CHAPTER 5
DATA ANALYSIS AND RESULTS

5.0 Introduction

This chapter examines the results of the study. The analyses were obtained using both descriptive and inferential statistics. Prior to the descriptive statistic, factor analysis was performed by examining the pattern of correlation or covariance between the observed measures. The descriptive statistics is shown that provides a general overview of demographic profile of the respondents. The data collected were checked and analyzed by using the Statistical Package for Social Sciences Programme (SPSS) version 17. This is followed by the relevant data analysis and assessment. Structural equation modeling (SEM) was adopted for data analysis. The validation of the structural model was achieved using SmartPLS 2.0.M3. The research model is analyzed and interpreted into two stages sequentially. First is the assessment and refinement of adequacy of the measurement model and followed by the assessment and evaluation of the structural model.

5.1 Factor Analysis

In order to explore the construct dimensions, Exploratory Factor Analysis (EFA) was first conducted to check if the proposed factor structures are indeed consistent with the actual data. EFV was run using the Principal Components extraction method with Varimax rotation.

The results from the Exploratory Factor Analysis confirmed the need to remove four factors from IS Sophistication construct, and one factor from the Interdependence construct. The remaining forty-three factors loaded as predicted onto their dimensions.

The items that are used to measure the dependent and independent variables were entered into a single exploratory factor analysis. In order to determine the degree of relationship between the variables, the factor loading for each dimension is examined. The results of the exploratory factor analysis is shown in Table 5.4

5.1.1 Factor Analysis - Individual Dimensions

To determine how many components (factors) to 'extract' we need to consider a few pieces of information provided in the output. Using Kaiser's criterion, we are interested only in components that have an eigenvalue of 1 or more.

As for IS Sophistication dimension, after factor the component matrix shows the loadings of each of the items on the four components. After removing the four items (ISS1, ISS2, ISS88 , ISS11) that has cross loading and the factor values < 0.5, the final rotated component matrix returns as shown in Table 5.2. According to their loadings three components were kept and the result of rotated factor analysis. These three components explain a total of 62.99 percent of the variance. (Refer to Appendix 2 – SPSS Report - Factor Analysis)

Table 5.1. Final Factor Analysis –Three Components has been identified

Rotated Component Matrix[a]

	Component		
	1	2	3
ISS15	.830		
ISS18	.774		
ISS17	.748		
ISS16	.738		
ISS19	.727		
ISS14	.720		
ISS13	.679		
ISS12	.667		
ISS6		.836	
ISS7		.832	
ISS10		.623	
ISS9		.570	
ISS3			.837
ISS4			.756
ISS5			.717

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

We apply the same factor analysis technique on the individual dimensions. Interdependence falls under single component with 62.99 percent of the variance explained. One item (IND24) has been removed from the interdependence construct with the factor loading lower than 0.5. All the remaining items carried forward to the analysis are having good factor loading analysis value of greater than 0.5. The factor structures suggested by the EFA match the one proposed in the research model. The various loading are shown in Table 5.3.

Table 5.2. Results of the Factor Analysis

Component	Items	Factor Loadings	Percentage of Variance Explained
IS Sophistication	ISS3-Shipping/Distribution	0.837	62.99
	ISS4-HR System	0.756	
	ISS5-Marketing and Sales	0.717	
	ISS6-Account Payable	0.836	
	ISS7-Account Receivable	0.832	
	ISS9-Enterprise data are maintained within database management system	0.570	
	ISS10-Computers are all networked	0.623	
	ISS12-Business transaction conducted with supplier/customers using EDI	0.667	
	ISS13-Data can be shared easily among various internal systems	0.679	
	ISS14-Order changes are automatically reflected in downstream processes or systems	0.720	
	ISS15-The company system can easily transmit, integrate and process data between suppliers and customers	0.830	
	ISS16-The company systems allows continuous monitoring of order status and various stages of the process	0.738	
	ISS17-Employees can easily retrieve information from various databases for decision support	0.748	
	ISS18-All product-related information is available online	0.774	
	ISS19-Customers can customize their orders online without phone/fax or face-to-face interactions	0.727	

Table 5.2. Results of the Factor Analysis (continued)

Component	Items	Factor Loadings	Percentage of Variance Explained
Interdependence	IND20-To be successful, this plan/department must be in constant contact with the other plant/department	0.802	65.41
	IND21-If this plant/department's communication links to these to the other plant/department were disrupted, things would quickly get very difficult	0.815	
	IND22-Close coordination with the other plant/department is essential for this plant/department to successfully do its job	0.851	
	IND23-Information provided by the other plants/departments is critical to the performance of this plant/department	0.821	
	IND25-The actions or decisions of the other plants/departments have important implications for the operations of this plant/department.	0.751	
Differentiation	DIF26-The number of different model numbers, configurations or formulations produced	0.782	70.91
	DIF27-The number of different active part numbers or material code numbers, excluding finished goods part numbers or finished goods code numbers	0.825	
	DIF28-Number of levels in the typical bill of materials	0.848	
	DIF29-The average number of design changes per month	0.882	
	DIF30-The number of new design introductions per month	0.835	
	DIF31-The average amount of time that passes between the time an order is put into production and the time it is completed	0.876	
	DIF32-The need to identify or segregate material by individual piece or lot rather than merely by part number	0.838	
	DIF33-Amount of production activity dedicated to processing (blending, purifying, converting, etc.) as opposed to assembly or fabrication.	0.848	
Customization	CUS34-The ERP system was altered to improve its fit with this plant	0.726	59.72
	CUS35-A standard version of the ERP software was implemented without changes being made	0.727	
	CUS36-This plant/department works independently of these other plants/departments	0.817	
	CUS37-When the ERP system was being implemented in this plant/department, the package was changed to better meet the needs of this plant/department	0.816	

Table 5.2. Results of the Factor Analysis (continued)

Component	Items	Factor Loadings	Percentage of Variance Explained
Task Efficiency	TEF38-Since ERP is implemented, plant/departmental employees such as buyers, planners and production supervisors need less time to do their jobs	0.854	80.70
	TEF39-ERP saves time in jobs like production, material planning and production management	0.921	
	TEF40-Now that we have ERP, it is less time-consuming to do work like purchasing, planning and production management set-up.	0.927	
	TEF41-ERP helps plant employees like buyers, planners, and production supervisors to be more productive	0.890	
Coordination Improvements	COR42-ERP helps the plant/department adjust to changing conditions with other plants/departments	0.877	80.71
	COR43-ERP has improved the plant/department's coordination with other plants/departments	0.928	
	COR44-ERP makes the plant/department aware of important information from these other plants/departments	0.884	
	COR45-ERP helps the plant/department synchronize with other plants/departments	0.904	
Overall ERP Benefits	OVB46-In terms of its business impacts on the plant/department, the ERP system has been a success	0.907	85.12
	OVB47-ERP has seriously improved the plant/department's overall business performance	0.926	
	OVB48-ERP has had a significant positive effect on the plant/department	0.934	

Table 5.3. Exploratory Factor Analysis Loading

	Coordination Improvements	Customization	Differentiation	ERP Time Elapsed	IS Sophistication	Interdependence	Overall ERP Benefits	Task Efficiency
COR42	0.868							
COR43	0.926							
COR44	0.890							
COR45	0.909							
CUS34		0.843						
CUS35		0.822						
CUS36		0.817						
CUS37		0.864						
DIF26			0.923					
DIF27			0.951					
DIF28			0.853					
DIF29			0.682					
DIF30			0.615					
DIF31			0.739					
DIF32			0.763					
DIF33			0.689					
IND20						0.777		
IND21						0.806		
IND22						0.833		
IND23						0.828		
IND25						0.791		
ISS10					0.561			

Table 5.3. Exploratory Factor Analysis Loading (continued)

ISS12					0.706			
ISS13					0.683			
ISS14					0.719			
ISS15					0.719			
ISS16					0.701			
ISS17					0.686			
ISS18					0.700			
ISS19					0.688			
ISS3					0.513			
ISS4					0.512			
ISS5					0.619			
ISS6					0.606			
ISS7					0.632			
ISS9					0.601			
LessThan1Year				0.998				
MoreThan1Years				0.999				
MoreThan5Years				0.967				
OVB46							0.908	
OVB47							0.927	
OVB48							0.932	
TEF38								0.860
TEF39								0.922
TEF40								0.924
TEF41								0.885

After the factor analysis, the properties of the measurement model are summarized in Table 5.5.

Table 5.4. Summary of Constructs

Construct Name	Construct Identifier	Initial Number of Items	Number of Items carried Forward to the Analysis	Cronbanch Alpha
IS Sophistication	ISS	19	15	0.895
Interdependence	IND	6	5	0.867
Differentiation	DIF	8	8	0.941
Customization	CUS	4	**4**	0.861
ERP Time Elapsed	ETE	3	3	0.989
Task Efficiency	TEF	4	4	0.920
Coordination Improvements	COO	**4**	4	0.920
Overall ERP Benefits	OVR	3	3	0.913

5.2 Descriptive Analysis

In descriptive statistics, we explored the data to understand the nature and characteristics of the data. It helps the researchers in selecting and using the appropriate analyses or procedures in hypothesis testing. On the other hand, the inferential statistics was used to infer relevant information with regard to the results. Statistical analysis of data from the survey is accomplished by using Statistical Package for Social Sciences Programme (SPSS) version 17. There are three levels of data analysis will be carried out in order to fulfill the objectives of this study. Firstly, the study looks at the frequency testing. The number of valid responses was verified and all data concerning the respondents' profile were discussed. Next, the study looks at the reliability of the scale. This is an important analysis as it is essentially the “gate-keeper” to ensure that the scale used for this research is both reliable and able to explain the phenomena. The study employs Cronbach’s Alpha Coefficient to track the internal consistency of the scale. Pallant (2001) says a coefficient of scale above 0.7 is a construct with valid measurement. This is followed by the factor analysis used to pinpoint which of the independent variables items have the strongest influence over the overall ERP benefits in eye of local manufacturing plant workers and hence affect the ERP intermediates benefits on coordination improvements and task efficiency. It was done by summarizing the underlying patterns of correlation where the items were grouped together based on its relation with each other. This test is often used in exploratory research. According to Tabachink and Fidell (1996), the minimum value for a good factor loading analysis is 0.5.

Table 5.1 shows the descriptive statistic of the study variables analyzed in this study. The descriptive statistic in Table 5.1 shows that of the two factors of IS Sophistication and Coordination Improvements receives the highest score with the mean of 5.70 and 5.66. The mean score of customization is fairly high at 5.17. As of the two ERP intermediate benefits components, Coordination Improvements is perceived to be higher (with a mean score of 5.66) than Task Efficiency (with a mean score of 5.59).

(Refer to Appendix 3 – SPSS Report – Descriptive Statistics)

Table 5.5. Descriptive Statistics of Variables

Component	Items	N	Min	Max	Mean	Std. Dev
Subconstructs						
IS Sophistication	ISS1-Inventory Department	131	3	7	5.70	0.951
	ISS2-Procurement	131	3	7		0.905
	ISS3-Shipping/Distribution	131	3	7		0.937
	ISS4-HR System	131	3	7		0.923
	ISS5-Marketing and Sales	131	3	7		0.956
	ISS6-Account Payable	131	4	7		0.845
	ISS7-Account Receivable	131	4	7		0.845
	ISS8-Firm's Supply Chain Management	131	3	7		0.931
	ISS9-Enterprise data are maintained within database management system	131	2	7		1.057
	ISS10-Computers are all networked	131	2	7		0.986
	ISS11-Documents are maintained using imaging technologies	131	3	7		1.087
	ISS12-Business transaction conducted with supplier/customers using EDI	131	3	7		0.979
	ISS13-Data can be shared easily among various internal systems	131	3	7		0.974

Table 5.5. Descriptive Statistics of Variables (continued)

Component	Items	N	Min	Max	Mean	Std. Dev
Subconstructs						
IS Sophistication	ISS14-Order changes are automatically reflected in downstream processes or systems	131	3	7		1.016
	ISS15-The company system can easily transmit, integrate and process data between suppliers and customers	131	3	7		1.024
	ISS16-The company systems allows continuous monitoring of order status and various stages of the process	131	3	7		1.058
	ISS17-Employees can easily retrieve information from various databases for decision support	131	3	7		1.049
	ISS18-All product-related information is available online	131	3	7		1.092
	ISS19-Customers can customize their orders online without phone/fax or face-to-face interactions	131	3	7		1.052
Inter-dependence	IND20-To be successful, this plan/department must be in constant contact with the other plant/department	131	3	7	5.56	0.958
	IND21-If this plant/department's communication links to these to the other plant/department were disrupted, things would quickly get very difficult	131	3	7		0.993
	IND22-Close coordination with the other plant/department is essential for this plant/department to successfully do its job	131	3	7		0.976
	IND23-Information provided by the other plants/departments is critical to the performance of this plant/department	131	3	7		0.981
	IND24-This plant/department works independently of the other plants/departments	131	2	7		1.263
	IND25-The actions or decisions of the other plants/departments have important implications for the operations of this plant/department.	131	3	7		1.010

Table 5.5. Descriptive Statistics of Variables (continued)

Component	Items	N	Min	Max	Mean	Std. Dev
Subconstructs						
Differentiation	DIF26-The number of different model numbers, configurations or formulations produced	131	2	7	4.44	1.340
	DIF27-The number of different active part numbers or material code numbers, excluding finished goods part numbers or finished goods code numbers	131	2	7		1.301
	DIF28-Number of levels in the typical bill of materials	131	2	7		1.371
	DIF29-The average number of design changes per month	131	2	7		1.317
	DIF30-The number of new design introductions per month	131	2	7		1.258
	DIF31-The average amount of time that passes between the time an order is put into production and the time it is completed	131	2	7		1.255
	DIF32-The need to identify or segregate material by individual piece or lot rather than merely by part number	131	2	7		1.378
	DIF33-Amount of production activity dedicated to processing (blending, purifying, converting, etc.) as opposed to assembly or fabrication.	131	2	7		1.473
Control Variables						
Customization	CUS34-The ERP system was altered to improve its fit with this plant	131	3	7	5.17	1.058
	CUS35-A standard version of the ERP software was implemented without changes being made	131	2	7		1.326
	CUS36-This plant/department works independently of these other plants/departments	131	1	7		1.320
	CUS37-When the ERP system was being implemented in this plant/department, the package was changed to better meet the needs of this plant/department	131	3	7		0.970

Table 5.5. Descriptive Statistics of Variables (continued)

Component	Items	N	Min	Max	Mean	Std. Dev
Endogenous Construct						
Task Efficiency	TEF38-Since ERP is implemented, plant/departmental employees such as buyers, planners and production supervisors need less time to do their jobs	131	3	7	5.59	0.972
	TEF39-ERP saves time in jobs like production, material planning and production management	131	3	7		0.936
	TEF40-Now that we have ERP, it is less time-consuming to do work like purchasing, planning and production management set-up.	131	3	7		0.991
	TEF41-ERP helps plant employees like buyers, planners, and production supervisors to be more productive	131	3	7		1.001
Coordination Improvements	COR42-ERP helps the plant/department adjust to changing conditions with other plants/departments	131	3	7	5.66	0.994
	COR43-ERP has improved the plant/department's coordination with other plants/departments	131	3	7		0.951
	COR44-ERP makes the plant/department aware of important information from these other plants/departments	131	3	7		0.888
	COR45-ERP helps the plant/department synchronize with other plants/departments	131	3	7		0.924
Overall ERP Benefits	OVB46-In terms of its business impacts on the plant/department, the ERP system has been a success	131	3	7	5.63	0.953
	OVB47-ERP has seriously improved the plant/department's overall business performance	131	2	7		1.104
	OVB48-ERP has had a significant positive effect on the plant/department	131	3	7		1.029

5.3 Data Analysis Structural Equation Modeling (SEM)

This study adopts Structural Equation Modelling (SEM) for data analysis. SEM has the ability to statistical test the prior theoretical assumptions against empirical data. SEM assesses the properties of the scales employed to measure the theoretical constructs and estimates the hypothesized relationships among said constructs (Barclay et al., 1995; Chin et al., 2003; Westland, 2007). Thus, SME is able to answer a set of interrelated research questions simultaneously through both measurement and structural model.

SEM has became an important and favourable technique in IS researches and has been used to address the key IS research problem especially in the understanding determinants of IS acceptance (Chin, et al., 2003, Yi and Davis, 2003; Lgbaria et al., 1995); IS Usage (Bhattacherjee and Premkumar, 2004; Agarwal and Prasad, 2000; At-Gahtani and King, 1999) and IS Adoption (Wixom and Watson, 2001; Venkatesh and Davis, 2000; Karahanna et al., 1999)

While other SEM tools exist, the choice to use PLS was driven by several factors. PLS was developed to handle both formative and reflective indicators whereas other SEM techniques do not permit this. The existence of this ability enables the designation of the type of relationship that the researcher believes to exist between the manifest variables and the latent constructs. Second, Wold (1981) specifically advises that PLS is not suitable for confirmatory testing, rather should be used for prediction and the exploration of plausible causality. Other techniques are primarily concerned with parameter accuracy. Thirdly, PLS does not make the assumption of multivariate normality that the SEM techniques LISEREL and AMOS do, and being a nonparametric procedure, the problem of multicollinearity is not an issue (Bido 2006). Finally, PLS's requirement on sample size is lower than the other SEM techniques (Chin 1998; Chin and Newsted 1999; Westland 2007). Sample size requirements are equal to the larger of; 10 times the number of indicators on the most complex formative construct or 10 times the largest number of independent constructs leading to an endogenous construct (Chin et al. 2003; Bido 2006; Westland 2007).

5.4 Partial Least Squares Analysis (PLS)

A PLS model is usually analyzed and interpreted into two stages sequentially. First is the assessment and refinement of adequacy of the measurement model and followed by the assessment and evaluation of the structural model. This is to ensure the reliability and validity of the measures prior to the attempt in making and drawing the conclusion on the structural model.

5.5 Assessment of Measurement Models

The assessment of measurement is essential and absolutely necessary as it provides thorough testing for the reliability and validity of the scales employed to measure the latent constructs and their manifest variables (Loehlin, 1998). Several steps were used in the assessment of the measurement model. First, an initial principal component (exploratory factor analysis) analysis is performed.

Subsequently, followed by assessment of convergent and discriminant validity, and evaluation of the measure's reliability.

5.5.1 Instrument Validity and Reliability

In order to test the validity and reliability of the constructs Rossiter (2002) procedure for scale development was followed. First, convergent and discriminate validity were determined and finally, reliability of the scale items was evaluated.

5.5.1.1 Convergent Validity

Convergent validity specifies that items that are indicators of a construct should share a high proportion of variance (Hair el al., 2006). The convergent validity of the scale items was assessed using three criteria. First, the factor loadings should be greater than 0.50 as proposed by Hair et al. (2007). Secondly, the composite reliability for each construct should exceed 0.70. Lastly, the Average variance extracted (AVE) for each construct should be above the recommended cut-off 0.50 (Fornell and Larker, 1981).

Within this study, the factor loadings revealed support for convergent validity for the six constructs. All loadings were greater than 0.50, with most loadings exceeding 0.60. The factor loadings ranged from 0.56 to 0.96. Items with loadings less than 0.70 can still be considered significant, but more of the variance in the measure is attributed to error (Hair et al., 2006). The high factor loadings give reason to conclude that the measures have convergent validity. All constructs factor loading exceeded the 0.50 cut-off, with the exception of IS Sophistication (AVE=0.412). However, the IS Sophistication dimensions were found to have adequate convergent validity based on their high composite reliability (>0.70) (Gerbing and Andersen, 1988; Das et al,. 2000). (Refer to Table 5.7

5.5.1.2 Discriminative Validity

The next step in the construct validation process is the assessment of discriminant validity. Discriminant validity reflects the extent to which the measure is unique and not simply a reflection of other variables (Peter and Churchill 1986). Each dimension of a construct should be unique and different from the other even though each reflects a portion of that construct. There are several ways to evaluate discriminant validity. Average Variance Extracted (AVE) is a common method of testing discriminant validity (Gerbing and Anderson, 1988). Discriminate validity was evaluated by examining the cross loadings of each item in the constructs and the square roof of AVE calculated for each construct. All the items should have higher loading on their corresponding construct than the cross loadings on the other constructs in the model. The square root of AVE for all factors should be greater than all the correlations between that construct and other constructs.

Table 5.6. Correlations and measures of validity among variables

Variables	AVE	Coordination Improvements	Customization	Differentiation	ERP Time Elapsed	IS Sophistication	Inter-dependence	Overall Benefits	Task Efficiency
Coordination Improvements	0.807	**0.898**							
Customization	0.700	0.498	**0.837**						
Differentiation	0.616	0.132	0.248	**0.785**					
ERPTimeElapsed	0.976	0.037	-0.023	0.041	**0.988**				
ISSophistication	0.412	0.470	0.405	0.306	-0.003	**0.642**			
Interdependence	0.651	0.456	0.602	0.366	0.030	0.589	**0.807**		
OverallERPBenefits	0.851	0.654	0.516	0.142	0.041	0.455	0.397	**0.923**	
TaskEfficiency	0.807	0.695	0.590	0.226	0.031	0.477	0.516	0.620	**0.898**

Table 5.6 shows the AVE and cross factor loading extracted for all latent variables. All the items is having higher loading on their corresponding construct than the cross loadings on the other constructs in the model. The AVE for each latent factor exceeded the respective squared correlation between factors, thus providing evidence of discriminant validity (Fornell and Larcker, 1981).

5.5.1.3 Reliability of Measures

The final step in investigating construct validity is to determine the reliability of the construct items. Reliability is the degree to which a set of indicators are internally consistent, the extent to which the instrument yields the same results on repeated trials. Reliability is necessary but not sufficient for validity of a measure, even measures with high reliability may not be valid in measuring the construct of importance (Hair et al., 2006). Reliable indicators should measure the same construct. A measure of internal consistency or composite reliability is a composite alpha value. This value was used to assess the reliability of the ten constructs. Construct reliability coefficients should all exceed the 0.70 lower limits (Hair et al., 1998; Rossiter, 2002). However, Nunnally (1967) and Srinivasan (1985) suggest that values as low as 0.50 are acceptable for initial construct development. Additionally, Van de Venn and Ferry (1980) state that acceptable values may be as low as 0.40 for broadly defined constructs. The composite reliability and Chronbach's alpha values for the studied constructs were computed by SmartPLS and ranged from 0.903 to 0.992 and 0.861 to 0.941, respectively (see Table 5.7).

Table 5.7. Summary of PLS Quality (AVE, R Square, Composite Reliability and Cronbach's Alpha)

Variables	Number of Items	AVE	R Square	Composite Reliability	Cronbach's Alpha
ISSophistication	15	0.412		0.912	0.895
Interdependence	5	0.651		0.903	0.867
Differentiation	8	0.616		0.926	0.941
Customization	**4**	0.700		0.903	0.861
ERPTimeElapsed	3	0.976		0.992	0.989
TaskEfficiency	4	0.807	0.425	0.944	0.920
CoordinationImprovements	4	0.807	0.345	0.944	0.920
OverallERPBenefits	3	0.851	0.481	0.945	0.913

From the table presented above, it is clearly stated that all the variables used in this research were reliable since it obtained the Composite Reliability and Cronbach's Alpha values more than 0.7. All values fall within the acceptable range to conclude good reliability.

5.6 Assessment of the Structural Model

As noted by Hair et al. (1998), a structural model is used to capture the linear regression effects of the endogenous construct upon one another. The structural model has the ability to specify the pattern of the relationships among the constructs (Leohlin, 1998). Thus, this model is an evolving area and one of great interest to researches because of its ability to perform direct testing of the theory of interest (Cheng, 2001).

The model was assessed using three criteria: 1) path coefficients (β); 2) path significant (p-value); and 3) variance explain (R^2). The validation of the structural model was achieved using SmartPLS 2.0.M3. The model was designed in PLS as per the guidelines given in the SmartPLS Guide (Ringle et al., 2005). Following Chin (1998), bootstrap re-sampling method was employed to test the statistical significant of each path coefficient. Five hundred (500) iterations using randomly selected sub-samples were performed to estimate the theoretical model and hypothesized relationships.

The criterion put forth by Rossiter (2002) states that for the structural model all paths should result in a t-statistic value greater than 2 and latent variable R-Squares (R^2) greater than 50%.

5.6.1 Overall Model

In order to test the hypothesized relationships between variables, structural equation modelling was employed using *SmartPLS 2.0.M3*. The Figure 5.1. summarise the results of the PLS analysis including path coefficients (β), path significant (p-value), and variance explain (R^2 values) of the structural model. All statistical tests were assessed at 5 percent level of significance using two-tailed t-tests.

The results for the full model indicate that the 42.5 percent of the variance in Task Efficiency and 34.5 percent of variance in Coordination Improvements were explained by the model. Taken together the Task Efficiency and Coordination Improvements intermediate benefits combined explained 48.1 percent of the variance in the Overall ERP Benefits. With six out of twelve hypotheses supported, the empirical results of the structural model with all hypothesized paths revealed a model with adequate fit. SmartPLS calculated the R-Square and t-Statistic for the full structural model and all path t-Statistic met the required cut off.

As the predicted paths for the structural model are all hypothesized unidirectional relationships, not all t-Statistic values well surpass the t-critical value of 1.645. Thus, there is a need to evaluate the actual impact of the theoretical variables. Following Fichman and Kemerer (1997), in addition to the full model, two nested models (theoretical model and control model) were evaluated. These three models were assessed to evaluate the true impact and the additional explanatory power of the theoretical variables after the variance explained by the control variables had been accounted for. As for full model, both the theoretical variables and control variables were included. The theoretical model included only theoretical variables and excluded the control variables. While for control model only the control variables were included. The results were summarized in Figure 5.2 and Figure 5.3. Comparisons between the three models are summarized in Table 5.8 and Table 5.9. A comparison between the full model and control model shows that the control model explains a substantive incremental variance of 10.7 percent in Task Efficiency and 6.6 percent in Coordination Improvements. In contrast, by comparing the full model and the theoretical model, the incremental variance derived by the model is around 7.4 percent for Task Efficiency and 9.5 percent for Coordination Improvements. Results indicate that the both Theoretical and Control Variables accounted for a substantial proportion of the variance in the R^2 value of Overall ERP benefits. The control variable (Customization) is having a significant positive impact on the ERP intermediate benefits. This indicate that the Customization control variable play an important role in ERP implementation. These results suggested that the theoretical in this study is substantive enough to explain the variance in the research model. The path coefficients for majority of the variables were statistically significant.

Table 5.8. Comparison of the Structural Models - Summary

Results	Full Model	Control Variables-Only Model	Theoretical Variables-Only Model
Number of paths in the model	13	7	9
Number of significant paths in the model	6	4	6
Variance Explained in Task Efficiency (R^2)	42.5	35.1	31.8
Variance Explained in Coordination Improvements	34.5	25.0	27.9
Variance Explained in Overall ERP Benefits	48.1	48.1	48.1
Task Efficiency			
- Additional Variance Explained by the Theoretical Variables	7.4 percent (42.5 - 25.1)		
- Additional Variance Explained by the Control Variables	10.7 percent (42.5 - 35.1)		
Coordination Improvements			
- Additional Variance Explained by the Theoretical Variables	9.5 percent (34.5 - 25.0)		
- Additional Variance Explained by the Control Variables	6.6 percent (34.5 - 27.9)		

Table 5.9. Comparison of the Structural Models - Results of the PLS Analysis: Path Coefficients

Constructs	Path Coefficients		
	Full Model	Control Variables-Only Model	Theoretical Variables-Only Model
IS Sophistication -> Task Efficiency	0.232 *		0.277 **
IS Sophistication -> Coordination Improvements	0.295 **		0.330 **
Interdependence -> Task Efficiency	0.123		0.348 **
Interdependence -> Coordination Improvements	0.11		0.289 **
Differentiation -> Task Efficiency	0.004		0.004
Differentiation -> Coordination Improvements	-0.083		-0.083
Customization -> Task Efficiency	0.422 ***	0.592 ***	
Customization -> Coordination Improvements	0.333 ***	0.499 ***	
ERP Time Elapsed -> Task Efficiency	0.037	0.044	
ERP Time Elapsed -> Coordination Improvements	0.046	0.049	
Task Efficiency -> Overall ERP Benefits	0.321 ***	0.391 ***	0.320 ***
Coordination Improvements -> Overall ERP Benefits	0.431 ***	0.433 ***	0.432 ***
Variance Explained in Task Efficiency (R^2)	42.5	35.1	31.8
Variance Explained in Coordination Improvements	34.5	25.0	27.9
Variance Explained in Overall ERP Benefits	48.1	48.1	48.1

Path significance :

*** $p < 0.001$
** $p < 0.01$
* $p < 0.05$

Figure 5.1. Structural Model Results – Full Model

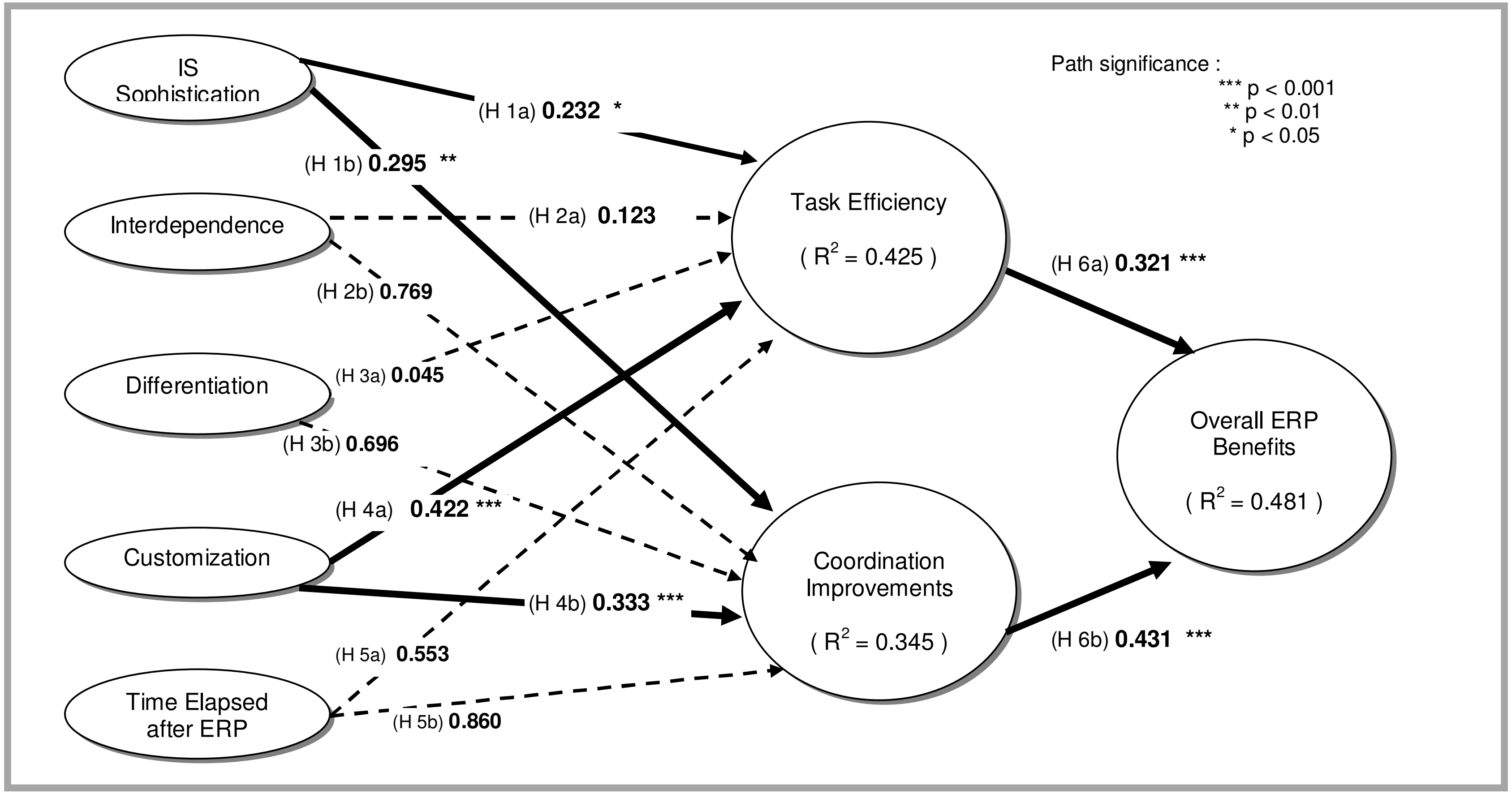


Figure 5.2. Structural Model Results – Theoretical Model Only

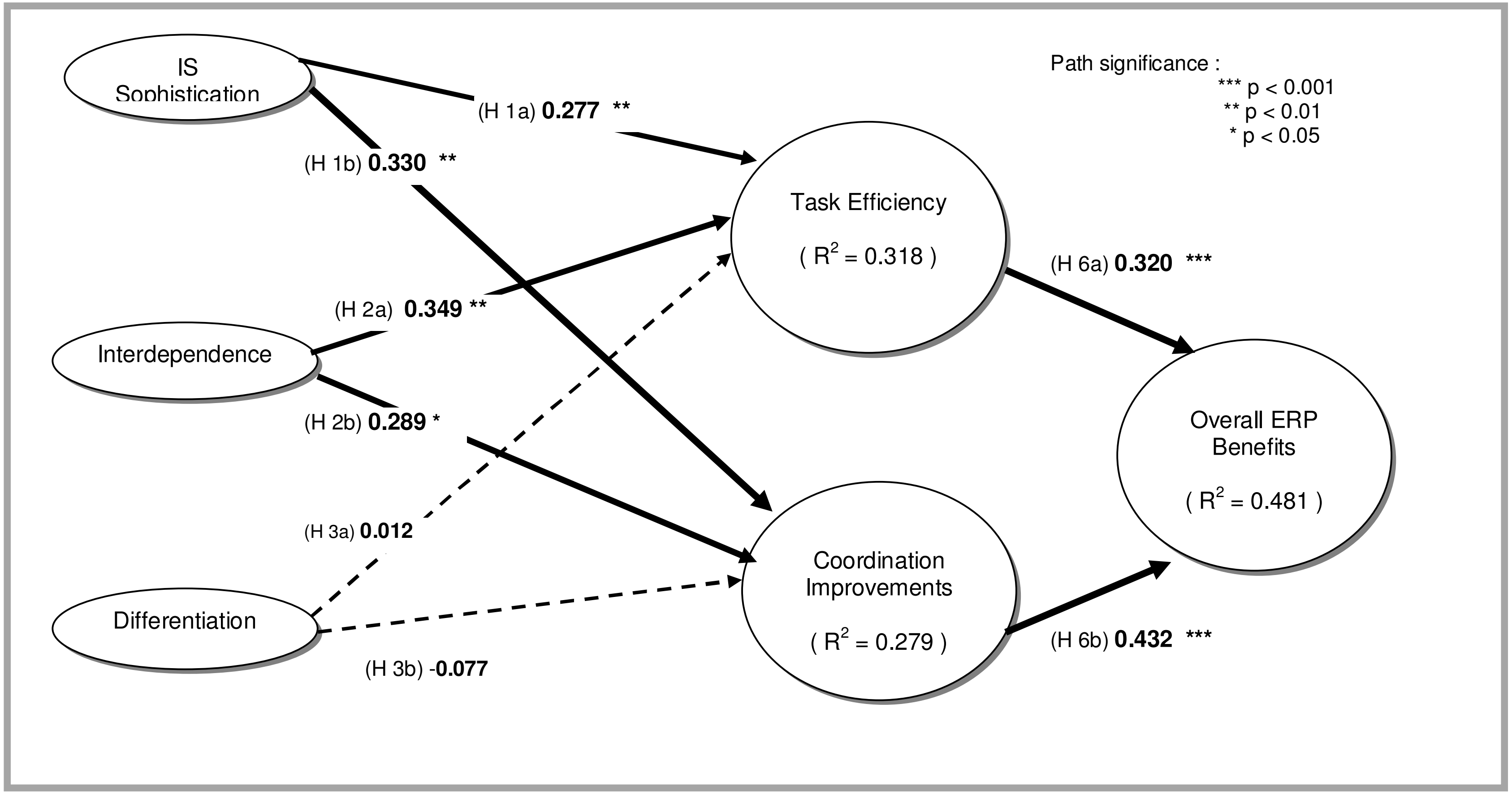
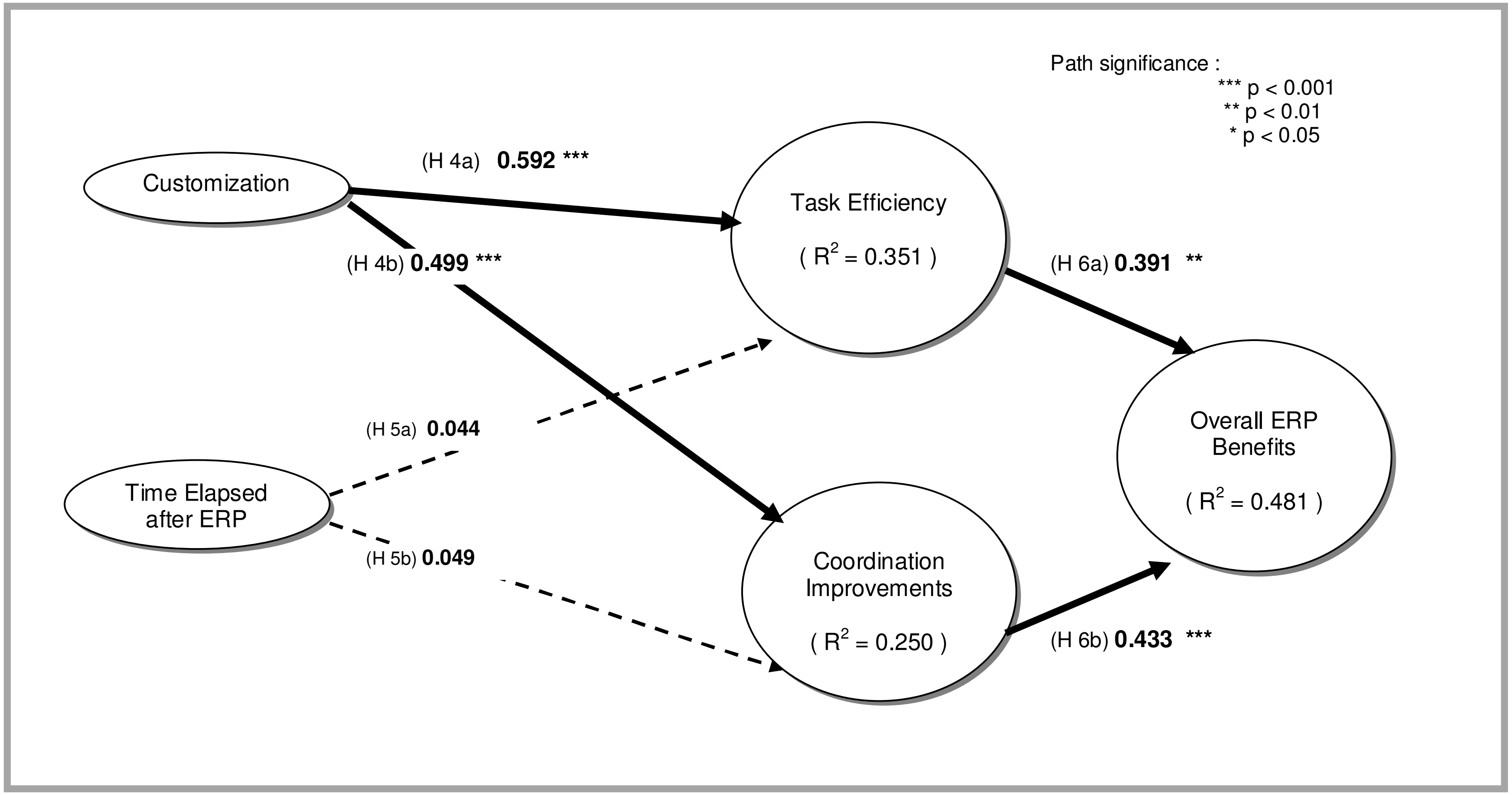


Figure 5.3. Structural Model Results – Control Model Only



5.6.2 Individual Hypotheses Testing

This section presents the results of the specific hypotheses predicted in this study. The evaluation criteria for confirming each hypothesis was the use of t-values for each path loading. Significant t-values for path loadings signify support for the proposed Path Mean Std Deviation T-Statistic hypothesis. The cut-off criteria used was a t-value greater or equal to 1.645 for an alpha level of 0.05 (Hair et al. 2006). Refer to Table 5.10 on the summary of the structural model.

Hypothesis H1a states that there is a positive relationship between IS Sophistication and Task Efficiency. Figure 4.3 shows that the hypothesised path for H1a was positive and significant ($\beta = 0.232$, $p < 0.05$). Thus hypothesis H1a was supported.

Hypothesis H1b explores IS sophistication's relationship to Coordination Improvements. The hypothesised path for H1a was positive and significant ($\beta = 0.295$, $p < 0.01$). Thus hypothesis H1a was supported.

Hypothesis H2a suggests that Interdependence has a positive relationship on Task Efficiency. The hypothesised path for H2a was not significant ($\beta = 0.123$, $p > 0.10$). Thus hypothesis H2a is not supported.

Hypothesis H2b suggests that Interdependence has a positive relationship on Coordination Improvements. The hypothesised path for H2b was not significant ($\beta = 0.110$, $p > 0.10$). Thus hypothesis H2b is not supported.

Hypothesis H3a suggests that Differentiation has a negative relationship on Task Efficiency. The hypothesised path for H3a was not significant ($\beta = 0.004$, $p > 0.20$). Thus hypothesis H3a is not supported

Hypothesis H3b suggests that Differentiation has a negative relationship on Coordination Improvements. The hypothesised path for H3b was not significant ($\beta = -0.083$, $p > 0.20$). Thus hypothesis H3b is not supported

Hypothesis H4a suggests that there is a positive relationship between Customization and Task Efficiency. The hypothesised path for H4a was positive and significant ($\beta = 0.422$, $p < 0.001$). Thus hypothesis H4a is supported.

Hypothesis H4b suggests that there is a positive relationship between Customization and Coordination Improvements. The hypothesised path for H4b was positive and significant ($\beta = 0.333$, $p < 0.001$). Thus hypothesis H4b is supported

Hypothesis H5a explores the relationship between ERP Time Elapsed and Task Efficiency. The hypothesised path for H5a was not significant ($\beta = 0.037$, $p > 0.20$). Thus hypothesis H5b is not supported.

Hypothesis H5b explores the relationship between ERP Time Elapsed and Coordination 9Improvements. The hypothesised path for H5b was not significant ($\beta = 0.046$, $p > 0.20$). Thus hypothesis H5b is not supported.

Hypothesis H6a investigates the relationship between Task Efficiency and Overall ERP Benefits. . The hypothesised path for H6a was positive and significant ($\beta = 0.320$, $p < 0.001$). Thus hypothesis H6a was supported.

The final Hypothesis H6b explores the relationship between Coordination Improvements and Overall ERP Benefits. The hypothesised path for H6b was positive and significant ($\beta = 0.432$, $p < 0.001$). Thus hypothesis H6b was supported.

Table 5.10. Summary of the Structural Model

	Hypotheses	Path Coefficient -t-statistic	Beta	Significant	Supported?
H1a	IS Sophistication -> Task Efficiency	2.554	0.232	$p < 0.05$	Supported • Positive Relationship
H1b	IS Sophistication -> Coordination Improvements	3.124	0.295	$p < 0.01$	Supported • Positive Relationship
H2a	Interdependence -> Task Efficiency	0.968	0.123	$p > 0.20$	Not Supported
H2b	Interdependence -> Coordination Improvements	0.845	0.110	$p > 0.20$	Not Supported
H3a	Differentiation -> Task Efficiency	0.046	0.004	$p > 0.20$	Not Supported
H3b	Differentiation -> Coordination Improvements	0.676	-0.083	$p > 0.20$	Not Supported
H4a	Customization -> Task Efficiency	4.682	0.422	$p < 0.001$	Supported • Positive Relationship
H4b	Customization -> Coordination Improvements	4.044	0.333	$p < 0.001$	Supported • Positive Relationship
H5a	ERP Time Elapsed -> Task Efficiency	0.553	0.037	$p > 0.20$	Not Supported
H5b	ERP Time Elapsed -> Coordination Improvements	0.869	0.046	$p > 0.20$	Not Supported
H6b	Task Efficiency -> Overall ERP Benefits	3.528	0.320	$p < 0.001$	Supported • Positive Relationship
H6a	Coordination Improvements -> Overall ERP Benefits	3.898	0.432	$p < 0.001$	Supported • Positive Relationship

5.7 Summary

This chapter explored the level of IS Sophistication, Interdependence, differentiation in the manufacturing environment and investigated its relationship to the ERP Intermediate benefits and the ERP Overall benefits. One the other hand, by drilling down to such level of analysis, the model may provides us an understanding of the intricacy of how ERP benefits certain firm more than the other as it affects different function differently.

The next chapter provides a discussion of the results found in the empirical study along with implications, limitations and future research.