CHAPTER 5:

5.0 DATA ANALYSIS AND RESULT

5.1 Introduction

Chapter Five discusses the result of data analysis of the study. For the purpose of the data analysis, Statistical Package for Social Science (SPSS) version 15.0 was employed. This chapter deals with the analysis to investigate the relationship between supply chain management practices, supply chain integration and supply chain performance using data collected during the field survey. The earlier part of this chapter reinforces the framework of analysis and hypotheses development. The following part is the descriptive statistical analysis and inferential statistical analysis of the main variables which are supply chain management practices, supply chain integration and supply chain performance. In its final part, this chapter presents the empirical evidence about relationship between supply chain management practices, supply chain integration and supply chain performance.

5.2 Response Rate

The total population size for this study will be 900 firms from electronics manufacturing industry (MIDA, 2008). Based on the recommended sample size for the above population size (Sekaran, 2003), about 269 questionnaires were distributed, 121 sets were returned, of which 113 responses were useful for analysis. Eight questionnaires were discarded because the respondents did not answer at least a minimum of 25 percent of the questions. In terms of some of the unanswered questions, the average score was assigned to manage blank responses (Sekaran, 2003). Due to constraints such as difficulty to contact respondents and most of them were busy, the action above was proposed. This response received represents 42 percent of the proposed sample size.

In addition, to circumvent sample bias from the perspective of questionnaire distribution method, Roscoe, (1975), suggested that the appropriate response rate should be more than 10 percent. For effective analysis at least a minimum of 30 percent responses must be collected (Sekaran, 2003). In this study, the response rate is 42 percent. Hence, sample bias is absent and the responses received can be assumed to represent the population. The higher percentage of response is the result of having the supporting documents (i.e. recommendation letter) from the Malaysian Logistics and Supply Chain Association (MLSCA).

In terms of determining the relevant statistical analysis for the available sample size, there were no specific guidelines. Nonetheless, it is suggested that multiple regression would be the best method in examining the quality of the measurement and examining predictive relationship simultaneously be conducted when the sample size is based on the ration of the number of variables and observation 1:5 (Johnson & Wichern, 1998). Based on this requirement, the minimum number of respondents was 60 samples. Since the sample size of the current study is 113; multiple regressions can be used to test if there is support for the proposed model.

5.3 Non-Response Bias

In the survey, it is important that the sample collected should represent the population under study (Veera & Chandran, 2010). This is crucial as inferences are made to generalize the findings of this study. The existence of a good response rate in this research provides some confidence that the response bias is not a significant problem (Weiss & Heide, 1993).

Nevertheless non-response bias was tested by assessing the difference between the early and late respondents.

The extrapolation technique was employed to test the likelihood of non-response, equating late responses to non-respondents(Armstrong & Overton, 1977) cited by (Cousins & Menguc, 2006). This was carried out by splitting the total sample into two groups; i] sample respondent received before the second wave of mailing (n = 64), and ii] sample respondent received after the second wave (n = 49). In order to compare these two groups in terms of the mean responses on each variable, t-test was used. The results revealed no significant differences between the two groups. As a result, the study respondents were not different from non-respondents. For example, the study found that there was no statistically significant difference (at $\alpha = 0.05$) between respondents and non-respondents based on the mean scores of the constructs used such as supplier strategic partnership (t = .85; p = .68); customer relationship (t = .98; p = .43); information sharing (t = -1.15; p = .38); information quality (t = 1.37; p = .24); internal lean practices (t = 0.35; p = 0.40); postponement (t = .50; p = .41); agreed vision & goals (t = -.89; p = .37); risk & reward sharing (t = -.78; p = .36); supply chain integration (t = -.89; p = .37); supply chain performance (t = -.89; p = .40) and based on responses to such demographic characteristics as business description (t = -.35; p = .64); operating experience (t = -.81; p = .54); numbers of employee (t = -.05; p = .85); annual sales (t = -.49; p = .51).

5.4 Data Screening

Data screening is an important preliminary process before analyzing any data for the purpose of research. This is to ensure the data is clean from several elements, namely, missing data and outliers (Johnson & Wichern, 1998).

5.4.1 Detection of Missing Data

Missing data were reduced as much as possible by checking all the questionnaires at the time of collection. When any questions were found unanswered it was either brought to attention of respondent by telephone or discarded. Since all the data entered into SPSS, before any tests were conducted using the data set, frequency distribution for each variable in the study as well as missing value analysis were run to ensure the data were clean, The result indicated that there was no missing data.

5.4.2 Detection of Outliers

Outliers as an observation with a unique combination of characteristics identifiable as distinctly different from the other observations (Hair, Anderson, Tatham, & Black, 1998). It is important to make a distinction between outliers that ought to be deleted and those that ought not to be. Outliers that required deletion are recorded missing, incorrect data entry, unusual data and data from respondents who are not members of the intended population (Tabachnick & Fidell, 2001). For this study, maximum and minimum extreme values for all the study variables were produced using SPSS. A visual inspection of the data revealed that the data were free from outliers.

5.5 Profile of Respondents

Profile of respondents showed in table 5.1 shows the respondents' organization profile. This demographic profile is based on the types of business description, organization's business operation experience, number of employees and annual sales turnover. Generally, the demographic profile of respondent depicts that the four major sectors in "electronics cluster" are in the following business description a) Electronic Component b) Industrial Electronics, c) Consumer Electronics and d) Information & Communications Technology (ICT) Products.

Table 5.1
Description of the Respondents Firms

Profile	Frequency	Percentage %
Business Description		
▪ Electronics Component	57	50.4
▪ Industrial Electronics	25	22.1
▪ Consumer Electronics	20	17.7
▪ Information & Communications Technology (ICT) Products	11	9.70
Operating Experience		
▪ Less 1 year	0	-
▪ 1 – 5 years	6	5.30
▪ 5 – 10 years	14	12.4
▪ 10 – 15 years	45	39.8
▪ 15 – 20 years	39	34.5
▪ More than 20 years	9	8.00
Number of Employees		
▪ Less than 50	0	-
▪ 50 – 100	15	13.3
▪ 100 – 250	21	18.6
▪ 250 – 500	45	39.8
▪ More than 500	32	28.3
Annual Sales		
▪ Less than 1 million	0	-
▪ 1 – 5 million	21	18.6
▪ 5 – 10 million	26	23.0
▪ 10 – 50 million	39	34.5
▪ 50 – 100 million	17	15.0
▪ More than 100 million	10	8.80

Source: Computed Data Analysis

The majority of the firms' respondents are from electronic component product manufacturing firms which constitute 50.4 percent of firm's business types. The semiconductor sub-sector accounts for the largest share of electronic components manufacturing, followed by passive component and display devices. Then the majority of the firms' respondents are from northern and southern region of Malaysia. The command numbers of employees are mostly above 250 employees. Almost all the selected firms for this study are between 5 to 20 years of operational experience.

5.6 Normality Test

This study test for the symmetric nature and peakedness / flatness for the data set using the shape descriptors, skewness and kurtosis, respectively. A variety of opinions can be found concerning the acceptable level of skewness (the symmetry of a distribution) and kurtosis (the clustering of scores toward the centre of a distribution) for a particular variable (George & Mallery, 2003; Morgan, Griego, & Gloekner, 2001).

Table 5.2:
Skewness and Kurtosis Analysis

Construct / Dimension	N	Skewness		Kurtosis	
	Statistics	Statistics	Std. Error	Statistics	Std. Error
Strategic Supplier Partnering	113	-0.867	0.227	0.704	0.451
Customer Relationship	113	-0.309	0.227	1.672	0.451
Information Sharing	113	-0.731	0.227	-0.273	0.451
Information Quality	113	-0.508	0.227	-0.394	0.451
Postponement	113	-0.558	0.227	-0.400	0.451
Internal Lean Practices	113	-0.081	0.227	-0.464	0.451
Agreed Vision & Goals	113	-0.045	0.227	0.049	0.451
Risk & Reward Sharing	113	-0.387	0.227	0.018	0.451
Supply Chain Integration	113	-0.733	0.227	0.723	0.451
Flexibility Performance	113	-0.876	0.227	0.748	0.451
Resource Performance	113	-0.777	0.227	0.509	0.451
Output Performance	113	-0.374	0.227	0.105	0.451

Source: Computed Data Analysis

Table 5.2 shows the skewness test and kurtosis test of all constructs (e.g. strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals, risk and reward sharing, supply chain integration, flexibility performance, resources performance and output performance.

The skewness value for measurement item ranges from -0.081 to -0.876, are well within the recommended range of -1 to +1 (Hair, Black, Babin, Anderson, & Tatham, 2006). Kurtosis value for measurement item ranges from -0.273 to +1.672, are well within the

recommended range of -2 to +2 (Carlos & Anil, 1980). As such, the test indicates that this result has been revealed having data of normal distribution.

To uphold the validity and reliability of analysis, the normal probability plot is examined. Hair, et al., (2006) also suggested using P-P plots to check the linear relationship of variables. The normal plot of regression standardized residual for the dependent variable indicates a relatively normal distribution.

5.7 Correlation Matrix

The interpretation of the strength of correlation was based on the description provided by Davis, (1971). The description is as follows:

if *r* is 1.0, the magnitude is perfect;

if *r* is 0.85 – 0.99, the magnitude is very high;

if *r* is 0.70 – 0.84, the magnitude is high;

if *r* is 0.50 – 0.69, the magnitude is substantial;

if *r* is 0.30 – 0.49, the magnitude is moderate;

if *r* is 0.10 – 0.29, the magnitude is low; and

if *r* is 0.01 - 0.09, the magnitude is negligible.

5.7.1 Multicollinearity Test

To test multicollinearity, the correlation matrix of the variables was studied to identify the occurrence of multicollinearity. The correlation coefficient is a measure of the closeness of

the relationships or association between independent and dependent variables (Hair, et al., 1995). Multicollinearity problem exists when the independent variables are too highly correlated, for instance Pearson's *r* between each pair of independent variables does not exceed 0.85 (Hair, et al., 1995). The results (see Table 5.3) indicate that none of the squared correlations was close to 0.85 to suggest a problem with multicollinearity among the research variables. Therefore, there is no evidence of significant multicollinearity among the research variables.

5.7.2 Correlation Matrix between Variables

Table 5.3 shows the correlation matrix between variables. Strategic supplier partnering has positive (significant) correlation with customer relationship (r = 0.333). This positive correlation indicates that the supply chain members in the electronics manufacturing industry do translate the customer's requirement into the formulation of strategic supplier partnering. As such, to successfully translate customers need into supplier partnering, there is the need for significant information quality exchange (r= 0.512) and information sharing (r=0.448) among manufacturer and suppliers. Through thorough information dissemination and strategic supplier partnering, it is possible to have process streamlining, eliminate waste and apply internal lean practices. This is proven with significant positive correlation of strategic supplier partnering and internal lean practices (r=0.356). In addition, strategic supplier partnering has positive correlation with commonly agreed vision and goals among supply chain members (r=0.364) and weak positive correlation with risk and reward sharing (r=0.135). Further, the close relationship with suppliers enables the manufacturer to conduct product customization through production modularity in the content of postponement (r=0.462). Moreover, strategic supplier partnering significantly correlate with

supply chain integration (r=0.406), flexibility performance (r=0.482), resources performance (r=0.412) and output performance (r=0.273).

Customer relationship management has positive correlation with information sharing (r=0.259) and information quality (r=0.137). This means information exchange and its quality plays an important role in nurturing manufacturer-customer relationship. Subsequently, internal lean practices (r=0.243) and postponement (r=0.248) has significant positive correlation with customer relationship management which indicates customer involvement in internal lean quality improvement program and distribution proximity to customer. In addition, customer relationship management has positive correlation with commonly agreed vision and goals among supply chain members (r=0.494) and weak positive correlation with risk and reward sharing (r=0.092). Further, the close relationship with customer enables the manufacturer to understand customer requirement better and to give importance to postponement practices (r=0.248). Moreover, customer relationship management significantly correlate with supply chain integration (r=0.239), flexibility performance (r=0.329), resources performance (r=0.211) and output performance (r=0.201).

Information sharing and information quality do compliment interchangeably due to its common objective to furnish the supply chain members with reliable and timely information to achieve successful business transaction. Therefore the information sharing and information quality do have significantly strong correlation (r=0.605). The internal supply chain management practices within a manufacturing focal firm such as internal lean practices and postponement needs strong coordination across functional department. As

such information sharing and information quality became a prerequisite for internal lean practices (r=0.551; r=0.475) and postponement (r=0.748; r=0.578). In addition, information sharing and information quality have positive correlation with commonly agreed vision and goals among supply chain members (r=0.335; r=0.207) and weak positive correlation with risk and reward sharing (r=0.128; r=0.108). Moreover, information sharing and information quality significantly correlates with supply chain integration (r=0.671; r=0.549), flexibility performance (r=0.742; r=0.521), resources performance (r=0.634; r=0.527) and output performance (r=0.658; r=0.483).

Since both internal lean practices and postponement are embedded within the context of internal supply chain management practices, there is a significant correlation between these two practices (r=0.624). However, internal lean practices have significant positive correlation with commonly agreed vision and goals among supply chain members (r=366) and weak positive correlation with risk and reward sharing (r=0.051). In addition, internal lean practices have significant positive correlation with supply chain integration (r=0.363), flexibility performance (r=0.462), resources performance (r=0.349) and output performance (r=0.399). Similarly with internal lean practices, postponement has significant positive correlation with commonly agreed vision and goals among supply chain members (r=0.389) and weak positive correlation with risk and reward sharing (r=0.084). In addition, postponement has significant positive correlation with supply chain integration (r=0.571), flexibility performance (r=0.584), resources performance (r=0.521) and output performance (r=0.587).

Unfortunately, the agreed vision and goals is not in tandem with risk and reward sharing system in the electronic manufacturing firms. This gives both of the practices a weak and insignificant correlation (r=0.143). However agreed vision and goals has significant positive correlation with supply chain integration (r=0.358), flexibility performance (r=0.434), resources performance (r=0.331) and output performance (r=0.313). Risk and reward sharing generally do not show significant correlation with any dimensions of study such as supply chain integration (r=0.117), flexibility performance (r=0.174), resources performance (r=0.119) and output performance (r=0.086).

Table 5.3:
Correlations among the Subscales of the Constructs

	SSP	CRM	IS	IQ	ILP	PST	VISN	RISK	SCI	FP	RP
CRM	0.333**										
IS	0.448**	0.259**									
IQ	0.512**	0.137	0.605**								
ILP	0.356**	0.243**	0.551**	0.475**							
PST	0.462**	0.248**	0.748**	0.578**	0.624**						
VISN	0.364**	0.494**	0.335**	0.207*	0.366**	0.389**					
RISK	0.135	0.092	0.128	0.108	0.051	0.084	0.143				
SCI	0.406**	0.239*	0.671**	0.549**	0.363**	0.571**	0.358**	0.117			
FP	0.482**	0.329*	0.742**	0.521**	0.462**	0.584**	0.434**	0.174	0.738**		
RP	0.412**	0.211*	0.634**	0.527**	0.349**	0.521**	0.331**	0.119	0.844**	0.587**	
OP	0.273**	0.201*	0.658**	0.483**	0.399**	0.587**	0.313**	0.086	0.752**	0.526**	0.701**

*** Correlation is significant at the 0.01 level
** Correlation is significant at the 0.05 level
* Correlation is significant at the 0.05 level

Source: Computed Data Analysis

5.8 Construct Validity

Construct validity is a method intended to select a relevant subset of items from a pool of measurement items or questions. These items are based upon criteria of uniqueness. In addition, they include the ability to convey different shades of meaning to respondents through expert opinion and statistical method. The statistical method, evaluated by using (1) principal component analysis as the extraction technique and (2) varimax as the method of rotation in order to perform construct validity (Churchill, 1979).

5.8.1 Principal Component Analysis

In social science research study, construct validity is used to measure the validity of the instruments in the survey questionnaires. Tu, (2002), reiterated that in order to validate the instrument, apart from content validity, a research study should also give importance to construct validation. Statistically, the construct validity can be measured and evaluated by using principal component analysis as the extraction technique and varimax as the method of rotation.

The ability of items to measure the same construct is demonstrated with higher factor loadings (with a cut-off loading of 0.40) on a single component and eigenvalues greater than 1.0. Further, Kaiser-Meyer- Olkin (KMO) measures of sampling adequacy is used as the indicator to determine good dimension. KMO varies from 0 to 1.0 and KMO overall should be 0.60 or higher to proceed with factor analysis (Norzaidi, Chong, Murali, & Intan Salwani, 2007). Besides, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test for Sphericity measure of sampling adequacy indicated a practical level of common variance.

Table 5.4
Kaiser-Meyer-Olkin (KMO)
and
Bartlett's test for Sphericity Measures

Construct	KMO test	Bartlett's test (sig.)
Strategic Supplier Partnering	0.779	0.00
Customer Relationship	0.669	0.00
Information Sharing	0.851	0.00
Information Quality	0.747	0.00
Postponement	0.720	0.00
Internal Lean Practices	0.634	0.00
Agreed Vision and Goals	0.655	0.00
Risk and Reward Sharing	0.629	0.00
Supply Chain Integration	0.753	0.00
Flexibility Performance	0.787	0.00
Resource Performance	0.887	0.00
Output Performance	0.885	0.00

Source: Computed Data Analysis

Table 5.4 shows all measures of those factors which are higher than recommended KMO cut-off point of 0.60. This indicates the sampling adequacy for a satisfactory factor analysis to proceed and Bartlett's test shows all factors were significant which means that the correlation matrix is an identity matrix. In short, this suggests that the inter-correlation matrix contains enough common variance to make factor analysis worth pursuing.

5.8.2 Exploratory Factor Analysis

The main objective of factor analysis is to reduce the number of variables and to detect the structure of the relationships among variables. There are a few methods in conducting factor analysis, with principal components and maximum likelihood being the most popular methods of parameter estimation (Kerlinger, 1973). Among these methods, the most frequently used approach is the principal components analysis using varimax rotation (Emory & Cooper, 1991). The idea of rotation is to reduce the number of factors on which the variables under investigation have high loadings. Rotation does not actually change anything but makes the interpretation of the analysis easier (Johnson & Wichern, 1998). Since the items selected for this study were innumerable, factor analysis was conducted in order to reduce the items into sizable factors, thus, enabling valid measures to be developed for items associated with the impact of middle manager's performance.

In order to conform to the requirements for a satisfactory factor analysis results, both methods, such as principal components analysis using varimax rotation and maximum likelihood, were used in the study. An item with low item-total correlation indicates that the item is not drawn from the same domain and should be deleted to reduce error and unreliability (Nunnally, 1978). Therefore, eigenvalues and variance explained (%) are considered important values in factor analysis. Dimensions with similar loading on two factors and dimensions with loading less than 0.40 were removed because loadings above 0.60 are usually considered high and those below 0.40 are low (S. C. Chong, 2006). The following sections discuss the results of factor analysis for independent, intervening and dependent variables.

5.8.3 Independent Variable Exploratory Factor Analysis – Supply Chain Management Practices

The factor analysis was conducted on the items related to eight independent variables that measure strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing. Dimensions are ordered and grouped by size of loading to facilitate interpretation. Principal component extraction used prior factors extraction to estimate the number of factors, presence of outlier, absence of multicollinearity and factorability of the correlation matrices (May, 2002). The following sections explain the factor analysis for supply chain management practices.

5.8.3.1 EFA for Strategic Supplier Partnering

The ten items of supply chain management practices [SCMP] loaded onto one factor. The factor contains ten items of which an eigenvalue of 5.81 and explained 58.52 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Strategic Supplier Partnering” [SSP]. Table 5.5 provides an analysis of construct validity testing on strategic supplier partnering.

Table 5.5:
Exploratory Factor Analysis for Independent Variables:
Strategic Supplier Partnership

Items	Factor
SSP1	0.552
SSP2	0.670
SSP3	0.639
SSP4	0.539
SSP5	0.839
SSP6	0.698
SSP7	0.573
SSP8	0.440
SSP9	0.431
SSP10	0.555
Eigenvalue	5.81
Variance [%]	58.52

Source: Computed Data Analysis

5.8.3.2 EFA for Customer Relationship

The eight items of supply chain management practices [SCMP] loaded onto one factors. The factor contains eight items of which an eigenvalue of 5.40 and explained 67.55 percent of the total variation. The factor loading are all more than 0.40, except item CRM6 is recommended to drop because of their values which are lower than the cut-off point (>0.40). This factor is labeled as ‘’Customer Relationship” [CRM]. Table 5.6 provides an analysis of construct validity testing on customer relationship.

Table 5.6:
Exploratory Factor Analysis for Independent Variables:
Customer Relationship

Items	Factor
CRM1	0.688
CRM2	0.652
CRM3	0.687
CRM4	0.633
CRM5	0.684
CRM6	0.074
CRM7	0.595
CRM8	0.530
Eigenvalue	5.40
Variance [%]	67.55

Source: Computed Data Analysis

5.8.3.3 EFA for Information Sharing

The seven items of supply chain management practices [SCMP] are loaded onto one factor. The factor contains seven items of which an eigenvalue of 4.30 and that explained 61.45 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Information Sharing” [IS]. Table 5.7 provides an analysis of construct validity testing on information sharing.

Table 5.7:
Exploratory Factor Analysis for Independent Variables:
Information Sharing

Items	Factor
IS1	0.777
IS2	0.776
IS3	0.846
IS4	0.708
IS5	0.831
IS6	0.795
IS7	0.746
Eigenvalue	4.30
Variance [%]	61.45

Source: Computed Data Analysis

5.8.3.4 EFA for Information Quality

The five items of supply chain management practices [SCMP] loaded on to one factor. The factor contains five items of which an eigenvalue of 3.23 and that explained 64.51 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Information Quality” [IQ]. Table 5.8 provides an analysis of construct validity testing on strategic supplier partnering.

Table 5.8:
Exploratory Factor Analysis for Independent Variables:
Information Quality

Items	Factor
IQ1	0.758
IQ2	0.810
IQ3	0.784
IQ4	0.860
IQ5	0.801
Eigenvalue	3.23
Variance [%]	64.51

Source: Computed Data Analysis

5.8.3.5 EFA for Postponement

The four items of supply chain management practices [SCMP] loaded onto one factor. The factor contains four items of which an eigenvalue of 2.97 and that explained 74.28 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Postponement” (PST). Table 5.9 provides an analysis of construct validity testing on postponement.

Table 5.9:
Exploratory Factor Analysis for Independent Variables: Postponement

Items	Factor
PST1	0.860
PST2	0.909
PST4	0.833
PST5	0.843
Eigenvalue	2.97
Variance [%]	74.28

Source: Computed Data Analysis

5.8.3.6 EFA for Internal Lean Practices

The four items of supply chain management practices [SCMP] loaded onto one factor. The factor contains four items of which an eigenvalue of 3.14 and that explained 79.01 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Internal Lean Practices” [ILP]. Table 5.10 provides an analysis of construct validity testing on internal lean practices.

Table 5.10:
Exploratory Factor Analysis for Independent Variables:
Internal Lean Practices

Items	Factor
ILP1	0.624
ILP2	0.604
ILP3	0.835
ILP5	0.701
Eigenvalue	3.14
Variance [%]	79.01

Source: Computed Data Analysis

5.8.3.7 EFA for Agreed Vision and Goals

The ten items of supply chain management practices [SCMP] loaded onto one factor. The factor contains ten items of which an eigenvalue of 3.05 and that explained 76.20 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Agreed Vision and Goals” [VISN]. Table 5.11 provides an analysis of construct validity testing on agreed vision and goals.

Table 5.11:
Exploratory Factor Analysis for Independent Variables:
Agreed Vision & Goals

Items	Factor
VISN1	0.556
VISN2	0.835
VISN3	0.772
VISN4	0.604
Eigenvalue	3.05
Variance [%]	76.20

Source: Computed Data Analysis

5.8.3.8 EFA for Risk and Reward Sharing

The three items of supply chain management practices [SCMP] loaded onto one factor. The factor contains three items of which an eigenvalue of 2.05 and that explained 68.28 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Risk and Reward Sharing” [RISK]. Table 5.12 provides an analysis of construct validity testing on risk and reward sharing.

Table 5.12:
Exploratory Factor Analysis for Independent Variables:
Risk & Reward Sharing

Items	Factor
RISK1	0.877
RISK2	0.889
RISK3	0.699
Eigenvalue	2.05
Variance [%]	68.28

Source: Computed Data Analysis

5.8.4 Intervening Variable Exploratory Factor Analysis

The second test of factor analysis was performed on the intervening variable, which is supply chain integration.

5.8.4.1 EFA for Supply Chain Integration

The five items of supply chain integration [SCI] loaded onto one factor. The factor contains five items of which an eigenvalue of 2.65 and that explained 53.01 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Supply Chain Integration” [SCI]. Table 5.13 provides an analysis of construct validity testing on supply chain integration.

Table 5.13:
Exploratory Factor Analysis for Intervening Variables:
Supply Chain Integration

Items	Factor
SCI1	0.749
SCI2	0.431
SCI3	0.864
SCI4	0.801
SCI5	0.718
Eigenvalue	2.65
Variance [%]	53.01

Source: Computed Data Analysis

5.8.5 Dependent Variable Exploratory Factor Analysis

The third test of factor analysis was performed on the dependent variable, which is supply chain performance.

5.8.5.1 EFA for Flexibility Performance

The five items of supply chain performance [SCP] loaded onto one factor. The factor contains five items of which an eigenvalue of 4.04 and that explained 80.78 percent of the total variation. The factor loading are all more than 0.40, except item FP4 is recommended to drop because of their values which are lower than the cut-off point (>0.40). This factor is labeled as ‘’Flexibility Performance” [FP]. Table 5.14 provides an analysis of construct validity testing on Flexibility Performance.

Table 5.14:
Exploratory Factor Analysis for Dependent Variables: Flexibility Performance

Items	Factor
FP1	0.802
FP2	0.926
FP3	0.911
FP4	0.209
FP5	0.801
Eigenvalue	4.04
Variance [%]	80.78

Source: Computed Data Analysis

5.8.5.2 EFA for Resources Performance

The five items of supply chain performance [SCP] loaded onto one factor. The factor contains five items of which an eigenvalue of 4.05 and that explained 81.08 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Resource Performance” [RP]. Table 5.15 provides an analysis of construct validity testing on Resource Performance.

Table 5.15:
Exploratory Factor Analysis for Dependent Variables: Resource Performance

Items	Factor
RP1	0.872
RP2	0.926
RP3	0.915
RP4	0.828
RP5	0.955
Eigenvalue	4.05
Variance [%]	81.06

Source: Computed Data Analysis

5.8.5.3 EFA for Output Performance

The five items of supply chain performance [SCP] loaded onto one factor. The factor contains five items of which an eigenvalue of 4.89 and that explained 69.86 percent of the total variation. The factor loading are all more than 0.40, hence no item is removed. This factor is labeled as ‘’Output Performance” [SCP]. Table 5.16 provides an analysis of construct validity testing on Output Performance.

Table 5.16:
Exploratory Factor Analysis for Dependent Variables:
Output Performance

Items	Factor
OP1	0.842
OP2	0.843
OP3	0.851
OP4	0.854
OP5	0.805
OP6	0.828
OP7	0.825
Eigenvalue	4.89
Variance [%]	69.86

Source: Computed Data Analysis

5.8.6 Summary of Exploratory Factor Analysis

At the end of EFA, 12 dimensions which were earlier proposed still remain. Only two items were recommended to be removed which are CRM6 (the dimension of customer relation) and FP4 (the dimension of flexibility performance). These two items were recommended to be dropped from the model since it has lower loading value than the cut-off point (0.40) (Chong, 2006), and removed until KMO achieves at 0.60 (cut-off) (Jones, LoPresti, Naphtali, & Whitney, 1999). As a result the independent variable (supply chain management practices) has eight dimensions, (i.e. strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices,

postponement, agreed vision and goals and risk and reward sharing), the intervening variable, (i.e. supply chain integration) and the dependent variable, (supply chain performance) has three dimensions, (i.e. flexibility performance, resources performance and output performance). As such the final model and the proposed model are similar theoretically and statistically. After all the dimensions have been identified, the next step is to determine the fitness of the model which is discussed later in the section.

5.9 Measures of Reliability

Reliability analysis refers to the test of the consistency of respondents' answers to all the items in a measure, or the degree to which an instrument measures the same way each time it is used under the same condition with the same subjects. In short, it reflects the degree that items are independent measures of the same concept, they will be correlated with one another. The appropriate test for reliability is inter-item consistency reliability which is popularly known as the Cronbach's coefficient alpha, which is used for multipoint-scaled items. The higher the coefficient, the better is the reliability of what the instrument intends to measure (Sekaran, 2003). In this study, the internal consistency reliability is measured by applying the Cronbach's alpha test to individual scales and the overall measures as reported in Table 5.17.

Budd (1987) recommended that the acceptable estimation of reliability study of Cronbach's alpha between 0.50 to about 0.80. Nonetheless, Hair et al., (1995) considered 0.30 as significant, loadings greater than 0.40 are considered more important; and loadings 0.50 or greater are considered very significant. Whereas, Nunnally, (1978) argued that in early stages of research, reliabilities of 0.50 – 0.60 would suffice, and that for basic research, it

can be argued that increasing reliabilities beyond 0.80 is often wasteful of time and funds. In short, the general rule of thumb is 0.60, which is the lower level of acceptability for the alpha (Jones, et al., 1999).

In this current study, the alpha values for all the constructs in the current study are greater than the guideline of 0.60 as stipulated by Hair et al. (1992) and Jones et al. (1999), they are deemed to be satisfactory. The Cronbach's alpha values for all the variables are as follow: strategic supplier partnering (0.794), customer relationship management (0.652), information sharing (0.894), information quality (0.857), postponement (0.884), internal lean practices (0.643), agreed vision and goals (0.613), risk and reward sharing (0.750), supply chain integration (0.751), flexibility performance (0.745), resource performance (0.939) and output performance (0.926). The overall Cronbach's alpha is charted at 0.815. Therefore, the study concludes that the scales can be applied for the analysis with acceptable reliability.

Table 5.17 also shows that, generally, mean scores of all the dimensions of supply chain management practices (strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing), supply chain integration and supply chain performance were on average higher than 4.00 (neutral). This finding indicates that the majority of respondents agreed with the statements in the questionnaire. In other words, most of the supply chain practitioner cum respondents agreed that firms do implement the supply chain management practices and believe it could help to improve their supply chain performance.

Table 5.17
Internal Consistency of the Constructs

Construct/scale	Mean	Standard Deviation	Cronbach's Alpha
Supply Chain Management Practices [Independent Variable]			
Strategic Supplier Partnering [5.84*]			0.794
• SSP1	6.27	0.59	
• SSP2	5.80	0.84	
• SSP3	5.61	0.98	
• SSP4	5.20	1.20	
• SSP5	5.90	1.10	
• SSP6	6.33	0.88	
• SSP7	5.93	0.84	
• SSP8	5.76	0.86	
• SSP9	5.81	1.02	
• SSP10	5.82	1.01	
Customer Relationship Management [3.93*]			0.652
• CRM1	6.26	0.87	
• CRM2	5.74	0.86	
• CRM3	5.65	0.95	
• CRM4	5.10	1.11	
• CRM5	5.72	0.87	
• CRM6	3.70	1.75	
• CRM7	5.17	1.04	
• CRM8	5.65	0.96	
Information Sharing [5.20*]			0.894
• IS1	4.74	1.39	
• IS2	4.65	1.31	
• IS3	4.82	1.40	
• IS4	5.44	1.15	
• IS5	4.95	1.37	
• IS6	5.84	1.17	
• IS7	5.95	1.04	
Information Quality [5.96*]			0.857
• IQ1	5.75	1.22	
• IQ2	5.75	1.12	
• IQ3	6.17	0.94	
• IQ4	5.96	1.11	
• IQ5	6.17	0.84	

* Average mean score

Source: Computed Data Analysis

Table 5.17 (…continue)
Internal Consistency of the Constructs

Construct/scale	Mean	Standard Deviation	Cronbach's Alpha
Supply Chain Management Practices [Independent Variable]			
Postponement [3.80*]			0.884
• PST1	4.98	1.35	
• PST2	4.87	1.41	
• PST3	6.04	8.92	
• PST4	5.16	1.32	
• PST5	5.39	1.26	
Internal Lean Practices [3.69*]			0.643
• ILP1	5.37	1.28	
• ILP2	4.07	1.51	
• ILP3	3.37	1.63	
• ILP4	6.50	8.86	
• ILP5	5.06	1.51	
Agreed Vision & Goals [5.43*]			0.613
• VISN1	5.43	1.16	
• VISN2	6.20	0.78	
• VISN3	6.00	1.19	
• VISN4	4.47	1.35	
Risk & Reward Sharing [5.18*]			0.750
• RISK1	5.54	1.18	
• RISK2	5.30	1.06	
• RISK3	4.70	1.32	
Supply Chain Integration [Mediating Variable]			
Supply Chain Integration [5.44*]			0.751
• SCI1	5.82	1.17	
• SCI2	5.00	1.24	
• SCI3	5.71	0.96	
• SCI4	5.48	1.05	
• SCI5	5.20	1.16	

* Average mean score

Source: Computed Data Analysis

Table 5.17 (…continue)
Internal Consistency of the Constructs

Construct/scale	Mean	Standard Deviation	Cronbach's Alpha
Supply Chain Performance [Dependent Variable]			
-Flexibility Performance [5.48*]			0.745
• FP1	5.84	1.17	
• FP2	5.95	1.04	
• FP3	5.90	1.06	
• FP4	4.28	1.67	
• FP5	5.46	1.11	
Supply Chain Performance -Resource Performance [5.71*]			0.939
• RP1	5.79	1.01	
• RP2	5.66	1.02	
• RP3	5.86	0.96	
• RP4	5.44	1.05	
• RP5	5.80	0.94	
Supply Chain Performance -Output Performance [5.28*]			0.926
• OP1	5.25	1.21	
• OP2	4.98	1.22	
• OP3	5.27	1.03	
• OP4	5.23	1.00	
• OP5	5.33	1.02	
• OP6	5.45	0.90	
• OP7	5.43	1.02	
OVERALL	**N/A**	**N/A**	**0.868**

* Average mean score

Source: Computed Data Analysis

5.10 Multiple Regression Analysis

The regression analysis is a form of multivariate analysis which is subject to fulfill the requirement of the normal assumptions of Ordinary Least Square [OLS]. These assumptions include 1] linearity of the phenomenon measured, 2] constant variance of error terms (homoscedasticity), 3] normality of the error term distribution, and 4] multicollinearity. The minimum sample size is based on the ration of observation to independent variables is 5:1 (Hair, et al., 1995).

5.10.1 Basic Assumption for Multiple Regression Analysis

Linearity is the degree to which change in dependent variable is associated with the independent variables. This assumption was assessed through an analysis of standardized residual plots for each independent variable. As a result, the standardized residual plots did not exhibit any nonlinear pattern to the residuals, thus ensuring that the overall equation was linear. Hence the assumption of linearity was met.

A general common problem faced, in a cross-sectional data comes from heteroscedasticity (Greene, 2000; Johnston & DiNardo, 1997). The second assumption, homoscedasticity, was assessed by plotting the studentized residual and standardized predicted value, and then compared them with the null plot. The result of the scatter plots showed no visible patterns, thus indicating that the second assumption was also met.

The third assumption, normality was examined by level of skewness (the symmetry of a distribution) and level of kurtosis (the clustering of scores toward the centre of a

distribution) for all variables of measure. Some statisticians have more liberal interpretation of less than +1.00 for skewness, kurtosis and both (George & Mallery, 2003; Morgan, et al., 2001). Table 5.2 shows that all constructs (e.g. strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals, risk and reward sharing, supply chain integration, flexibility performance, resources performance and output performance) have less than +1.00 (skewness and kurtosis) which indicates that this result revealed normal distribution.

The next is the fourth assumption that ascertains of the independent variables should not have high correlations among them or this is indicated as multicollinearity. Multicollinearity problem exists when the independent variables are too highly correlated, for instance Pearson's *r* between each pair of independent variables does not exceed 0.85 (Hair, et al., 1995). The results (see Table 5.3) indicate that none of the squared correlations was close to 0.85 to suggest a problem with multicollinearity among the research variables. Therefore, there is no evidence of significant multicollinearity among the research variables.

5.10.2 Condition or Assumption for Hierarchical Regression Analysis

There are three main conditions or assumption which is required to be fulfilled in order to examine the mediation effect using hierarchical regression analysis. The mediating effect exists under the following conditions (Baron & Kenny, 1986):

Step 1

i] The independent variable (supply chain practices) is significantly associated with the mediator (supply chain integration).

Step 2

i] The independent variable (supply chain practices) is significantly associated with the dependent variable (resource performance] in the absence of the mediator (supply chain integration).

ii] The independent variable (supply chain practices) is significantly associated with the dependent variable (flexibility performance] in the absence of the mediator (supply chain integration).

iii] The independent variable (supply chain practices) is significantly associated with the dependent variable (output performance] in the absence of the mediator (supply chain integration).

Step 3

i] The mediator variable (supply chain integration) is significantly associated with the dependent variable (resource performance).

ii] The mediator variable (supply chain integration) is significantly associated with the dependent variable (flexibility performance).

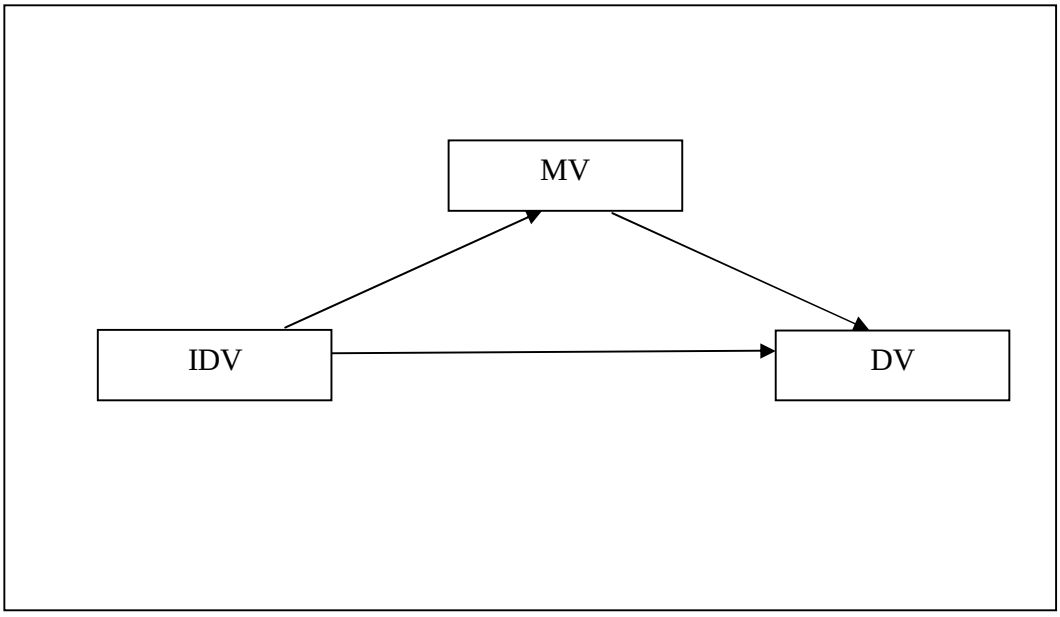
iii] The mediator variable (supply chain integration) is significantly associated with the dependent variable (output performance).

Step 4

i] When the independent variable (supply chain practices) and the mediator variable (supply chain integration) are controlled, a previously significant relationship between the independent variable and dependent variable (resource performance) is no longer significant or it is significantly decreased.

ii] When the independent variable (supply chain practices) and the mediator variable (supply chain integration) are controlled, a previously significant relationship between the independent variable and dependent variable (flexibility performance) is no longer significant or it is significantly decreased.

iii] When the independent variable (supply chain practices) and the mediator variable (supply chain integration) are controlled, a previously significant relationship between the independent variable and dependent variable (output performance) is no longer significant or it is significantly decreased.



Source: Generated by Researcher

Key

i.	DV	=	Dependent variable [supply chain performance]
ii.	IDV	=	Independent variable [supply chain practices]
iii.	MV	=	Mediating variable [supply chain integration]

Figure 5.1:
Schematic Diagram of Variables

The above figure illustrates the schematic diagram and the relationship between the main variables of the study includes 1] dependent variable (supply chain performance), 2] independent variable (supply chain practices) and 3] mediating variable (supply chain integration).

Table 5.18:
Test Model for Hierarchical Regression Analysis

Test Models	
Model 1	MV = f[IDV] = a+ b [IDV]
Model 2	DV = f[IDV] = c + d [IDV]
Model 3	DV = f[MV] = e + f[MV]
Model 4	DV = f[IDV,MV] = g + h[IDV] +j[MV]

Source: Generated by Researcher

Key

i.	DV	=	dependent variable [supply chain performance]
ii.	IDV	=	independent variable [supply chain practices]
iii.	MV	=	mediating variable [supply chain integration]

Table 5.18 depicts the various test models for hierarchical regression analysis which is employed in this study. There are four test models in tandem to all the four steps required to fulfill the conditions or assumption for hierarchical regression analysis.

Table 5.19:
Conformance to Mediating Effect

Full and Partial Effect Conformance	
Full Effect	Partial Effect
b= sig	b= sig
d=sig	d=sig
f= sig	f= sig
j= sig	j= sig
h= not sig	h= sig but h < d

Source: Generated by Researcher

Table 5.19 depicts the criteria of conformance to mediating effect in terms of partial mediation effect and full mediation effect. The criterion for full mediation effect is fulfilled if the independent variable and the mediating variable are controlled; a previously significant relationship between the independent variable and dependent variable is no longer significant. In contrast, the criterion for partial mediation effect is fulfilled if the independent variable and the mediating variable are controlled; a previously significant relationship between the independent variable and dependent variable is significantly decreased.

5.11 Result of Multiple Regression Analysis

The result of the multiple regressions analysis will be presented in three sets. These three sets of regression analysis will represent three dependent variables, which are resources performance, flexibility performance and output performance. These dependent variables were regressed separately on eight independent variables (strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing). The method suggested by Baron and Kenny (1986) was used in assessing the mediating effect of supply chain integration on the relationship between independent variables and dependent variables (resources performance, flexibility performance and output performance).

Table 5.20:
Regression Result of
Resources Performance-Dependent Variable

Variables	Std Beta	Std Beta	Std Beta	Std Beta	Result
	Step 1 Model 1 X ⟶ M	Step 2 Model 2 X ⟶ Y	Step 3 Model 3 M ⟶ Y	Step 4 Model 4 X, M ⟶ Y	
Criterion					
Y = RP					
Predictor					
X_1: SSP	.038	.084		.055	No Mediation
X_2: CRM	-.525	-.233		.163	No Mediation
X_3: IS	.465***	.436***		.085	**Full Mediation**
X_4: IQ	.224***	.198***		.029	**Full Mediation**
X_5: ILP	-.052	-.056		-.017	No Mediation
X_6: PST	.498	.251		-.126	No Mediation
X_7: VISN	.171**	.104		-.025	No Mediation
X_8: RISK	.024	.031		.012	No Mediation
Mediator					
M = SCI			.833***	.755***	
R^2	.484	.412	.713	.703	
F	14.14***	10.80***	275.23***	30.51***	

*Notes: * Significant at 0.1 level; ** Significant at 0.05 level; *** Significant at 0.01 level*

Source: Computed Data Analysis

Table 5.20 depicts the results of the hierarchical regression of supply chain resource performance (dependent variable). The result indicates that supply chain integration has full mediation effect between the relationship of 1] information sharing and supply chain resource performance, and 2] information quality and supply chain resource performance.

Table 5.21:
Regression Result of
Output Performance-Dependent Variable

Variables	Std Beta	Std Beta	Std Beta	Std Beta	Result
	Step 1 Model 1 X ⟶ M	Step 2 Model 2 X ⟶ Y	Step 3 Model 3 M ⟶ Y	Step 4 Model 4 X, M ⟶ Y	
Criterion					
Y = OP					
Predictor					
X_1: SSP	.038	-.080		-.102	No Mediation
X_2: CRM	-.525	-.582*		-.279	No Mediation
X_3: IS	.465***	.570***		.302***	**Partial Mediation**
X_4: IQ	.224***	.167*		.038	**Full Mediation**
X_5: ILP	-.052	.008		.038	No Mediation
X_6: PST	.498	.626*		.339	No Mediation
X_7: VISN	.171**	.079		-.020	No Mediation
X_8: RISK	.024	.024		.010	No Mediation
Mediator					
M = SCI			.752***	.576***	
R^2	.484	.431	.566	.598	
F	14.14***	11.60***	144.70***	19.52***	

*Notes: * Significant at 0.1 level; ** Significant at 0.05 level; *** Significant at 0.01 level*

Source: Computed Data Analysis

Table 5.21 depicts the results of the hierarchical regression of supply chain output performance (dependent variable). The result indicates that supply chain integration has full mediation effect between the relationship of information quality and supply chain output performance and partial mediation effect between information sharing and supply chain output performance.

Table 5.22:
Regression Result of
Flexibility Performance-Dependent Variable

Variables	Std Beta	Std Beta	Std Beta	Std Beta	Result
	Step 1 Model 1 X ⟶ M	Step 2 Model 2 X ⟶ Y	Step 3 Model 3 M ⟶ Y	Step 4 Model 4 X, M ⟶ Y	
Criterion					
Y = FP					
Predictor					
X_1: SSP	.038	.102		.088	No Mediation
X_2: CRM	-.525	-.145		.054	No Mediation
X_3: IS	.465***	.561***		.385***	**Partial Mediation**
X_4: IQ	.224***	.086		.001	No Mediation
X_5: ILP	-.052	-.042		-.022	No Mediation
X_6: PST	.498	.146		-.043	No Mediation
X_7: VISN	.171**	.230**		.165**	**Partial Mediation**
X_8: RISK	.024	.058		.048	No Mediation
Mediator					
M = SCI			.738***	.379***	
R^2	.484	.596	.545	.667	
F	14.14***	21.68***	132.85***	25.94***	

*Notes: * Significant at 0.1 level; ** Significant at 0.05 level; *** Significant at 0.01 level*

Source: Computed Data Analysis

Table 5.22 depicts the results of the hierarchical regression of supply chain flexibility performance (dependent variable). The result indicates that supply chain integration has partial mediation effect between the relationship of 1] information sharing and supply chain flexibility performance, and 2] agreed vision and supply chain flexibility performance.

5.11.1 Testing the relationship between independent and mediating variables [STEP- 1]

H4: There is a positive significant relationship between supply chain management practices and supply chain integration.

Specifically:

Hypothesis 4	Statement
H4a	There is a positive significant relationship between strategic supplier partnering and supply chain integration.
H4b	There is a positive significant relationship between customer relationship and supply chain integration.
H4c	There is positive significant relationship between information sharing and supply chain integration.
H4d	There is positive significant relationship between information quality and supply chain integration.
H4e	There is positive significant relationship between internal lean practices and supply chain integration.
H4f	There is positive significant relationship between postponement and supply chain integration.
H4g	There is positive significant relationship between agreed vision and goals and supply chain integration.
H4h	There is positive significant relationship between risk and reward sharing and supply chain integration.

This study hypothesized that supply chain management practices were positively related to supply chain integration. Hence, the supply chain integration was regressed on eight dimensions of supply chain management practices. The findings showed that Hypothesis 4 was partially supported. The detail of the findings is discussed as follows:

The findings showed (see Tables 5.20, 5.21 and 5.22) that: (1) the extent of information sharing was positively and significantly related to supply chain integration ($p < 0.01$), (2) the extent of information quality was positively and significantly related to supply chain integration ($p < 0.05$), and (3) the extent of agreed vision and goals was positively and significantly related to supply chain integration ($p < 0.05$). The finding suggest that (1) higher information sharing practices would result in higher supply chain integration level, (2) higher information quality practices would result in higher supply chain integration level, and (3) higher agreed vision and goal practices would result in higher supply chain integration level. Therefore, hypotheses 4c, 4d and 4g were supported.

The other five dimensions of supply chain management practices (strategic supplier partnering, customer relationship management, internal lean practices, postponement, and risk and reward sharing) were not significantly related to supply chain integration. Therefore, hypotheses 4a, 4b, 4e, 4f and 4h were not supported. Hence, the variation in supply chain integration was explained by information sharing, information quality, and agreed vision and goals. The percentage of explanation was as much as 48.40% ($R^2 = 0.484$).

5.11.2 Testing for relationship between independent and dependent variables [STEP- 2]

H1-3: There is a positive significant relationship between supply chain management practices and supply chain performance.

In order to test the relationship between supply chain management and supply chain performance, there are three main hypotheses involved (H1, H2 and H3). The supply chain management practices include strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing. On the other hand, supply chain performance was measured in terms of resources performance, output performance and flexibility performance. The detail of the findings for H1, H2 and H3 are as follows:

5.11.2.1 Testing for relationship between supply chain management practices and resource performance

H1: There is a positive significant relationship between supply chain management practices and resources performance. .

Specifically:

Hypothesis 1	Statement
H1a	There is a positive significant relationship between strategic supplier partnering and resources performance.
H1b	There is a positive significant relationship between customer relationship and resources performance.
H1c	There is a positive significant relationship between information sharing and resources performance.
H1d	There is a positive significant relationship between information quality and resources performance.
H1e	There is a positive significant relationship between internal lean practices and resources performance.
H1f	There is a positive significant relationship between postponement and resources performance.
H1g	There is a positive significant relationship between agreed vision and goals and resources performance.
H1h	There is a positive significant relationship between risk and reward and resources performance.

This study hypothesized that supply chain management practices were positively related to resource performance. Hence, the resources performance was regressed on eight dimensions of supply chain management practices. The findings showed (see table 5.20) that hypothesis 1 was partially supported. The detail of the findings is discussed as follows:

The findings showed that: (1) the extent of information sharing was positively and significantly related to resource performance ($p < 0.01$), and (2) the extent of information quality was positively and significantly related to resources performance ($p < 0.01$). The finding suggest that (1) higher information sharing practices would result in higher resources performance, and (2) similarly, higher information quality practices would result in higher resources performance level. Therefore, hypotheses 1c and 1d were supported. The other six dimensions of supply chain management practices (strategic supplier partnering, customer relationship management, internal lean practices, postponement, agreed vision & goals and risk and reward sharing) were not significantly related to resource performance. Therefore, hypotheses 1a, 1b, 1e, 1f, 1g and 1h were not supported. Hence, the variation in resource performance was explained by information sharing and information quality. The percentage of explanation was as much as 41.20% ($R^2 = 0.412$).

5.11.2.2 Testing for relationship between supply chain management practices and output performance

H2: There is a positive significant relationship between supply chain management practices and output performance.

Specifically:

Hypothesis 2	Statement
H2a	There is a positive significant relationship between strategic supplier partnering and output performance.
H2b	There is a positive significant relationship between customer relationship management and output performance.
H2c	There is a positive significant relationship between information sharing and output performance.
H2d	There is a positive significant relationship between information quality and flexibility performance.
H2e	There is a positive significant relationship between internal lean practices and output performance.
H2f	There is a positive significant relationship between postponement and output performance.
H2g	There is a positive significant relationship between agreed vision and goals and output performance.
H2h	There is a positive significant relationship between risk and reward and output performance.

This study hypothesized that supply chain management practices were positively related to output performance. Hence, the output performance was regressed on eight dimensions of supply chain management practices. The findings showed (see table 5.21) that Hypothesis 2 was partially supported. The detail of the findings is discussed as follows:

The findings showed that: (1) the extent of information sharing was positively and significantly related to output performance ($p< 0.01$), (2) the extent of information quality was positively and significantly related to output performance ($p< 0.1$) and (3) the extent of postponement was positively and significantly related to output performance ($p< 0.1$).

The findings suggest that (1) higher information sharing practices would result in higher output performance, (2) similarly, higher information quality would result in higher output performance level, and (3) higher postponement practices would result in higher output performance level.

Therefore, hypotheses 2c, 2d and 2f were supported. The other five dimensions of supply chain management practices (strategic supplier partnering, customer relationship management, internal lean practices, agreed vision & goal and risk & reward sharing) were not significantly related to output performance. Therefore, hypotheses 2a, 2b, 2e, 2g, and 2h were not supported. Hence, the variation in output performance was explained by information sharing and agreed vision & goals. The percentage of explanation was as much as 43.10% ($R^2 = 0.431$).

5.11.2.3 Testing for relationship between supply chain management practices and flexibility performance

H3: There is a positive significant relationship between supply chain management practices and flexibility performance.

Specifically:

Hypothesis 3	Statement
H3a	There is a positive significant relationship between strategic supplier partnering and flexibility performance.
H3b	There is a positive significant relationship between customer relationship management and flexibility performance.
H3c	There is a positive significant relationship between information sharing and flexibility performance.
H3d	There is a positive significant relationship between information quality and flexibility performance.
H3e	There is a positive significant relationship between internal lean practices and flexibility performance.
H3f	There is a positive significant relationship between postponement and flexibility performance.
H3g	There is a positive significant relationship between agreed vision and goals and flexibility performance.
H3h	There is a positive significant relationship between risk & reward and flexibility performance.

This study hypothesized that supply chain management practices were positively related to flexibility performance. Hence, the flexibility performance was regressed on eight dimensions of supply chain management practices. The findings showed (see table 5.22) that Hypothesis 3 was partially supported. The detail of the findings is discussed as follows:

The result showed that: (1) the extent of information sharing was positively and significantly related to flexibility performance ($p < 0.01$), and (2) the extent of agreed vision & goals was positively and significantly related to flexibility performance ($p < 0.05$). The finding suggest that (1) higher information sharing practices would result in higher flexibility performance, and (2) similarly, higher agreed vision & goals practices would result in higher flexibility performance level.

Therefore, hypotheses 1c and 1h were supported. The other six dimensions of supply chain management practices (strategic supplier partnering, customer relationship management, information quality, internal lean practices, postponement, and risk and reward sharing) were not significantly related to flexibility performance. Therefore, hypotheses 3a, 3b, 3d, 3e, 3f, and 3h were not supported. Hence, the variation in flexibility performance was explained by information sharing and agreed vision & goals. The percentage of explanation was as much as 59.60% ($R^2 = 0.596$).

5.11.3 Testing for relationship between mediating variable and dependent variables [STEP- 3]

H5: There is a positive significant relationship between supply chain integration and supply chain performance.

Specifically:

Hypotheses 5	Statement
H5a	Supply chain integration is positively related to resources performance
H5b	Supply chain integration is positively related to flexibility performance
H5c	Supply chain integration is positively related to output performance

This study hypothesized that supply chain integration was positively related to supply chain performance. Supply chain performance was measured in terms of resources performance, flexibility performance and output performance. Hence, the supply chain performance integration was regressed on supply chain integration. The findings showed that hypothesis 5 was fully supported. The detail of the findings is discussed as follows:

The findings showed (see Tables 5.20, 5.21 and 5.22) that: (1) the extent of supply chain integration was positively and significantly related to resources performance ($p < 0.01$), (2) the extent of supply chain integration was positively and significantly related to output

performance ($p < 0.01$) and (3) the extent of supply chain integration was positively and significantly related to flexibility performance ($p < 0.01$).

The finding suggest that (1) higher level of supply chain integration would result in higher resource performance, (2) higher level of supply chain integration would result in higher flexibility performance, and (3) higher level of supply chain integration would result in higher output performance,. Therefore, hypotheses 5a, 5b and 5c were supported. Hence, the variation in:

1] supply chain resource performance was explained by supply chain integration. The percentage of explanation was as much as 71.30% ($R^2 = 0.713$).

2] supply chain output performance was explained by supply chain integration. The percentage of explanation was as much as 56.60% ($R^2 = 0.566$).

3] supply chain flexibility performance was explained by supply chain integration. The percentage of explanation was as much as 54.50% ($R^2 = 0.545$).

5.11.4 Testing for mediation [STEP 4]

Three separate regressions were carried out to test the hypotheses that posited supply chain integration to mediate the relationship between dimensions of supply chain management practices and (1) resource performance, (2) flexibility performance, (3) output performance. The output of these hierarchical regression analyses are illustrated in Tables 5.20, 5.21 and 5.22.

According to Baron and Kenny (1986), three relationships should be established. First, the dimensions of supply chain management practices (independent variables) must be a significant predictor of these respective dimensions of supply chain performance (dependent variable) namely, (1) resource performance, (2) flexibility performance and (3) output performance. Second, the dimensions of supply chain management practices (independent variables) must be a significant predictor of supply chain integration (mediating variable).

Third, in the final regression equation with the dimensions of supply chain management practices (independent variables) entered together with supply chain integration (mediator), and the supply chain integration (mediator) must be a significant predictor of the respective dimension of supply chain performance (dependent variable), which are (1) resource performance, (2) flexibility performance and (3) output performance.

Full mediation is established if the dimensions of supply chain management practices (independent variable) in this third regression equation are non-significant. Meanwhile the partial mediation is established if the dimensions of supply chain management practices (independent variable) are significant but the beta (β) is reduced. The specific results of the mediation analysis (third regression equation) were as follows:

5.11.4.1 Testing mediation between independent variables and dependent variable (resource performance)

H6: Supply chain integration will mediate the relationship between supply chain management practices and resource performance.

Specifically:

Hypotheses 6	Statement
H6a	Supply chain integration will mediate the relationship between strategic supplier partnering and resources performance.
H6b	Supply chain integration will mediate the relationship between customer relationship and resources performance.
H6c	Supply chain integration will mediate the relationship between information sharing and resources performance.
H6d	Supply chain integration will mediate the relationship between information quality and resources performance.
H6e	Supply chain integration will mediate the relationship between internal lean practices and resources performance.
H6f	Supply chain integration will mediate the relationship between postponement and resources performance.
H6g	Supply chain integration will mediate the relationship between agreed vision and goals and resources performance.
H6h	Supply chain integration will mediate the relationship between risk & reward sharing and resources performance.

This study hypothesized that supply chain integration will mediate the relationship dimensions of supply chain management practices and resource performance. Supply chain management practices was measured in terms of strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing. As shown in Table 5.20, information sharing, information quality and agreed vision and goals were the only three variables that are found to be significantly related to supply chain integration in Step 1 (β= 0.465, $p< 0.01$); (β= 0.224, $p< 0.01$); (β= 0.171, $p< 0.05$) and also information sharing and information quality were the only two variables that are found to be significantly related to resource performance in Step 2 (β= 0.436, $p< 0.01$); (β= 0.198, $p< 0.01$).

In the Step 4, information sharing and information quality were found to be not significantly related to resource performance (β= 0.085); (β= 0.029). Hence, the supply chain integration acted as a full mediator in the relationship between (1) information sharing and resource performance and (2) information quality and resource sharing.

Thus, hypotheses H6c and H6d were supported. In contrast, supply chain integration did not mediate the relationship between the other six dimensions of supply chain management practices. Thus, hypotheses H6a, H6b, H6e, H6f, H6g and H6h were not supported.

5.11.4.2 Testing mediation between independent variables and dependent variable (output performance)

H7: Supply chain integration will mediate the relationship between supply chain management practices and output performance.

Specifically:

Hypotheses 7	Statement
H7a	Supply chain integration will mediate the relationship between strategic supplier partnering and output performance.
H7b	Supply chain integration will mediate the relationship between customer relationship and output performance.
H7c	Supply chain integration will mediate the relationship between information sharing and output performance.
H7d	Supply chain integration will mediate the relationship between information quality and output performance.
H7e	Supply chain integration will mediate the relationship between internal lean practices and output performance.
H7f	Supply chain integration will mediate the relationship between postponement and output performance.
H7g	Supply chain integration will mediate the relationship between agreed vision and goals and output performance.
H7h	Supply chain integration will mediate the relationship between risk & reward sharing and output performance.

This study hypothesized that supply chain integration will mediate the relationship dimensions of supply chain management practices and output performance. Supply chain management practices were measured in terms of strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing. As shown in table 5.21, information sharing, information quality and agreed vision and goals were the only three variables that are found to be significantly related to supply chain integration in Step 1 (β= 0.465, $p< 0.01$); (β= 0.224, $p< 0.05$); (β= 0.171, $p< 0.05$) and also information sharing and information quality were the only two variables that are found to be significantly related to output performance in Step 2 (β= 0.570, $p< 0.01$); (β= 0.167, $p< 0.1$).

In the forth step, information sharing were found to be also significantly related to resource performance (β= 0.302 $p<0.01$). . Hence, the supply chain integration acted as a partial mediator in the relationship between information sharing and output performance. Thus, hypothesis H7c was supported. Meanwhile, information quality were found to be not significantly related to resource performance (β= 0.308). Hence, the supply chain integration acted as a full mediator in the relationship between information quality and output performance. Thus, hypothesis H7d was supported. In contrast, supply chain integration did not mediate the relationship between the other six dimensions of supply chain management practices. Thus, hypotheses H7a, H7b, H7e, H7f, H7g and H7h were not supported.

5.11.4.3 Testing mediation between independent variables and dependent variable (flexibility performance)

H8: Supply chain integration will mediate the relationship between supply chain management practices and flexibility performance.

Specifically:

Hypotheses 8	Statement
H8a	Supply chain integration will mediate the relationship between strategic supplier partnering and flexibility performance.
H8b	Supply chain integration will mediate the relationship between customer relationship and flexibility performance.
H8c	Supply chain integration will mediate the relationship between information sharing and flexibility performance.
H8d	Supply chain integration will mediate the relationship between information quality and flexibility performance.
H8e	Supply chain integration will mediate the relationship between internal lean practices and flexibility performance.
H8f	Supply chain integration will mediate the relationship between postponement and flexibility performance.
H8g	Supply chain integration will mediate the relationship between agreed vision and goals and flexibility performance.
H8h	Supply chain integration will mediate the relationship between risk & reward sharing and flexibility performance.

This study hypothesized that supply chain integration will mediate the relationship dimensions of supply chain management practices and flexibility performance. Supply chain management practices was measured in terms of strategic supplier partnering, customer relationship management, information sharing, information quality, internal lean practices, postponement, agreed vision and goals and risk and reward sharing.

As shown in table 5.22, there were only two dimensions of supply chain management practices that were significantly related to supply chain integration and flexibility performance. The first variable was information sharing. In Step 1 the beta value for information sharing was 0.465 ($p < 0.01$), while in Step 2, the beta value was 0.561 ($p < 0.01$). In Step 4 the information sharing was still a significant predictor of flexibility performance, but the beta value was reduced ($\beta = 0.385$, $p < 0.01$). Hence, supply chain integration acted as a partial mediator in the relationship between information sharing and flexibility performance. Thus, hypothesis H8c was supported.

Next, the result showed agreed vision & goals to be significantly related to supply chain integration and flexibility performance. In the Step 1 the beta value for agreed vision & goals was ($\beta = 0.171$, $p < 0.05$), while in the step 2 the beta value was ($\beta = 0.230$, $p < 0.05$). In the Step 4, agreed vision & goals was also significant predictor of flexibility performance ($\beta = 0.165$, $p < 0.05$). Hence, supply chain integration acted as a partial mediator in the relationship between agreed vision & goals and flexibility performance. Thus, hypothesis H8g was supported. In contrast, supply chain integration did not mediate the relationship between the other six dimensions of supply chain management practices. Thus, hypotheses H8a, H8b, H8d, H8e, H8f and H8h were not supported.

5.12 Summary

This chapter presents the results of the data analysis using descriptive analysis and inferential analysis (multivariate analysis). The first section describes the descriptive statistics including the demographic profile of the firm respondents. The exploratory factor analysis was also performed, and the correlation analysis was also conducted between the factors extracted.

In the multivariate analysis, before the study proceeds with the analysis using hierarchical regression technique, first the assumptions of multivariate analysis were assessed. This consisted of testing for multicollinearity, normality and linearity of the data. The assumptions were fulfilled. There were no signs that the multivariate requirements were violated. Subsequently, multivariate analysis using hierarchical regression technique was used.

The analysis basically examined the effects of the independent variables on the dependent variables. Specifically, Hypothesis 1 to Hypothesis 3 focused on the direct relationship between the variables and Hypothesis 6 to Hypothesis 8 focused on the mediating effect of supply chain integration. In addition, Hypothesis 4 was focused on the effect of independent variables on the mediating variable and Hypothesis 5 was focused on the effect of mediating variables on the dependent variables.

In testing all the proposed hypotheses, four steps were involved in the regression analysis: (1) Step 1 the mediator was regressed with independent variable, (2) Step 2 the dependent

variables was regressed with independent variables, (3) Step 3 the dependent variables was regressed with mediating variable and (4) Step 4 dependent variable was regressed with independent variables entered together with mediator. This chapter concluded with the partial mediated model and full mediation model to examine the relationship of the proposed hypotheses.