variables across

different genders with the help of Structural Equation Model (SEM).

Pretesting Questionnaire

A pretest was undertaken for this study using a sample size of 30 questionnaires given to respondents working in Bangkok's hospitality sector. The table provides a summary of the analysis's findings.

Table 1: Summary of Cronbach's Alpha Coefficient for Pretest

Variables	Alpha Test
1. Supplier and Purchase Department Relationship	0.979
2. Purchase Department Performance	0.814
3. Business Performance	0.784
4. Supply Chain Sustainability	0.888

According to (Morgan, Leech, Gloeckner, and Barret, 2004), if the Cronbach's Coefficient Alpha test yields a value of 0.6 or higher, it is considered to have satisfactory reliability; this is because it indicates that the covariance among the variables is positive.

The summary analysis of the demographic factors using frequency and percentage is shown below:

Table 2: Summary of Demographic Factors using Frequency and Percentage

Demographic Factors	Counts	Cumulative %
Gender		
Male	282	70.5
Female	118	29.5
Total	**400**	**100**
Age		
20 or Less	6	1.5
Between 21-30	202	50.5
Between 31-40	103	25.75
Between 41-50	63	15.75
More than 50	26	6.5
Total	**400**	**100**
Educational Level		
Associate Degree	16	4
Bachelor's degree Graduate	309	77.25
Postgraduate and above	75	18.75
Total	**400**	**100**
Job Position Level		
Junior	248	62
Senior	77	19.25
Assistant Manager	43	10.75
Manager and above	32	8
Total	**400**	**100**
Working Experience		
Less than 1 Year	91	22.75
1-2 Years	115	28.75

2-3 Years	101	25.25
3-4 Years	53	13.25
4-5 Years	9	2.25
5 or more years	31	7.75
Total	**400**	**100**
Monthly Income		
20000 THB or Less	41	10.25
20001-30000THB	125	31.25
30001-40001THB	189	47.25
40001-50000THB	42	10.5
50001 and above	3	0.75
Total	**400**	**100**

Based on the demographic data for gender presented in the table, 70.50% (282 respondents) of the sample size were male, while the remaining 29.50% (118 respondents) were female. For the age distribution, it was determined that the majority of respondents were between the ages of 21 and 30 with 50.50% (202 respondents), followed by those who were between the ages of 31 and 40 with 25.75%. (103 respondents). The third age group was between the ages of 41 and 50 with 15.75% (63 respondents), followed by the group of 51 or older with 6.50% (26 respondents). The smallest group comprised of 1.50 percent and these were the people below 20 years of age (6 respondents).

Table No. 2 also shows a demographic distribution breakdown for level of education. It was discovered that 77.25% (309 respondents) of the respondents held a bachelor's degree, whereas just 4% (16 respondents) held an associate degree.

For the demographic breakdown of employment position level, it was determined that the largest category was junior with 62% (248 responses), followed by senior with 19.25%. (77 respondents). The third category was help with 10.75% of the total (43 respondents). The category of manager has the lowest number, at 8%, according to the findings (32 respondents).

Table No. 2 reveals that the majority of respondents (28.75%) had worked for 1–2 years, based on the demographic data on their job experience (115 respondents). 2–3 years ranked second highest with 25.25% (101 respondents). 22.75% of those who had worked less than one year ranked third highest (91 respondents). The fourth and fifth highest categories were 3–4 years with 13.25% (53 respondents) and 5 or more years with 7.75% (31 respondents), respectively. 2.25% of the population was less than 4–5 years old (9 respondents).

The final demographic breakdown was the category of monthly income. The largest percentage of responders with a salary between 30,001 THB and 40,001 THB was 47.25%. (189 respondents). 31.25% (125 respondents) of respondents were in the wage range of 20,001–30,000 THB, followed by 42 respondents (10.50%) who were in the salary range of 40,001–50,000 THB. Less than 10.25% of respondents earned a salary between 20,000 and 30,000 Thai Baht (41 respondents). Lastly, it was determined that the pay range for those earning 50,000 THB was 0.75% higher (3 respondents).

CONFIRMATORY COMPOSITE ANALYSIS

Confirmatory composite analysis was used within the scope of this investigation so that the connection could be viewed in terms of linear compounds. As part of convergent validation (Figure 2), the Composite Reliability (CR) and Average Variance Extracted metrics were used to evaluate the measurement model.
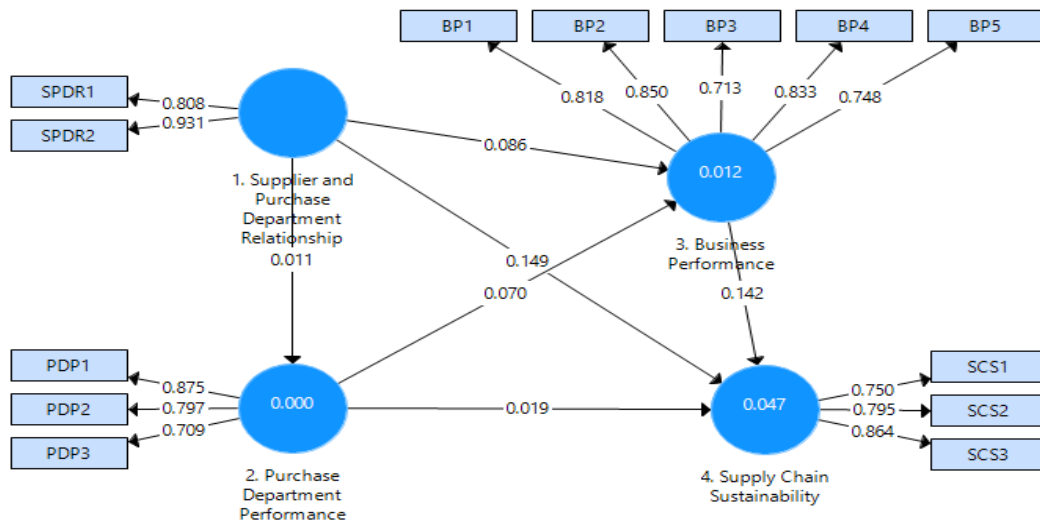
Figure 2: Measurement Model establishing Covergent Validity

Table No. 3: Construct Reliability and Validity

Constructs	Codes	Factor Loadings	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Supplier and Purchase Department Relationship	SPDR1	0.808	0.698	0.808	0.863	0.759
	SPDR2	0.931				
Purchase Department Performance	PDP1	0.875	0.756	0.744	0.838	0.634
	PDP2	0.797				
	PDP3	0.709				
Business Performance	BP1	0.818	0.853	0.865	0.895	0.630
	BP2	0.850				
	BP3	0.713				
	BP4	0.833				
	BP5	0.748				
Supply Chain Sustainability	SCS1	0.750	0.727	0.737	0.846	0.647
	SCS2	0.795				
	SCS3	0.864				

The results (Table No. 3) demonstrated that the base model is acceptable because all outcomes met the minimum needed threshold, with Cronbach's Alpha values over 0.70 (Nunnally, 1978), Composite Reliability (Construct Reliability) values above 0.70, etc (Hair et al., 1998). Each AVE exceeded 0.50. (Fornell and Larker, 1981). All indicator item factor loadings are above 0.70, indicating strong convergent validity (Yoo and Alavi, 2001).

Table No. 4: Discriminant Validity (Fornell-Larcker Criterion)

Constructs	Supplier and Purchase Department Relationship	Purchase Department Performance	Business Performance	Supply Chain Sustainability
Supplier and Purchase Department Relationship	**0.871**			
Purchase Department Performance	0.011	**0.796**		
Business Performance	0.087	0.071	**0.794**	
Supply Chain Sustainability	0.161	0.031	0.156	**0.805**

The study's discriminant validity was examined to see if the constructs were distinct and if further statistical analysis could be done. Table No. 4 shows the results of Fornell and Larker's (1981) discriminant validity investigation. The figures show that the investigated constructs don't overlap, suggesting that the research is suitable for further analysis. The study also uses the Heterotrait-Monotrait Ratio (HTMT) to assess discriminant validity. PLS-SEM uses HTMT as a model-assessment building block.

Table No. 5 shows all values are less than one, indicating the correlation between the two constructs differs and meets validation criteria. Teo et al., (2008) Gold, et al. (2001). To generalize the outcomes of the study, the SRMR value must be lower than 0.08, according to Hu and Bentler (1999). The results of Table No. 6 indicate that the model has a good fit

Table No. 5: Heterotrait-Monotrait Ratio (HTMT)

Constructs	1. Supplier and Purchase Department Relationship	2. Purchase Department Performance	3. Business Performance
Supplier and Purchase Department Relationship			
Purchase Department Performance	0.083		
Business Performance	0.105	0.079	
Supply Chain Sustainability	0.219	0.068	0.198

Table No. 6: Model Fit Summary

	Saturated Model	Estimated Model
SRMR	0.066	0.066
d_ULS	0.396	0.396
d_G	0.169	0.169
Chi-Square	431.997	431.997
NFI	0.731	0.731

MEASUREMENT INVARIANCE OF COMPOSITE MODEL (MICOM)

Group comparisons made with PLS-SEM have the potential to lead researchers to be misguided unless they first prove the invariance of the measurements they are using. Prior to beginning multigroup analyses using PLS-SEM, it is, therefore, feasible to perform a measurement invariance of composite models (MICOM) analysis by following a three-step approach. The MICOM results of Step 2 (compositional invariance) and Step 3 are shown in the report of the permutation algorithm in SmartPLS (the equality of composite mean values and variances). The results of Step 1 can't be used in SmartPLS because the configural invariance assessment needs to look at how the model is set up, what settings were chosen, and other things that can't be done with a statistical test. On running MICOM in SmartPLS, configural invariance is usually set up automatically (Step 1). In Step 2, SmartPLS gives confidence intervals based on permutations that help to figure out if a composite has a correlation between male (Group A) and female (Group B) that is much lower than one. If this is not the case, the composite doesn't change much between the two groups, which proves compositional invariance.

Table No. 7: Establishing Compositional Invariance (Step 2)

Constructs	Original Correlation	Correlation Permutation Mean	5.0%	Permutation p-Values
Supplier and Purchase Department Relationship	**0.998**	0.949	0.797	**0.836**
Purchase Department Performance	**0.827**	0.814	0.270	**0.309**
Business Performance	**0.991**	0.975	0.940	**0.630**
Supply Chain Sustainability	**0.994**	0.964	0.890	**0.732**

The results of step 2 indicate that compositional invariance has been established as original correlations are greater than 5% quantile values. Also, the permutation p-values of all the constructs are not significant, which means that step 3 can be used to analyze the study further.

Step 3 is the last step that uses permutation-based confidence intervals for the mean values

and the variances in order to identify whether the mean value and variance of a composite are different between groups (male and female). This is important because it will show whether partial or full measurement invariance has been proven.

Table No. 8: Establishing Measurement Invariance of Composite Models (MICOM) (Step 3)

	Mean - Original Difference (Male - Female)	Mean - Permutation Mean Difference (Male - Female)	2.5%	97.5%	Permutation p-Values	Variance - Original Difference (Male - Female)	Variance - Permutation Mean Difference (Male - Female)	2.5%	97.5%	Permutation p-Values
Supplier and Purchase Department Relationship	0.179	-0.001	-0.235	0.226	0.111	-0.360	0.022	-0.395	0.458	0.114
Purchase Department Performance	0.188	0.004	-0.204	0.221	0.093	-0.241	0.012	-0.371	0.381	0.210
Business Performance	0.079	0.004	-0.211	0.207	0.435	-0.014	0.010	-0.230	0.258	0.905
Supply Chain Sustainability	0.157	-0.001	-0.229	0.203	0.176	-0.021	0.008	-0.255	0.279	0.894

The results of step 3 indicate that "full invariance" exists as the mean original difference and variance original difference both fall between 2.5% and 97.5%. So, we can say that measurement invariance of composite model (MICOM) is established in this research and multi-group analysis can be applied.

MULTI GROUP ANALYSIS (MGA)

The multi-group analysis permits testing to determine whether pre-defined data groups have statistically significant variations in their group-specific parameter estimations (e.g., outer weights, outer loadings and path coefficients). This method is a non-parametric significance test for the difference between the results for each group. It is based on the results of PLS-SEM bootstrapping. The original (old) p-value shows a significant result at the 5% probability of error level if the p-value is less than 0.05 or greater than 0.95 for a certain difference in group-specific path coefficients.

Table No. 9: PLS-Multi Group Analysis

|	Path Coefficients-diff (Male - Female)	p-Value original 1-tailed (Male vs Female)	p-Value new (Male vs Female)	Supported
H1: The impact of supplier and purchase department relationship on purchase department	0.071	0.335	**0.671**	**Yes**

|				
performance does not significantly differs across gender.				
H2: The impact of supplier and purchase department relationship on business performance does not significantly differs across gender.	0.122	0.219	**0.438**	**Yes**
H3: The impact of supplier and purchase department relationship on supply chain sustainability does not significantly differs across gender.	-0.163	0.928	**0.144**	**Yes**
H4: The impact of purchase department performance on business performance does not significantly differs across gender.	0.012	0.508	**0.985**	**Yes**
H5: The impact of purchase department performance on supply chain sustainability does not significantly differs across gender.	-0.057	0.653	**0.695**	**Yes**
H6: The impact of business performance on supply chain sustainability does not significantly differs across gender.	-0.058	0.709	**0.583**	**Yes**

The results of PLS-Multi Group Analysis (PLS-MGA) as shown in table No. 9 indicate that both groups, male and female, do not differ significantly in any of the hypotheses
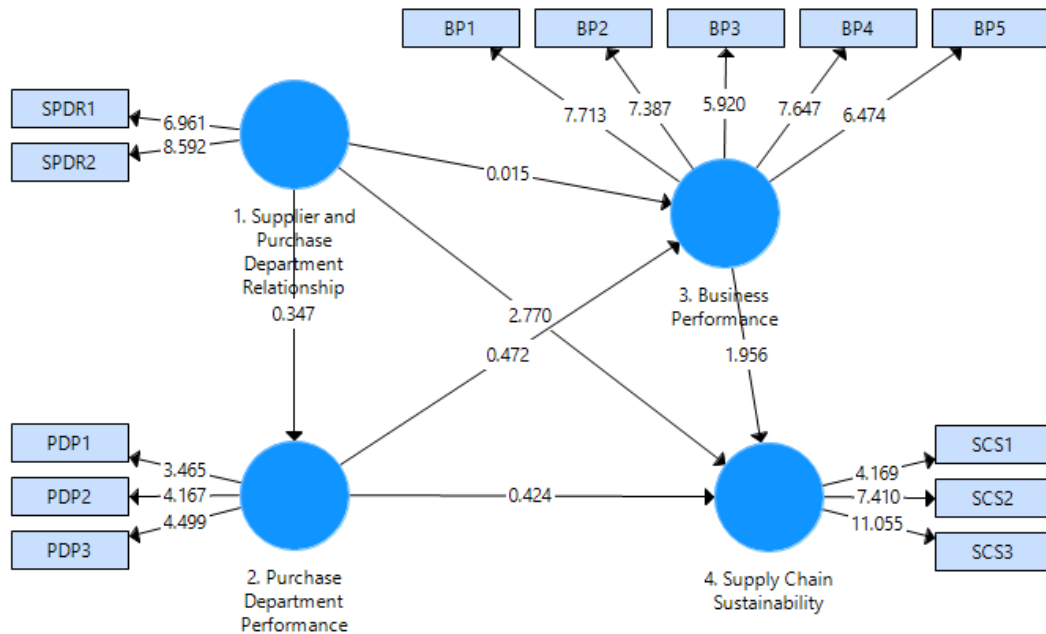
ANALYSIS OF STRUCTURAL MODEL
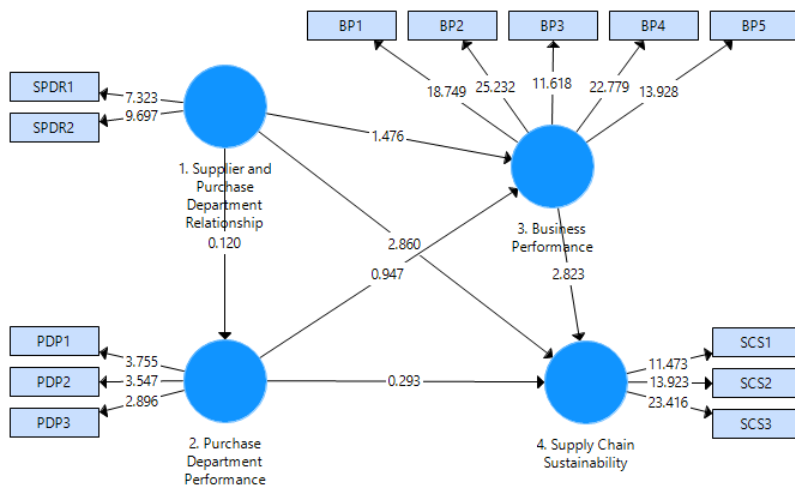
Figure 3: Bootstrapping results for the entire data set incorporating Male and Female group
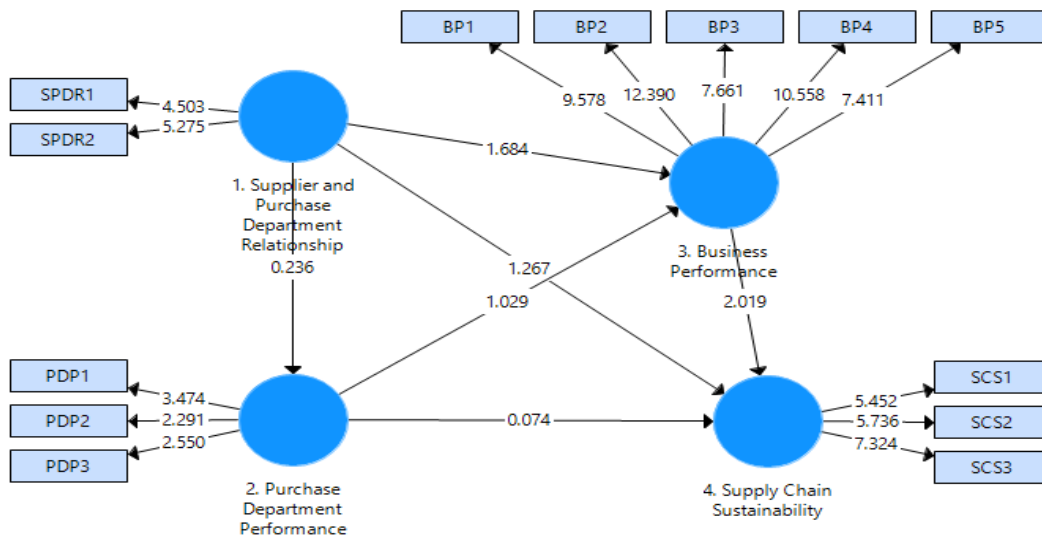
Figure 4: Bootstrapping results for the Male group

Figure 5: Bootstrapping results for the Female group

Table No. 10: Bootstrapping Results

Hypot heses	Path Coeffic ients Origin al (Male)	Path Coeffic ients Origin al (Femal e)	Path Coeffic ients Origin al Sampl e (O) (Comp lete Data)	t-Val ue (M ale)	t-Valu e (Fem ale)	T Statis tics (Com plete Data)	p-Val ue (M ale)	p-Valu e (Fem ale)	P Value s (Com plete Data)
1. Supplie r and Purchas e Depart ment Relatio nship -> 2. Purchas e Depart ment Perfor mance	0.027	-0.044	0.011	0.23 6	0.347	0.120	**0.81 5**	**0.722**	**0.905**
1. Supplie r and Purchas	0.120	-0.002	0.086	1.68 4	0.015	1.476	**0.09 1**	**0.988**	**0.140**

e Department Relationship -> 3. Business Performance									
1. Supplier and Purchase Department Relationship -> 4. Supply Chain Sustainability	0.093	0.256	0.149	1.267	2.770	2.860	**0.199**	**0.005**	**0.004**
2. Purchase Department Performance -> 3. Business Performance	0.088	0.076	0.070	1.029	0.472	0.947	**0.315**	**0.633**	**0.344**
2. Purchase Department Performance -> 4. Supply Chain Sustainability	-0.006	0.050	0.019	0.074	0.424	0.293	**0.941**	**0.678**	**0.770**
3. Business Performance -> 4. Supply Chain	0.134	0.191	0.142	2.019	1.956	2.823	**0.044**	**0.048**	**0.005**

Sustain ability									

CONCLUSION

The results of the PLS-Multi Group Analysis (PLS-MGA), as shown in Table No. 9, suggest that neither the male nor female groups differ significantly on any of the hypotheses. Therefore, an attempt was made to identify variables that have a significant impact, particularly concerning males, females, or considering the entire set of data (Table No. 10). The results showed that supplier and purchase department relationships had a significant impact on business performance according to females. They also believed that supplier and purchase department relationships had a significant impact on supply chain sustainability, which is also supported by the results of a complete set of data incorporating both male and female. Both genders strongly believe that business performance significantly impacts supply chain sustainability. The findings also reveal that the performance of the organization is dependent upon the performance of the purchase department, and the performance of the purchase department is dependent upon the relationship between the buyer and the supplier.

When a supplier and the purchasing department of an organization build a long-term, healthy relationship, they can share ideas and get feedback from each other. This will allow operations to be improved, the supply chain to be streamlined, costs to go down, and customer service to get better. The supplier-purchase department relationship, therefore, contributes significantly to the supply chain's sustainability. The purchasing department is crucial to effective supply chain management. The performance of a business and each partner in the chain has an impact on the sustainability of the entire supply chain and the final product.

LIMITATIONS AND DIRECTIONS FOR FUTURE STUDY

This study focuses on a geographically restricted area. The focus of the study is a sample of male and female employees in the hospitality industry in Bangkok, Thailand. Thus, the study can be conducted on employees from other industries, locations, or countries. Future research could be conducted in other regions to determine the perspectives of different industries on supply chain sustainability. Furthermore, this study incorporated only a few independent variables, including supplier-purchase department relationship, purchase department performance, and business performance, to examine the link between the dependent variable and the independent variables. So, in addition to these variables, more possible variables could be tested and analyzed to see how they affect the sustainability of the supply chain.

REFERENCES

Axelsson, S. (2014). Buyer-Supplier Relationships: Factors characterising successful collaborations. Retrieved August 21, 2019, from https://gupea.ub.gu.se/bitstream/2077/37726/1/gupea_2077_37726_1.pdf

Azeem, K. (2015, May). SCHOLEDGE *International Journal of Management & Development.* Retrieved August 21, 2019, from https://thescholedge.org/index.php/sijmd/article/view/39/164

Christopher, M. (1998), Logistics and Supply Chain Management, London, Financial Times Management.

Fornell, C. G., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Errors. *Journal of Marketing Research*, 18 (1), 39-50.

Gold, A. H., Malhotra, A., & Segars, A. H. (2001). Knowledge Management: An Organizational Capabilities Perspective. *Journal of Management Information Systems, 18* (1), 185-214.

Hair, J.F., Anderson, R. E., Tatham, R. L. and Black, W. C. (1998), Multivariate Data Analysis, Prentice-Hall, Upper Saddle River, New Jersey.

Hayes, A. (2019, August 11). Supply Chain Management (SCM). Retrieved August 21, 2019, from https://www.investopedia.com/terms/s/scm.asp

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A New Criterion for Assesing Discriminant Validity in Variance-Based

Structural Equation Modeling. *Journal of Academy of Markeing Science , 43* (1), 115-135.

Hu, L. T, and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modelling, 6, 1-55.

Kannan V.R. &Tan, K.C. (2006). Buyer–Supplier Relationships: The Impact of Supplier Selection and Buyer-Supplier Engagement on Relationship and Firm Performance, *International Journal of Physical Distribution & Logistics Management*, 36 (10).

Morgan, G. A., Leech, N. L., Gloeckner, G. W., and Barrett, K. C. (2004). Measurement and Descriptive Statistics. *IBM SPSS for Introductory Statistics: Use and Interpretation.* (5th ed.). 37-53.

Nunnally, J.C. (1978), Psychometric Theory, 2nd edition, McGraw-Hill, New York.

Saunders, M., Lewis, P. & Thornhill, A. (2012). Convenience sampling. (2012). Retrieved August 21, 2019, from https://research-methodology.net/sampling-in-primary-data-collection/convenience-sampling/

Teo, T., Lee, C. B., & Chai, C. S. (2008). Understanding Pre-Service Teachers' Computer Attitudes: Applying and Extending the Technology Acceptance Model (TAM). *Journal of Computer Assisted Learning, 24* (2), 128-143.

UK, E. (2017, April 24). What Might We Mean By Firm Performance? Retrieved August 21, 2019, from https://www.ukessays.com/essays/commerce/what- might-we-mean-by-firm-performance-commerce-essay.php

Yoo, Y. and Alavi, M. (2001). Media and Group Cohesion: Reflective Influences on Social Presence, Task Participation, and Group Consensus, MIS Quarterly, 25(3), 371-390