CHAPTER FIVE

RESULTS AND DISCUSSION

5.0 Introduction

This chapter contains a detailed discussion on the results from the analysis of the questionnaire survey as well as from the semi-structured interviews. It starts with the results of the questionnaire survey in Section 5.1, which serve as the main data collection method in this study. It includes data cleaning and screening in Section 5.1.1, followed by an analysis on the response rate and test of non-response bias in Section 5.1.2. Then, the sample profile for both the respondents and firms are reviewed in Section 5.1.3. Section 5.1.4 contains a thorough discussion on the evaluation of the PLS path model, which includes an evaluation of the outer model as well as the inner model. This section also presents the results from the validity and reliability tests. Next, the tabulations for frequency distribution and descriptive statistics are presented in Section 5.1.5. This is followed by the results of hypotheses testing and their summary in Section 5.1.6 and 5.1.7, respectively. Section 5.1.8 evaluates and discusses the findings obtained from the questionnaire survey.

The results of the semi-structured interviews are then discussed in Section 5.2. The discussion of the results from the semi-structured interviews starts with the review of the sample profile in Section 5.2.1. Then, thorough discussions on the opinions gathered from the interviews are presented in Section 5.2.2.

5.1 Results of the Questionnaire Survey

The first phase of data collection method was done through a questionnaire survey. The quantitative approach of gathering information serves as the main tool of the data collection in this study. The objective of the questionnaire survey is to obtain data to test the hypotheses related to the relationships between market competition, strategy, the implementation of IMP, managerial use of MAS information and organisational performance.

5.1.1 Data Cleaning and Screening

After the respondents returned the questionnaire booklet, the answers provided in the questionnaire were checked for completeness and accuracy. If there was any missing data and if the respondent had provided their contact information, they were contacted to obtain the information needed. In the case where no contact information had been provided, then the missing data were treated as missing values.

According to Hair et al. (1998), missing data could occur in several ways. For example, errors in data entry that create invalid codes, failure to complete the entire questionnaire, morbidity of the respondents, disclosure restrictions, inapplicability of the questions, refusal to answer certain questions, insufficient knowledge about certain questions, and so on. Although the missing data could not be avoided, their occurrence could be minimised and treated.

SmartPLS provided two options to deal with missing values: mean replacement and casewise deletion. Since the sample size is small, this study opted to choose the mean replacement method to deal with missing data. Furthermore, casewise deletion may discard a lot of useful information, which may lead to lower efficiency (Temme, Kreis and Hildebrandt, 2006).

The data were also checked to see if any errors occurred, especially during the data entry process. This was done by conducting descriptive statistical analysis to detect the existence of any invalid codes. Descriptive statistics consisting of frequency analysis, mean, median, standard deviation, minimum and maximum values were conducted using SPSS. This test was also useful to detect any outliers in the data. All errors were corrected before proceeding to further statistical analysis.

5.1.2 Response Rate and Test of Non-Response Bias

A total of 1000 questionnaires were sent either to top management (President/Chief Executive Officer/Managing Director/General Manager) or manager in charge (Chief Financial Officer/Financial Controller/Accountant/Production Manager/Operation Manager/Plant Manager/Factory Manager) of the manufacturing firms randomly selected from the FMM Directory. Out of 1000 questionnaires, 22 were returned due to inability to reach the respondents or refusal to participate in the survey. A total of 29 questionnaires were returned before the due date (within one month), while another 47 questionnaires were received within the following few weeks. This scenario is expected due to the longer time taken when using the postal mail. After several reminders, follow-ups and resending of questionnaires, another 42 responses were received within the following three months, representing a total response rate of 11.8%. However, eight responses were omitted because there were either too many unanswered questions or they were returned blank (unanswered). The final sample consisted of 110 responses or 11% of the total sample. Table 5.1 tabulates an analysis of the response rate.

Table 5.1: Analysis of the Response Rate

	Total	**Percentage**
Total number of questionnaires mailed out	1000	100%
Less: Returned questionnaires	(22)	(2.2%)
	978	97.8%
No response	(860)	86%
Number of responses received	118	11.8%
Less: Blank/Incomplete questionnaires	(8)	(0.8%)
Total usable responses	**110**	**11%**

Consequently, a test of non-response bias was conducted on the usable responses. Respondents were categorised into two categories. Those who responded within one month (before the due date) were considered as early respondents, whereas those who responded after one month (after the due date) were considered as late respondents. Out of 110 usable responses, 29 responses were categorised as early responses and the remaining 81 responses were categorised as late responses. The test of non-response bias was conducted on these two groups to see if there was any significant difference in the mean scores between the early and late responses. This was done through independent sample t-test. As can be seen in Table 5.2, the mean scores for all main variables used in this study were not significantly different between the early and late responses at the 5% significance level. Therefore, it can be concluded that non-response bias is not a problem in this study.

Table 5.2: Results of Test of Non-Response Bias (Independent Sample t-test)

Variables	Early responses (n = 29)		Late responses (n = 81)			
	Mean	S.D.	Mean	S.D.	t	p
Market competition	3.45	0.797	3.35	0.661	0.632	.529
Business strategy:						
- Prospector	3.89	0.596	3.78	0.574	0.883	.379
- Defender	3.49	0.427	3.41	0.459	0.848	.398
- Analyser	4.09	0.476	4.01	0.540	0.745	.458
- Balancer	4.17	0.491	4.07	0.496	0.983	.328
- Reactor	3.27	0.461	3.27	0.547	0.023	.982
JIT	3.53	0.550	3.55	0.517	-0.150	.881
- JIT manufacturing systems	3.79	0.753	3.77	0.590	0.147	.883
- JIT inventory systems	3.27	0.691	3.32	0.667	-0.374	.709
TQM (Part A)	3.64	0.806	3.61	0.602	0.164	.870
TQM (Part B)	62.68	26.53	63.14	26.45	-0.081	.935
AMT	2.79	0.901	2.86	1.134	-0.275	.784
- Advanced technology	2.60	0.998	2.68	1.158	-0.322	.748
- Computer integration	3.16	1.135	3.20	1.352	-0.135	.893
MAS	3.52	0.760	3.52	0.597	0.036	.972
- Scope	3.14	0.880	3.29	0.801	-0.823	.412
- Timeliness	3.56	0.792	3.63	0.742	-0.405	.686
- Integration	3.74	0.914	3.56	0.795	0.982	.328
- Aggregation	3.67	0.976	3.59	0.671	0.411	.683
Performance	3.93	0.593	3.84	0.627	0.716	.475
- Financial	3.81	0.898	3.78	0.665	0.186	.853
- Non-financial	4.06	0.485	3.90	0.682	1.177	.242

5.1.3 Sample Profile

Based on 110 usable responses, descriptive statistical analysis was performed for the demographic information data to obtain the tabulation of the survey respondents and firms. Only the frequency option was selected in this analysis to tabulate the frequencies and percentages for each category. The demographic information data are divided into two main categories: profile of survey respondents and profile of firms.

5.1.3.1 Profile of Respondents

Table 5.3 presents the profile of the respondents. The majority (86.4%) of the respondents were male while 13.6% were female. Most of them (38.2%) were between 40 to 49 years old, followed by 31.8% respondents aged between 30 to 39 years, 18.2% aged 50 years and above, and 11.8% were between 20 to 29 years old. The majority of them (94.5%) were Malaysian, whereas 5.5% hold other nationalities such as Japanese, British, Filipino, German or Belgian. A total of 62 respondents or 56.4% were Malay, 30 respondents (27.2%) were Chinese, 11 respondents (10%) were Indian, and 7 respondents (6.4%) were categorised under other ethnic group.

Top management consisting of President, Chief Executive Officer (CEO), Managing Director (MD), and General Manager (GM) made up 13.6% of the respondents. The largest proportion of the respondents (35.5%) hold positions of either a Production Manager, Operation Manager, Plant Manager, or Factory Manager. Officers and executives, who represent middle level managers, made up 15.5% of the respondents and 13.6% were other managers. Engineers, who were categorised under others, represented 11.8% of the total respondents, while Chief Financial Officer (CFO), Financial Controller, and Accountant made up 9.1% of the respondents, one respondent preferred not to disclose their job designation. Overall, since 83.6% of the respondents were the targeted respondents who have broad knowledge of the operation of the firms, it can be concluded that the information gathered for this study came from reliable sources.

In the questionnaire form, respondents were asked to provide their length of service in their present job using a ratio scale. However, for the purpose of analysis, the length of service was divided into two categories: less than 3 years, and 3 years and above. The majority (90.9%) of the respondents had work experience in their present job of at least 3 years, only 7.3% had work experience of less than 3 years and 1.8% did not provide their work experience. This information indicates that they were experienced personnel. As such, the information provided by them can be assumed to be reliable.

In terms of level of education, almost half of the respondents (46.4%) were degree holders, 20.9% were diploma holders, and 18.2% held at least a masters degree. The rest of the respondents were SPM/STPM holders (5.5%), professional qualifications (4.5%), others (3.6%), and only 1% did not state their level of education.

Table 5.3: Profile of Survey Respondents

Demographic Information	Categories	Frequency	Percentage
Gender	Male	95	86.4
	Female	15	13.6
Age	20 to 29 years	13	11.8
	30 to 39 years	35	31.8
	40 to 49 years	42	38.2
	50 years and above	20	18.2
Nationality	Malaysian	104	94.5
	Others	6	5.5
Ethnic Group	Malay	62	56.4
	Chinese	30	27.2
	Indian	11	10.0
	Others	7	6.4
Job Title	President/CEO/MD/GM	15	13.6
	CFO/Financial Controller/Accountant	10	9.1
	Production/Operation/Plant Manager	39	35.5
	Other managers	15	13.6
	Officer/Executive	17	15.5
	Others	13	11.8
	No information provided	1	0.9
Length of service	Less than 3 years	8	7.3
	3 years and above	100	90.9
	No information provided	2	1.8
Level of Education	SPM/STPM	6	5.5
	Diploma	23	20.9
	Degree	51	46.4
	Masters and above	20	18.2
	Professional qualification	5	4.5
	Others	4	3.6
	No information provided	1	0.9

5.1.3.2 Profile of Firms

Table 5.4 tabulates the frequency distribution of the sample firms. As can be seen from Table 5.4, the sample firms represent various industries. More than a quarter (28.2%) of the sample firms were from electrical and electronic sector, followed by transport and automotive parts and components (15.5%), rubber and plastic products (10%). Other industries include food, beverages and tobacco (8.2%), iron, steel and metal products (8.2%), chemical and adhesive products (5.5%), others (4.6%), building materials, cement, concrete, ceramics and tiles (2.7%), gas and petroleum products (2.7%), machinery and equipment (2.7%), paper, printing, packaging and labelling (2.7%), pharmaceutical, medical equipment, cosmetics and toiletries (2.7%), textile, clothing, footwear and leather products (2.7%), household products and appliances (1.8%), furniture and wood related products (0.9%). Only one respondent (0.9%) did not indicate the type of industry.

Most of the sample firms (80%) had operated for more than 10 years, 13.6% had been operating between 5 to 10 years, and only 5.5% had operated less than 5 years. The distribution of firms based on ownership structure was almost equal between locally owned firms and foreign owned firms. While nearly half of the sample firms (45.5%) were locally owned, 46.3% were foreign owned firms. Only 8 firms (7.3%) were categorised as joint venture firms that share an equal proportion of ownership between local and foreign equity.

The sample firms comprised small, medium and large companies. For example, more than one-third of the firms (39.1%) had more than 500 full time employees, nearly a quarter of the firms (24.6%) had less than 150 employees, 21.8% and 13.6% of them had employees between 251 to 500 and 151 to 250, respectively. These firms also reported their total gross assets and annual sales turnover. Most of them (40.9%) had total gross assets of more than RM150 million, 28.2% with less than RM50 million, 16.4% had total gross assets between RM50 to RM100 million, 12.7% had total gross assets between RM101 to RM150 million, and 1.8% did not disclose such information. In terms of annual sales turnover, slightly more than half of the firms (50.9%) reported a turnover of above RM100 million, less than a quarter (21.8%) had a turnover between RM51 to RM100 million, 14.6% had a turnover below RM25 million, 10% had a turnover of between RM26 to RM50 million, and 2.7% did not reveal the information. The information concerning the number of full time employees, total gross assets and annual sales turnover reveal that most of the sample firms were categorised as large companies.

Table 5.4: Profile of Sample Firms

Demographic Information	Categories	Frequency	Percentage
Type of Industry	Building materials, cement, concrete, ceramics and tiles	3	2.7
	Chemical and adhesive products	6	5.5
	Electrical and electronics products	31	28.2
	Food, beverage and tobacco	9	8.2
	Furniture and wood related products	1	0.9
	Gas and petroleum products	3	2.7
	Household products and appliances	2	1.8
	Iron, steel and metal products	9	8.2
	Machinery and equipment	3	2.7
	Paper, printing, packaging and labelling	3	2.7
	Pharmaceutical, medical equipment, cosmetics and toiletries	3	2.7
	Rubber and plastic products	11	10.0
	Textile, clothing, footwear and leather products	3	2.7
	Transport and automotive parts/components	17	15.5
	Others	5	4.6
	No information provided	1	0.9
Years in Operation	Less than 5 years	6	5.5
	5 to 10 years	15	13.6
	More than 10 years	88	80.0
	No information provided	1	0.9
Ownership Structure	Local (more than 50% local equity)	50	45.5
	Joint venture	8	7.3
	Foreign (more than 50% foreign equity):		
	- Anglo American	15	13.6
	- Asian	32	29.1
	- Others	4	3.6
	No information provided	1	0.9
Number of Full Time Employees	Not exceeding 150	27	24.6
	151 to 250	15	13.6
	251 to 500	24	21.8
	Above 500	43	39.1
	No information provided	1	0.9
Total Gross Assets	Less than RM50 million	31	28.2
	RM50 to RM100 million	18	16.4
	RM101 to RM150 million	14	12.7
	Above RM150 million	45	40.9
	No information provided	2	1.8
Annual Sales Turnover	Not exceeding RM25 million	16	14.6
	RM26 to RM50 million	11	10.0
	RM51 to RM100 million	24	21.8
	Above RM100 million	56	50.9
	No information provided	3	2.7

5.1.4 Evaluation of PLS Path Model

There are two sets of linear equations in the PLS path model: the inner model and the outer model. While the inner or structural model specifies the relationships between unobserved or latent variables, the outer or measurement model specifies the relationships between latent variables and their observed or manifest variables (Chin, 1998 and Henseler, Ringle & Sinkovics, 2009).

5.1.4.1 Evaluation of Outer Model

The outer model consists of two types of models: the reflective and the formative measurement models. The reflective model (also known as Mode A) has a causal relationship from the latent variable to the manifest variables, whereas the formative model (also known as Mode B) has a causal relationship from the manifest variables to the latent variable. Accordingly, the arrow scheme in the reflective model should be directed in an outward manner (from the latent variable to the manifest variables), whereas the arrow scheme in the formative model should be directed in an inward manner (from the manifest variables to the latent variable).

According to Chin (1998), the decision to employ a certain type of outer model depends on three considerations: theory/substantive knowledge, research objectives, and empirical conditions. If the latent variable is conceptualised to influence manifest variables, or if the objective is to explain or predict the observed measures, or if the sample size and multicollinearity are of concern, then the reflective model should be used. On the other hand, the formative model should be used if the manifest variables are conceptualized as the mix of indicators and their combination led to the formation of the latent variable, or if the objective is to focus at the abstract level, or if the sample size is large and there is no multicollinearity problem. The exclusion of a manifest variable may change the meaning of the latent variable in the formative model (Diamantopoulos and Winklhofer, 2001; Henseler et al., 2009). Chin (1998) further stated that the reflective model is suitable if the focus is on the structural path relations, and the estimates for the measurement model are not stable. Based on these criteria, the reflective model is deemed to be more suitable for this study. Furthermore, Bisbe, Batista-Foguet and Chenhall (2007, p. 800) contended that "Most constructs in the management literature and virtually all constructs reported in the extant management accounting and control systems (MACS) survey-based literature are based on reflective models".

Unlike the formative model, the loadings in the reflective model should be examined to determine the appropriateness of the indicators. Each loading represents the correlation between the indicator and the component score, where an indicator with low loading indicates that it has little relationship in terms of shared variance with the latent variable component score (Chin, 1998). The reflective model requires both validity and reliability tests. In contrast, only the validity test is applicable for the formative model. The reliability tests are considered irrelevant and inappropriate in the formative model due to the assumption of error-free measures (Henseler et al., 2009) and the indicators do not covary (Bisbe et al., 2007). Furthermore, unlike the formative model, which is based on multiple regressions, multicollinearity is not a problem in the reflective model since only simple regressions are involved (Diamantopoulos and Winklhofer, 2001). As the current study employs the reflective model, no multicollinearity test was performed.

Another important point to note is that PLS path modelling does not require goodness of fit measures (Hulland, 1999 and Henseler et al., 2009). Similarly, since the normality assumption is of no concern for PLS, the normality test is deemed to be irrelevant.

5.1.4.1.1 Tests of Validity

Validity focuses on what should be measured and how accurate the indicators measure the concept. The tests for the validity of the measures consist of two types: convergent validity and discriminant validity.

5.1.4.1.1.1 Convergent Validity

Convergent validity assesses the degree to which two measures of the similar concept are correlated (Hair et al., 1998). If the scale correctly measures the intended concept, the correlation will be high. There are two ways to assess convergent validity: (1) factor loading for each indicator should be significant and exceed 0.50; and (2) the value of average variance extracted (AVE) for each construct should be at least 0.50 (Fornell and Larcker, 1981).

First, convergent validity is assessed by examining the factor loading for each indicator. This is also a test for individual item (indicator) reliability (Chin, 1998 and Henseler et al., 2009). The factor loadings generated by PLS are interpretable similar to the loadings generated by principal components factor analysis (Bookstein, 1986). An indicator should share more variance with the component score than with the error variance. As such, the correlations between a construct and each of its indicators (standardised outer loadings) should be greater than 0.70. However, Chin (1998, p. 325) argued that the rule of thumb of 0.70 for individual item reliability "should not be as rigid at early stages of scale development. Loadings of 0.50 or 0.60 may still be acceptable if there exist additional indicators in the block for comparison basis". Hulland (1999) also suggested that the value of 0.50 should be adequate as a threshold for individual item reliability. Thus, this study uses 0.50 as an acceptable value for individual item reliability.

The factor loading should be significant and exceed 0.50. Table 5.5 shows the factor loading for each indicator in the outer model. As can be seen, three items for market competition had loadings of less than 0.50. These items are: MC1 (number of major competitors), MC4 (extent of price manipulations/exploitations), and MC7 (changes in government regulation or policy). They had outer loadings of 0.420, 0.367 and 0.460, respectively. These items were then deleted from further analysis.

Low loadings were also found for the IMP variables. Two items were deleted from JIT and AMT constructs, and one item from TQM. The items that were deleted from JIT constructs are: JIT9 (number of total parts) and JIT10 (amount of buffer stock). These items had outer loadings of 0.497 and 0.252, respectively. Only one item under the TQM construct (TQM4) had an outer loading of less than 0.50 (0.143). This item relates to the current approach in providing quality products. Both items from AMT that were not achieved convergent validity were classified under advanced technology and not computer integration. The loadings for AMT2 (computer aided design/CAD), and AMT14 (local area network/LAN) were 0.445 and 0.339, respectively.

All indicators in other constructs (business strategy, management accounting systems, and business unit performance) had fulfilled at least a minimum requirement of convergent validity. Thus, none were deleted from their constructs.

Table 5.5: Outer Loadings (Mean, STDEV, T-Values)

Items	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
A1	0.833598	0.832828	0.036424	0.036424	22.886113**
A2	0.879484	0.878708	0.024589	0.024589	35.768021**
A3	0.846319	0.845380	0.033142	0.033142	25.536216**
A4	0.837779	0.834554	0.038778	0.038778	21.604750**
A5	0.804707	0.800564	0.046652	0.046652	17.249131**
A6	0.765283	0.763150	0.054327	0.054327	14.086542**
A7	0.702921	0.703440	0.045768	0.045768	15.358271**
AMT1	0.589910	0.588593	0.067862	0.067862	8.692792**
AMT2	0.444922	0.446330	0.094750	0.094750	4.695763**
AMT3	0.563910	0.566474	0.077345	0.077345	7.290861**
AMT4	0.551146	0.549217	0.076001	0.076001	7.251846**
AMT5	0.578940	0.574006	0.075729	0.075729	7.644900**
AMT6	0.500159	0.487337	0.088173	0.088173	5.672472**
AMT7	0.527909	0.523764	0.081968	0.081968	6.440405**
AMT8	0.549535	0.545080	0.077078	0.077078	7.129559**
AMT9	0.608762	0.598423	0.083003	0.083003	7.334242**
AMT10	0.611350	0.605417	0.069118	0.069118	8.844969**
AMT11	0.565189	0.557325	0.097168	0.097168	5.816614**
AMT12	0.662136	0.664599	0.063699	0.063699	10.394761**
AMT13	0.766032	0.767700	0.042325	0.042325	18.098668**
AMT14	0.338766	0.327945	0.110705	0.110705	3.060086**
AMT15	0.580703	0.576363	0.078001	0.078001	7.444832**

** Significant at p<0.01
*   Significant at p<0.05

Table 5.5: Outer Loadings (Mean, STDEV, T-Values) (continued)

Items	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
AMT16	0.621791	0.621316	0.083693	0.083693	7.429426**
AMT17	0.774106	0.772779	0.046337	0.046337	16.706064**
AMT18	0.765534	0.765593	0.042358	0.042358	18.072909**
AMT19	0.783523	0.782229	0.041962	0.041962	18.672254**
AMT20	0.782418	0.779405	0.045557	0.045557	17.174421**
AMT21	0.810532	0.808061	0.035940	0.035940	22.552075**
AMT22	0.791010	0.789925	0.039599	0.039599	19.975700**
AMT23	0.787720	0.785085	0.043482	0.043482	18.116150**
I1	0.866490	0.863921	0.030868	0.030868	28.071153**
I2	0.937733	0.937393	0.012760	0.012760	73.491614**
I3	0.914283	0.914233	0.016123	0.016123	56.707546**
JIT1	0.629282	0.637651	0.079369	0.079369	7.928546**
JIT2	0.514049	0.508134	0.113226	0.113226	4.540043**
JIT3	0.599841	0.594090	0.087363	0.087363	6.866071**
JIT4	0.698111	0.702153	0.065587	0.065587	10.643975**
JIT5	0.668394	0.661984	0.065095	0.065095	10.267975**
JIT6	0.512860	0.490551	0.145213	0.145213	3.531778**
JIT7	0.606141	0.589748	0.113942	0.113942	5.319728**
JIT8	0.564459	0.543950	0.112397	0.112397	5.022007**
JIT9	0.497483	0.472922	0.139970	0.139970	3.554208**
JIT10	0.252364	0.222038	0.165738	0.165738	1.522672
MC1	0.420038	0.414875	0.146507	0.146507	2.867020**
MC2	0.845684	0.834052	0.042552	0.042552	19.874007**
MC3	0.842237	0.836740	0.033779	0.033779	24.933631**
MC4	0.366655	0.361416	0.154820	0.154820	2.368267*
MC5	0.730113	0.717866	0.071234	0.071234	10.249474**
MC6	0.644572	0.618265	0.117779	0.117779	5.472724**
MC7	0.459654	0.435715	0.132089	0.132089	3.479877**
P1	0.847009	0.849763	0.028709	0.028709	29.503555**
P2	0.737264	0.737658	0.058751	0.058751	12.548868**
P3	0.863589	0.863230	0.028021	0.028021	30.819309**
P4	0.870003	0.870333	0.026633	0.026633	32.665896**
P5	0.804180	0.803184	0.038150	0.038150	21.079274**
P6	0.873727	0.875062	0.021250	0.021250	41.116172**

** Significant at $p<0.01$
* Significant at $p<0.05$

Table 5.5: Outer Loadings (Mean, STDEV, T-Values) (continued)

Items	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)
P7	0.835471	0.837494	0.036184	0.036184	23.089523**
P8	0.829909	0.831434	0.038883	0.038883	21.343957**
S1	0.732139	0.730676	0.060141	0.060141	12.173627**
S2	0.647531	0.645848	0.076836	0.076836	8.427450**
S3	0.810811	0.811354	0.035153	0.035153	23.065217**
S4	0.835810	0.833379	0.034580	0.034580	24.170093**
S5	0.828229	0.827237	0.032465	0.032465	25.511104**
T1	0.878913	0.876316	0.025353	0.025353	34.666672**
T2	0.891343	0.890116	0.021392	0.021392	41.667579**
T3	0.853984	0.853914	0.030702	0.030702	27.815243**
T4	0.799349	0.795386	0.042327	0.042327	18.884921**
TQM1	0.605153	0.597571	0.082229	0.082229	7.359377**
TQM2	0.710177	0.708140	0.067923	0.067923	10.455607**
TQM3	0.715477	0.713756	0.067267	0.067267	10.636336**
TQM4	0.143146	0.139402	0.138977	0.138977	1.029999
TQM5	0.647459	0.640233	0.069118	0.069118	9.367424**
TQM6	0.674207	0.671830	0.068403	0.068403	9.856377**
TQM7	0.677967	0.673780	0.066209	0.066209	10.239818**
TQM8	0.646630	0.653987	0.058568	0.058568	11.040716**
TQM9	0.603625	0.597255	0.082592	0.082592	7.308547**
TQM10	0.696464	0.688959	0.061984	0.061984	11.236138**

** Significant at $p<0.01$
* Significant at $p<0.05$

Note:

MC = Market competition

AMT = Advanced manufacturing technology

JIT = Just-in-time

TQM = Total quality management

S = Scope

T = Timeliness

A = Aggregation

I = Integration

P = Performance

The value of average variance extracted (AVE) for each construct after the items with low loadings were deleted will be discussed in Section 5.1.6.

5.1.4.1.1.2 Discriminant Validity

Discriminant validity refers to the degree to which two conceptually similar concepts are distinct (Hair et al., 1998). Discriminant validity can be assessed in two ways: (1) cross-loadings, where the loading for each indicator should be higher than all of its cross-loadings; and (2) The Fornell-Larcker criterion (Fornell and Larcker, 1981), where the value of AVE for each construct should be higher than its highest squared correlation with any other construct. The former assesses discriminant validity on the indicator level, whereas the latter assesses discriminant validity on the construct level (Henseler at al., 2009).

Table 5.6 shows the cross loadings for all indicators. The shaded area consists of loadings for all indicators in each construct. All items were found to load higher on their own block (construct) than on other blocks (constructs). This implies that the construct component score predicts each indicator in its block better than indicators in other blocks, thus, fulfilling the first criteria of discriminant validity.

The second method to assess discriminant validity is to compare the value of AVE for each construct with its highest squared correlation with any other construct, or to compare the square root of AVE with the correlation. The results will be discussed in Section 5.1.6 after deleting items with low loadings.

Table 5.6: Cross Loadings

Items	A	AMT	F	I	JIT	MC	NF	S	T	TQM
A1	0.833598	0.353172	0.519174	0.648586	0.466490	0.216781	0.547230	0.400016	0.461297	0.432330
A2	0.879484	0.418031	0.553001	0.667803	0.517212	0.133585	0.480378	0.409614	0.465068	0.453021
A3	0.846319	0.396370	0.581303	0.646831	0.486150	0.212754	0.473368	0.498102	0.522555	0.468607
A4	0.837779	0.277130	0.550088	0.561587	0.439678	0.173038	0.414555	0.324018	0.416264	0.347633
A5	0.804707	0.311250	0.418533	0.568178	0.366054	0.035416	0.402973	0.307504	0.418874	0.309697
A6	0.765283	0.343234	0.532723	0.562446	0.406777	0.220900	0.449002	0.399427	0.461635	0.406386
A7	0.702921	0.236999	0.413009	0.434546	0.317661	0.166567	0.431502	0.317711	0.399515	0.288313
AMT1	0.424338	0.589910	0.256736	0.317752	0.361327	0.200400	0.286149	0.338458	0.200968	0.381977
AMT2	0.023293	0.444922	-0.03995	0.022045	0.161773	0.346099	0.110668	0.053654	0.078248	0.252130
AMT3	0.339719	0.563910	0.200670	0.260133	0.297537	0.291458	0.245027	0.371787	0.247782	0.351349
AMT4	0.149244	0.551146	-0.01090	0.063821	0.305014	0.266080	0.074763	0.101488	0.108070	0.356902
AMT5	0.126372	0.578940	0.035078	0.006774	0.229152	0.127960	0.016013	0.095834	0.141230	0.390624
AMT6	0.155173	0.500159	0.013299	-0.07200	0.179256	0.082261	0.012195	0.025947	-0.05594	0.235418
AMT7	0.219269	0.527909	0.120504	0.151860	0.277641	0.231626	0.185747	0.148926	0.189142	0.389147
AMT8	0.219080	0.549535	0.165508	0.144128	0.249140	0.178327	0.103777	0.187357	0.210337	0.446069
AMT9	0.368646	0.608762	0.231201	0.184940	0.213337	0.039748	0.165469	0.293318	0.398419	0.360394
AMT10	0.299350	0.611350	0.172511	0.152281	0.299991	0.042956	0.129046	0.249316	0.287214	0.384878
AMT11	0.276563	0.565189	0.152848	0.112158	0.288662	0.030888	0.135507	0.149167	0.245813	0.374576
AMT12	0.313505	0.662136	0.223791	0.302228	0.326781	0.302433	0.207441	0.344097	0.224222	0.391165
AMT13	0.349902	0.766032	0.306894	0.309012	0.434773	0.318511	0.229885	0.356838	0.304206	0.485054
AMT14	0.292876	0.338766	0.235960	0.246592	0.268772	0.163756	0.179702	0.175251	0.226498	0.251805
AMT15	0.330656	0.580703	0.341446	0.228088	0.335763	0.130905	0.230411	0.273467	0.233719	0.419988
AMT16	0.140302	0.621791	0.211000	0.120473	0.301069	0.159240	0.269778	0.175545	0.189477	0.324368
AMT17	0.265043	0.774106	0.167283	0.229135	0.410982	0.262864	0.281764	0.244727	0.202280	0.402604
AMT18	0.230634	0.765534	0.094813	0.216406	0.378524	0.364066	0.220314	0.269736	0.220600	0.421691
AMT19	0.282252	0.783523	0.141692	0.312061	0.497624	0.381090	0.318609	0.300475	0.266651	0.511001
AMT20	0.279331	0.782418	0.132401	0.258595	0.401461	0.300198	0.262291	0.274809	0.237925	0.468434
AMT21	0.373295	0.810532	0.292702	0.308888	0.437123	0.357460	0.291646	0.433788	0.329184	0.478435
AMT22	0.345794	0.791010	0.313566	0.329438	0.443540	0.292815	0.338383	0.375018	0.274146	0.486103
AMT23	0.276933	0.787720	0.220707	0.275358	0.389516	0.274237	0.296081	0.297517	0.249881	0.426285
I1	0.643189	0.335494	0.444712	0.866490	0.491121	0.254672	0.492892	0.527983	0.434437	0.561362
I2	0.673154	0.293615	0.499776	0.937733	0.513333	0.247075	0.480530	0.569584	0.528062	0.482967
I3	0.656067	0.241388	0.503360	0.914283	0.417019	0.242173	0.415758	0.588490	0.460108	0.431098
JIT1	0.373047	0.414244	0.192234	0.422704	0.629282	0.324349	0.342373	0.249624	0.282067	0.526072
JIT2	0.439062	0.284483	0.324486	0.390301	0.514049	0.055977	0.342327	0.193479	0.524082	0.413679
JIT3	0.463666	0.342883	0.483136	0.407578	0.599841	0.275362	0.357061	0.324022	0.457971	0.400708
JIT4	0.378983	0.494886	0.275419	0.419868	0.698111	0.527234	0.355356	0.295279	0.293320	0.539022
JIT5	0.380557	0.358968	0.247659	0.308512	0.668394	0.128288	0.330169	0.095896	0.171384	0.437007
JIT6	0.019280	0.064941	0.217827	0.067441	0.512860	0.179706	0.129715	0.112040	0.170458	0.185931
JIT7	0.208637	0.144351	0.380141	0.216795	0.606141	0.250324	0.269406	0.179667	0.259314	0.292682
JIT8	0.165423	0.151872	0.208224	0.189658	0.564459	0.277879	0.188025	0.204284	0.333785	0.298824
JIT9	0.163978	0.225241	0.188287	0.121993	0.497483	0.324810	0.128700	0.139901	0.221853	0.289171
JIT10	-0.04231	-0.01528	0.003748	-0.03477	0.252364	0.079375	-0.06560	0.063900	-0.03978	0.012176
MC1	-0.02226	0.011774	-0.10376	-0.07309	0.173896	0.420038	0.065627	-0.02641	-0.03865	0.042938
MC2	0.100068	0.347221	0.149741	0.156317	0.413307	0.845684	0.189016	0.291722	0.253211	0.303725

Table 5.6: Cross Loadings (continued)

Items	A	AMT	F	I	JIT	MC	NF	S	T	TQM
MC3	0.261584	0.387790	0.169122	0.336483	0.370119	0.842237	0.284719	0.294875	0.236422	0.316359
MC4	0.033863	0.028090	-0.01601	0.021495	0.121039	0.366655	0.186455	-0.09504	-0.06537	0.036523
MC5	0.186056	0.230613	0.249819	0.218261	0.322144	0.730113	0.283777	0.154716	0.194340	0.330305
MC6	0.132379	0.151086	0.182432	0.180722	0.307945	0.644572	0.170955	0.264838	0.188599	0.248204
MC7	0.025888	0.090437	0.011277	0.084914	0.219358	0.459654	0.005992	0.090540	0.148592	0.183487
P2	0.561587	0.310541	0.737264	0.484270	0.357164	0.154813	0.558205	0.362811	0.424959	0.438071
P6	0.453567	0.227867	0.873727	0.389986	0.408480	0.249747	0.601147	0.414588	0.404865	0.409843
P7	0.520067	0.126445	0.835471	0.398271	0.349198	0.099687	0.411819	0.381630	0.350423	0.251509
P8	0.545075	0.239467	0.829909	0.479900	0.412773	0.165157	0.511968	0.423061	0.428188	0.353711
P1	0.623295	0.281898	0.633935	0.534439	0.467447	0.170020	0.847009	0.344078	0.447070	0.459125
P3	0.490034	0.285528	0.543470	0.460913	0.439511	0.234842	0.863589	0.337507	0.484649	0.433957
P4	0.410691	0.269570	0.536291	0.374254	0.349393	0.277871	0.870003	0.318825	0.328484	0.367107
P5	0.366932	0.257116	0.434698	0.343288	0.376534	0.294603	0.804180	0.299635	0.435895	0.338743
S1	0.318095	0.331246	0.304904	0.460397	0.324504	0.224209	0.199225	0.732139	0.251147	0.377603
S2	0.230052	0.238860	0.356296	0.329777	0.201158	0.151440	0.318009	0.647531	0.292540	0.329033
S3	0.404139	0.359987	0.367253	0.573828	0.332768	0.282542	0.305546	0.810811	0.440180	0.374164
S4	0.406954	0.220007	0.449284	0.481957	0.199745	0.222221	0.343840	0.835810	0.341673	0.377476
S5	0.428487	0.351614	0.391612	0.519692	0.296158	0.266901	0.323800	0.828229	0.409188	0.401225
T1	0.447980	0.300133	0.409937	0.360994	0.420890	0.180188	0.393605	0.367704	0.878913	0.454275
T2	0.505349	0.299679	0.409839	0.510237	0.398573	0.196064	0.410900	0.406874	0.891343	0.412953
T3	0.387817	0.284312	0.386082	0.404680	0.366042	0.252835	0.403305	0.437767	0.853984	0.387848
T4	0.548593	0.298860	0.471005	0.504919	0.549727	0.300169	0.500266	0.347943	0.799349	0.487153
TQM1	0.242619	0.243266	0.285040	0.268680	0.428408	0.209515	0.370074	0.075347	0.361390	0.605153
TQM2	0.354429	0.484533	0.338423	0.306373	0.449971	0.258159	0.334772	0.323188	0.336996	0.710177
TQM3	0.400017	0.480618	0.392210	0.418722	0.440651	0.252399	0.405090	0.459207	0.422341	0.715477
TQM4	-0.06944	-0.03777	0.009744	-0.04072	0.196230	0.069457	-0.03785	-0.10674	0.081420	0.143146
TQM5	0.240937	0.471262	0.338901	0.289683	0.357566	0.241401	0.264561	0.405594	0.336313	0.647459
TQM6	0.271948	0.436569	0.306606	0.317867	0.478333	0.337870	0.319489	0.383028	0.392471	0.674207
TQM7	0.218143	0.401699	0.147727	0.329457	0.450621	0.308693	0.312688	0.367213	0.295396	0.677967
TQM8	0.437234	0.449291	0.242835	0.482078	0.536489	0.155465	0.300056	0.252201	0.253931	0.646630
TQM9	0.364919	0.395945	0.270730	0.439308	0.398432	0.343610	0.206105	0.356367	0.354638	0.603625
TQM10	0.346068	0.257466	0.347957	0.390204	0.482146	0.144307	0.347760	0.191851	0.298449	0.696464

Note:

MC = Market competition

AMT = Advanced manufacturing technology

JIT = Just-in-time

TQM = Total quality management

S = Scope

T = Timeliness

A = Aggregation

I = Integration

P = Performance

F = Financial performance

NF = Non-financial performance

5.1.4.1.2 Tests of Reliability

Reliability assesses the degree of consistency of various measures. In PLS methodology, Chin (1998) suggests the use of composite reliability, ρ_c, developed by Werts, Linn and Jöreskog (1974) to assess the internal consistency of indicators. The major difference between composite reliability and the commonly used reliability measure, Cronbach's (1951) coefficient alpha (Cronbach's α), is that the latter assumes that all indicators are equally reliable (Chin, 1998 and Henseler et al., 2009). Thus, 'Cronbach's α tends to provide a severe underestimation of the internal consistency reliability of latent variables in PLS path models' (Henseler et al., 2009, p.299). Conversely, composite reliability recognises that indicators have different loadings. Furthermore, composite reliability provides a closer approximation of reliability because it does not assume tau equivalency among measures such as Cronbach's α. This explains why Cronbach's α tends to be a lower bound of reliability. Therefore, similar to Chin (1998), Das et al. (2000) and Henseler et al. (2009), this study uses composite reliability as a measure of internal consistency.

The commonly used threshold for reliability is 0.70, where the value above 0.70 indicates high reliability and the value below 0.70 implies a lack of reliability (Hair et al., 1998). The results will be discussed in section 5.1.6.

5.1.4.2 Evaluation of Inner Model

The inner model should only be assessed after the variables have achieved sufficient validity and reliability. Since the main objective of PLS is to minimise error or maximise the variance explained in all endogenous (dependent) constructs, thus, the degree to which the PLS model achieves its objective can be determined by examining the coefficient of determination (R^2) values for the endogenous construct or latent variables (Hulland, 1999). Another way to evaluate the inner (structural) model is by examining the individual path coefficients. It is defined as standardised beta coefficients of ordinary least squares regressions that "provide a partial empirical validation of the theoretically assumed relationships between latent variables" (Henseler et al., 2009, p. 304).

The evaluation of the inner model was performed via the resampling technique to determine the confidence intervals of the path coefficients and statistical inference. In PLS, this was done by the bootstrapping procedure. In this study, bootstrap samples of 500 were used. The results for path coefficients (β estimates), path significances (p-values), and variance explained (R^2) for dependent variables are used for hypotheses testing. The results will be discussed in section 5.1.6.

5.1.5 Frequency Distribution and Descriptive Statistics

After dropping indicators that did not achieve convergent validity, descriptive statistics were performed for all the main variables used in this study. Descriptive statistics that include mean, standard deviation, minimum and maximum values for actual and theoretical ranges for the independent and dependent variables are presented in Table 5.7 through 5.13.

Table 5.7 shows the descriptive statistics for perceived market competition. Overall, the respondents perceived the market competition as slightly higher than average as indicated by the overall mean score of 3.29. Among different types of competition, access to the marketing channel received the highest mean score of 3.53. This result suggests that the respondents regarded access to the marketing channel as the most competitive factor as compared to other types of competition, which suggests that it could be quite difficult for the manufacturing firms to gain access to the marketing or distribution channel. The lowest mean score of 3.11 was for frequency of technological change in the industry. This implies that this factor was perceived as less competitive in the manufacturing industry.

Table 5.7: Descriptive Statistics for Perceived Market Competition

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Frequency of technological change in the industry	3.11	1.04	1	5	1	5
Frequency of new product introduction	3.27	1.18	1	5	1	5
Package deals for customers	3.26	0.99	1	5	1	5
Access to marketing channels	3.53	0.85	1	5	1	5
Overall	**3.29**	**0.80**	**1**	**5**	**1**	**5**

Scale: 1 (Low) to 5 (High)

Table 5.8 depicts the descriptive statistics for business strategy. Among the five strategy archetypes, balancer received the highest mean score of 4.10 whereas reactor had the least mean score of 3.27. A relatively high mean score obtained by balancer and analyser suggests that manufacturing firms in Malaysia tend to implement a combination of strategies. A possible explanation for the lowest mean score received by reactor could be due to its characteristic of no consistent and coherent strategy (Shortell and Zajac, 1990). Since its characteristics may follow other different types of strategy at different times, this type of strategy is often excluded for analysis in the Malaysian context (e.g.: Sim and Teoh, 1997; Jusoh, 2006), as well as other countries (e.g.: Hambrick, 1981; Dansky and Brannon, 1996).

Table 5.8: Descriptive Statistics for Strategy

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Prospector	3.81	0.58	1.92	5	1	5
Defender	3.43	0.45	2.58	4.42	1	5
Analyser	4.03	0.52	2.5	4.92	1	5
Balancer	4.10	0.49	2.75	5	1	5
Reactor	3.27	0.52	2	4.42	1	5

Scale: 1 (Strongly disagree) to 5 (Strongly agree)

As mentioned earlier, there were two categories for JIT: JIT manufacturing systems and JIT inventory systems. As shown in Table 5.9, JIT manufacturing systems had a higher overall mean score (3.78) compared to JIT inventory systems (3.38). Since the sample consisted of manufacturing firms, this result is not surprising. Manufacturing firms tend to use JIT manufacturing systems more rather than JIT inventory systems in their production processes. Even though the majority of the respondents hold positions of Production Manager, Operation Manager, Plant Manager, or Factory Manager, they recognised that the accounting system implemented by their organisations, were widely used to reflect the costs of manufacturing. This is shown by the highest mean score of 3.98, which was obtained for such a factor.

Table 5.9: Descriptive Statistics for Just In Time

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
JIT Manufacturing Systems						
Attention devoted to minimizing set-up times	3.69	0.99	1	5	1	5
Performance of preventive maintenance	3.93	0.82	2	5	1	5
Accounting system reflects costs of manufacturing	3.98	0.79	1	5	1	5
Products pulled through the plant	3.45	1.04	1	5	1	5
Plant laid out by process or product	3.84	0.98	1	5	1	5
Overall	**3.78**	**0.63**	**2.4**	**5**	**1**	**5**
Scale: 1 (Not used at all) to 5 (Extensively used)						
JIT Inventory Systems						
Number of your suppliers	3.26	0.86	1	5	1	5
Size of their deliveries	3.44	0.87	1	5	1	5
Length of product runs	3.43	0.88	2	5	1	5
Overall	**3.38**	**0.72**	**2**	**5**	**1**	**5**
Scale: 1 (Huge decrease) to 5 (Hugh increase)						
Overall JIT	**3.63**	**0.55**	**2.3**	**5**	**1**	**5**

The significant emphasis on the TQM philosophy for continuous improvement of quality of products and processes is reflected in Table 5.10 below as continuous process improvements recorded the highest score of 4.04. The results indicate that continuous process improvements were almost consistently used by manufacturing firms. This is followed by the time devoted by the plant management staff to quality improvement. It appears that the staff spent a great deal of their time in improving product quality.

The respondents were also asked to provide the absolute number in the form of a percentage. The rationale of using percentages is to check whether the results are in line with the Likert scale. The results shown in Table 5.10 suggest that the firms did implement TQM in their organisations. On average, 62 per cent of the plant's manufacturing processes were under statistical control, 63 per cent of the plant's employees had quality as a major responsibility and were routinely given feedback about quality. These results are consistent with the Likert scale, where, on average, all factors scored at least 3.

Table 5.10: Descriptive Statistics for Total Quality Management

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Time spent by the plant management staff on quality improvement	3.93	0.83	1	5	1	5
Time spent working with suppliers to improve quality	3.55	1.00	1	5	1	5
Ability to measure the cost of quality	3.65	0.91	1	5	1	5
Quality function deployment	3.63	1.12	1	5	1	5
Taguchi methods	3.00	1.23	1	5	1	5
Continuous process improvements	4.04	0.87	1	5	1	5
Overall	**3.63**	**0.71**	**1.83**	**5**	**1**	**5**
Percentage (%) of the plant's manufacturing processes under statistical control	62.08	32.11	0	100	0	100
Percentage (%) of the plant's employees has quality as a major responsibility	63.61	31.82	0	100	0	100
Percentage (%) of the plant's employees that are routinely given feedback about quality	63.37	30.31	1	100	0	100
Overall	**63.02**	**26.35**	**5**	**100**	**0**	**100**

Similar to JIT, AMT were also categorised into two parts: Advanced technologies and computer integration. An analysis of the results in Table 5.11 shows that manufacturing firms in Malaysia used computer integration more than advanced technologies. This is shown by the higher overall mean score (3.19) obtained by computer integration as compared to advanced technologies (2.48). This result is similar with Isa (2005). She also found that the mean scores for overall index for AMT adoption were lower than the mean scores for overall computer integration for the current period as well as for the past three year period.

In general, the results in Table 5.11 suggest that firms used computer integration more during product design development and production planning stage as shown by the highest mean value of 3.53, followed by production planning and component manufacturing stage with a mean value of 3.45. In terms of advanced technologies, manufacturing resource planning (MRP II) was more widely used compared to other technologies with a mean score of 3.47. Conversely, direct numerical control (DNC) had the lowest mean score of 1.69. Isa (2005) also found DNC to be the least used application whereas MRP was the most frequently used application.

Table 5.11: Descriptive Statistics for Advanced Manufacturing Technology

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Advanced Technologies						
Manufacturing resource planning (MRP II)	3.47	1.72	0	5	0	5
Computer aided manufacturing (CAM)	2.53	1.90	0	5	0	5
Numerical control (NC)	2.44	1.92	0	5	0	5
Computer numerical control (CNC)	2.38	1.93	0	5	0	5
Direct numerical control (DNC)	1.69	1.81	0	5	0	5
Flexible manufacturing systems (FMS)	2.24	1.83	0	5	0	5
Robotics	2.25	1.81	0	5	0	5
Automated materials handling	2.38	1.81	0	5	0	5
Automated packaging	2.19	1.88	0	5	0	5
Automated storage	1.70	1.71	0	5	0	5
Computer aided test and inspection	3.05	1.70	0	5	0	5
Computer aided process planning	2.85	1.74	0	5	0	5
Wide area network (WAN)	3.04	2.03	0	5	0	5
Overall	**2.48**	**1.20**	**0**	**5**	**0**	**5**
Scale: N/A (If the technology is not applicable), 1 (Not used at all) to 5 (Extensively used)						

Table 5.11: Descriptive Statistics for Advanced Manufacturing Technology (continued)

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Computer Integration						
Product design development and production planning	3.53	1.59	0	5	0	5
Production planning and component manufacturing	3.45	1.44	0	5	0	5
Component manufacturing and assembly	2.75	1.81	0	5	0	5
Assembly and production scheduling	3.17	1.65	0	5	0	5
Production scheduling and maintenance	3.35	1.47	0	5	0	5
Maintenance and materials handling	2.98	1.48	0	5	0	5
Materials handling and quality control	3.05	1.46	0	5	0	5
Quality control and materials management	3.22	1.42	0	5	0	5
Overall	**3.19**	**1.29**	**0**	**5**	**0**	**5**
Scale: N/A (Not applicable), 1 (Not computer integrated at all) to 5 (Completely computer integrated)						
Overall AMT	**2.75**	**1.12**	**0**	**5**	**0**	**5**

The extent of usage or applicability of timeliness, integration and aggregation were almost similar, as indicated by the overall mean score of about 3.60 for the three dimensions in Table 5.12. These results indicate that the timeliness, integration and aggregation information were highly and equally used by the respondents. The degree of usage of the scope of information was moderate as shown by the overall average score of 3.25. This means that manufacturing firms used both financial and non-financial information, internal and external sources of information, quantitative and qualitative information, and historical and future oriented information. The highest mean score for the extent of usage of MAS information was for frequent reporting, followed by segregation of costs between fixed and variable components. This is consistent with the findings by Isa (2005) who also found that manufacturing firms in Malaysia were reporting more frequently. The lowest mean scores were for information that relates to possible future events and the estimation of the possibility of future events occurring. These two types of information, which relate to future events, were not extensively used by the manufacturing firms.

Table 5.12: Descriptive Statistics for Management Accounting Systems

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Scope						
Information that relates to possible future events	3.15	1.15	1	5	1	5
Non-financial information	3.48	1.10	1	5	1	5
Quantification of the likelihood of future events occurring	3.19	1.03	1	5	1	5
External information	3.21	1.03	1	5	1	5
Non-economic information	3.23	1.01	1	5	1	5
Overall	**3.25**	**0.82**	**1**	**5**	**1**	**5**
Scale: 1 (Not used at all) to 5 (Extensively used)						
Timeliness						
Requested information arrives immediately upon request	3.66	0.85	1	5	1	5
Information are supplied automatically upon its receipt into information systems or as soon as processing is completed	3.63	0.91	1	5	1	5
No delay between an event occurring and relevant information being reported	3.31	0.89	1	5	1	5
Reports are provided frequently on a systematic and regular basis	3.84	0.87	1	5	1	5
Overall	**3.61**	**0.75**	**1.3**	**5**	**1**	**5**
Scale: 1 (Strongly disagree) to 5 (Strongly agree)						

Table 5.12: Descriptive Statistics for Management Accounting Systems (continued)

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Integration						
Presence of precise targets for each activity performed in all sections within department	3.68	0.96	1	5	1	5
Information that relates to the impact that your decisions have on the performance of other departments	3.60	0.91	1	5	1	5
Information on the impact of your decisions throughout your business unit, and the influence of the other individual's decisions on your area of responsibility	3.54	0.874	1	5	1	5
Overall	**3.61**	**0.83**	**1**	**5**	**1**	**5**
Scale: 1 (Not used at all) to 5 (Extensively used)						

Table 5.12: Descriptive Statistics for Management Accounting Systems (continued)

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Aggregation						
Information provided on the different sections or functional areas	3.73	0.94	1	5	1	5
Information on the effect of events on particular time periods	3.76	0.97	1	5	1	5
Information that shows the influence of events on different functions	3.49	0.92	1	5	1	5
Information on the effect of different sections' activities on summary reports such as profit, cost, revenue reports for particular sections and overall organisation	3.58	0.92	1	5	1	5
Information in forms which enable to conduct "what if analysis"	3.36	0.87	1	5	1	5
Information in formats suitable for input into decision models	3.56	0.99	1	5	1	5
Costs separated into fixed and variable components	3.82	0.95	1	5	1	5
Overall	**3.62**	**0.76**	**1.14**	**5**	**1**	**5**
Scale: 1 (Not used at all) to 5 (Extensively used)						
Overall MAS	**3.52**	**0.64**	**1.63**	**5**	**1**	**5**

Table 5.13 tabulates descriptive statistics for perceived performance. It appears that the average score for financial, non-financial and overall performance were above average. This is shown by the overall mean score of 3.79 for financial performance, 3.94 for non-financial performance, and 3.87 for overall performance. These results imply that manufacturing firms perceived that they achieved their performance targets.

Among non-financial performance indicators, delivery gained the highest mean score (4.00), followed by quality (3.96) and productivity (3.91). As for financial measures, profitability was rated the highest with a mean value of 3.87, followed by sales volume (3.85) and costs (3.76).

The results also indicate that non-financial performance was slightly better than financial performance. Therefore, the organisations felt that they were more successful in attaining their non-financial planned targets rather than financial targets. This scenario is expected due to the current economic turbulence that affects organisations all over the world. This finding also indicates that organisations nowadays put more emphasis on the use of non-financial information rather than financial information, thus providing support for the studies of Gordon and Narayanan (1984), Chenhall and Morris (1986), Mia (1993), Mia and Chenhall (1994), Naranjo-Gil and Hartmann (2006; 2007), Boulianne (2007), and Mia and Winata (2008), among others. In Malaysia, Isa (2005) also found that Malaysian manufacturing firms used more non-financial measures in their decision-making systems.

Table 5.13: Descriptive Statistics for Perceived Performance

Variable	Mean	S.D.	Actual Range		Theoretical Range	
			Min	Max	Min	Max
Financial Performance						
Costs	3.76	0.80	1	5	1	5
Sales volume	3.85	0.94	2	5	1	5
Market share	3.67	0.95	1	5	1	5
Profitability	3.87	0.86	1	5	1	5
Overall	**3.79**	**0.73**	**1.5**	**5**	**1**	**5**
Non-financial Performance						
Productivity	3.91	0.74	2	5	1	5
Quality	3.96	0.75	2	5	1	5
Delivery	4.00	0.77	2	5	1	5
Service	3.89	0.76	2	5	1	5
Overall	**3.94**	**0.64**	**2**	**5**	**1**	**5**
Overall Performance	**3.87**	**0.62**	**2.4**	**5**	**1**	**5**

Scale: 1 (Poor performance) to 5 (Excellent performance)

5.1.6 Hypotheses Testing

In this section, various hypotheses developed in the study are tested by examining path coefficients (β estimates), path significances (p-values), and variance explained (R^2) for dependent variables using PLS. PLS generates estimates of standardised regression coefficients (β values) for the hypothesised paths, which are then used to measure relationships among latent variables. Prior to testing the hypotheses, convergent validity, discriminant validity and reliability (other than performed earlier in section 5.1.4) are tested to ensure that the model obtains adequate validity and reliability.

The analyses and discussions of the results of hypotheses testing are further divided into two parts. The first part contains the analysis of an overall model, and the second part contains a thorough examination of individual and separate models for each hypothesis.

5.1.6.1 Overall Model

The overall model consists of all main variables used in the study. The purpose of this analysis is to examine the relationship between the main variables of this study, which consist of market competition, strategy, IMP, the use of MAS information, and performance. The relationships among these variables and all main hypotheses are tested. Prior to that, the adequacy of the measurement model is assessed by examining convergent validity, discriminant validity and reliability.

Table 5.14 tabulates the value for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations. All main constructs are found to be reliable and valid. The composite reliability exceeded the threshold of 0.70, which indicates that all constructs were reliable (Hair et al., 1998; Chin, 1998; Das et al., 2000; and Henseler et al., 2009). The AVE value above 0.50 for all constructs satisfied the second test of convergent validity (Fornell and Larcker, 1981). To fulfil the second test of discriminant validity, the value of AVE for each construct should be higher than its highest squared correlation with any other construct, or the square root of AVE should be higher than its correlations (Fornell and Larcker, 1981). All shaded numbers on the leading diagonals in Table 5.14 are the square roots of AVEs while the off-diagonal elements are the latent variable correlations. A comparison of the square root of AVEs with the latent variable correlations in the lower left of the off-diagonal elements found that no correlations exceed the square root of AVEs between any pair of the constructs thereby indicating that discriminant validity is achieved.

Table 5.14: Composite Reliability, AVE, Square Root of AVE and Correlations (Overall Model)

Construct	Composite Reliability	AVE	IMP	MAS	MC	Perf	Strategy
IMP	0.870366	0.691956	0.831839				
MAS	0.887637	0.664945	0.649406	0.815442			
MC	0.860391	0.608472	0.436615	0.335447	0.780046		
Perf	0.896707	0.812763	0.540964	0.697675	0.296911	0.901534	
Strategy	0.913334	0.680577	0.453707	0.498720	0.566761	0.492742	0.824971

Note:

IMP = Integrated manufacturing practices

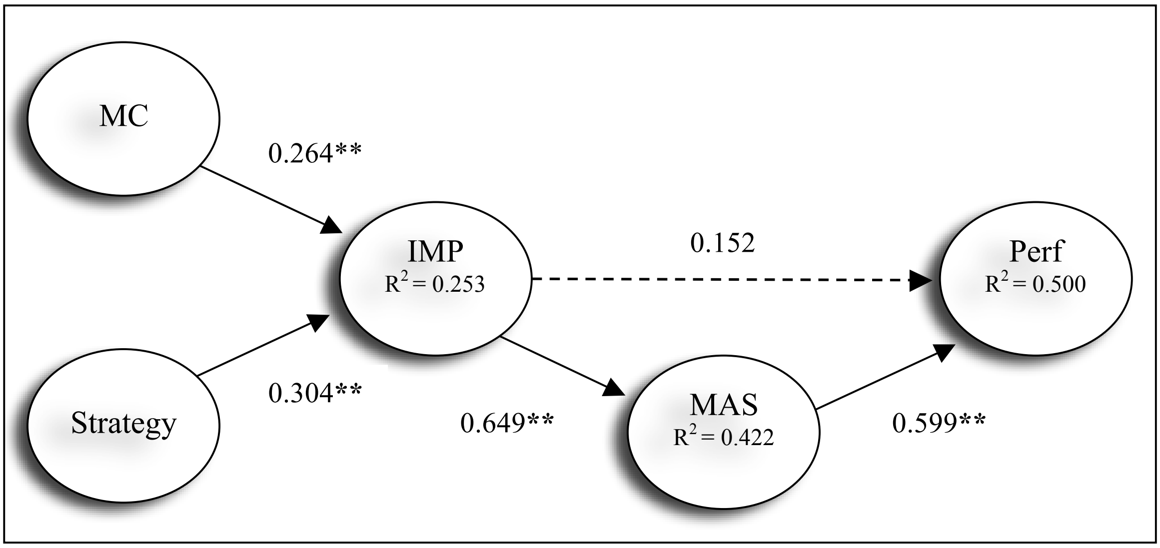
MAS = Management accounting systems

MC = Market competition

Perf = Performance

AVE = Average variance extracted

Figure 5.1 summarises the results of the PLS analysis for the overall model, including the path coefficients (β estimates), path significances (p-values), and variance explained (R^2 values) for dependent variables.



** Significant at p<0.01

Note:
IMP = Integrated manufacturing practices
MAS = Management accounting systems
MC = Market competition
Perf = Performance

Figure 5.1: Overall Model

Figure 5.1 shows that the relationship between the intensity of market competition (MC) and integrated manufacturing practices (IMP) was positive and significant ($\beta = 0.264$, $p < 0.01$). Thus, hypothesis 1 is supported. The relationship between business strategy and IMP was also positive and significant ($\beta = 0.304$, $p < 0.01$) providing support for hypothesis 2. The R^2 value suggests that market competition and strategy explained 25.3 per cent of the variance in IMP.

The relationship between IMP and performance (Perf) was positive but not significant ($\beta = 0.152$, $p > 0.05$). As such, hypothesis 3 is not supported. Both hypothesised paths from IMP to management accounting systems (MAS) as well as from MAS to performance were positive and significant at the 1% significance level with β equal to 0.649 and 0.599, respectively. Thus, hypothesis 4 and 5 are supported. IMP explained 42.2 per cent of the variance in MAS, whereas 50 per cent of the variance in performance was explained by IMP and MAS.

To test the mediating effects of MAS in the relationship between IMP and performance, similar procedures to those recommended by Baron and Kenney (1986) and utilised by Bass, Avolio, Jung and Berson (2003) were used. Evidence for *full mediation* is present when the following conditions are met: A path from the independent variable (i.e., IMP) to the dependent variable (i.e., performance) is not significant but paths from the independent variable to the mediator (i.e., MAS) and from the mediator to the dependent variable are significant (Wold, 1985). *Partial mediation* is present when all paths are significant. In this study, the results indicated that MAS fully mediated the relationship of IMP with performance.

Following the procedure utilised by Bass et al. (2003), who used PLS, the indirect effect can be determined by multiplying the path coefficients (β estimates) from IMP to MAS as well as from MAS to performance. Including MAS as a mediator, the indirect effect of IMP on performance was 0.389 (0.649 x 0.599). This shows that the indirect effect of IMP on performance (0.389) was greater than the direct effect (0.152). Furthermore, according to Billings and Wroten (1978), in order for the data to support the theory, any path in excess of 0.05 is deemed to be meaningful. Lau, Wong and Eggleton (2008) also recognised the use of indirect effects that are greater than 0.05. Since the indirect effect of IMP on performance is greater than 0.05, it is deemed to be meaningful. Overall, these results support the expectation that the effects of IMP on performance are mostly indirect via MAS rather than direct.

In addition, the strength of mediation was quantified using the bootstrap method proposed by Shrout and Bolger (2002). This was done by computing the ratio of the indirect effect over the total effect before the mediating variable was added into the model. The path from IMP to performance before MAS was added into the model was positive and significant ($\beta = 0.544$, $p < 0.01$). Thus, the ratio of the indirect effect over the total effect was 0.715 (0.389/0.544). This indicates that 71.50 per cent of the effect between IMP and performance is explained by the mediating process. This result supports the earlier finding that the indirect effect of IMP on performance was greater than the direct effect.

5.1.6.2 Partial Model

5.1.6.2.1 Hypothesis 1: The Relationship between Market Competition and Integrated Manufacturing Practices

The hypothesis that the intensity of market competition is positively related with IMP implementation (H1) was confirmed. To investigate the effect of market competition on each component of manufacturing practices, additional analysis was conducted. The intensity of market competition may have a different impact on the individual implementation of JIT, TQM and AMT.

Table 5.15 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for market competition and each dimension of IMP (JIT, TQM and AMT). The composite reliability for all variables exceeded a minimum value of 0.70 and all variables achieved at least a minimum AVE value of 0.50. The square roots of AVEs (shaded numbers on the leading diagonals) were higher than any pair of their correlations (the lower left of the off-diagonal). All these results indicate adequate validity and reliability.

Table 5.15: Composite Reliability, AVE, Square Root of AVE and Correlations (Market Competition and Integrated Manufacturing Practices)

Construct	Composite Reliability	AVE	AMT	JIT	MC	TQM
AMT	0.898059	0.815150	0.902857			
JIT	0.805254	0.674783	0.456510	0.821452		
MC	0.860248	0.608310	0.365231	0.417481	0.779942	
TQM	0.859444	0.506338	0.541168	0.569027	0.336767	0.711574

Note:

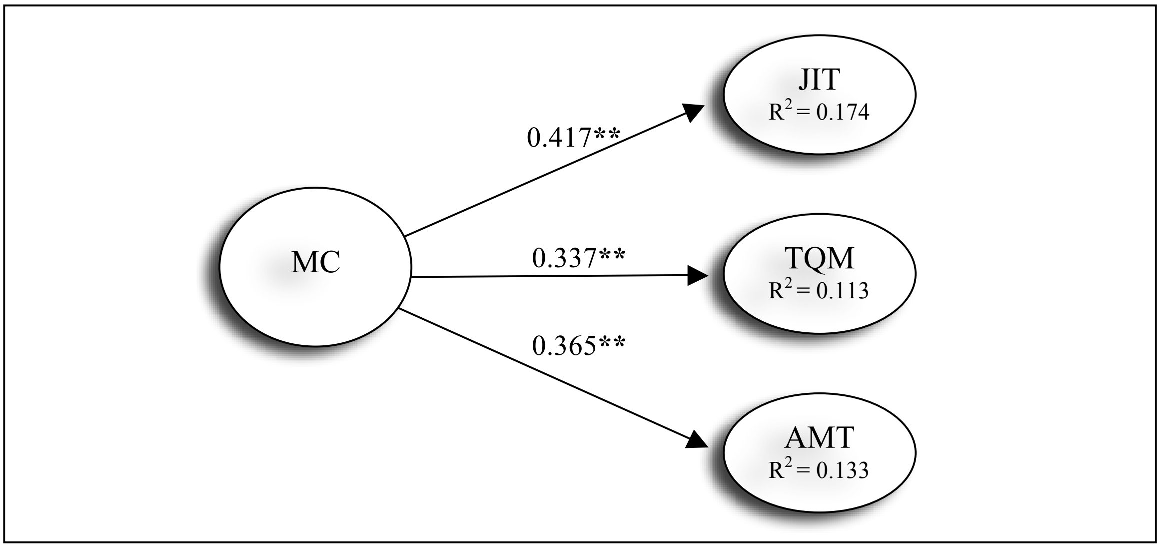
AMT = Advanced manufacturing technology

JIT = Just-in-time

TQM = Total quality management

MC = Market competition

AVE = Average variance extracted



** Significant at p<0.01

Note:

AMT = Advanced manufacturing technology

JIT = Just-in-time

TQM = Total quality management

MC = Market competition

Figure 5.2: The Relationship between Market Competition and Integrated Manufacturing Practices

Figure 5.2 summarises the results of the PLS analysis between market competition and each dimension of IMP (JIT, TQM and AMT). It shows the path coefficients (β estimates), path significances (p-values), and variance explained (R^2 values) for the dependent variables.

As shown in Figure 5.2, all paths from market competition to each dimension of IMP were positive and significant at the 1% significance level. The path coefficients from MC to JIT, TQM and AMT were 0.417, 0.337 and 0.365, respectively. Market competition explained 17.4 per cent of the variance in JIT, 11.3 per cent of the variance in TQM and 13.3 per cent of the variance in AMT. Overall, the results indicate that as market competition intensifies, the use of JIT, TQM and AMT by manufacturing firms increases. These findings are somewhat similar to Ax et al. (2008), that market competition influences the adoption of target costing.

5.1.6.2.2 Hypothesis 2: The Relationship between Strategy and Integrated Manufacturing Practices

This study proposed that business strategy has a positive effect on IMP implementation (H2). This hypothesis was supported in the overall model. However, it is interesting to know, which of the five strategy archetypes (prospector, defender, analyser, balancer and reactor) used in this study has a positive and significant effect on IMP implementation as each of the strategy archetypes may affect IMP differently.

The results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for prospector (Pr), defender (Dr), analyser (Ar), balancer (Br), reactor (Rr) and IMP are shown in Table 5.16. The composite reliability and AVE for all variables exceeded a minimum value of 0.70 and 0.50, respectively. The square roots of AVEs (shaded numbers on the leading diagonals) were higher than any pair of their correlations (the lower left of the off-diagonal) except for balancer strategy. The square roots of AVEs for balancer strategy (0.887) was lower than its correlation with analyser strategy (0.897). However, the difference was too small to conduct further tests on that factor for other evidence of discriminant validity (Das et al., 2000). Das et al. (2000) also faced a similar situation where the AVE for one factor (0.33) was smaller than its squared correlation (0.43). However, no further tests were performed on the grounds that the difference was too small. Furthermore, Fornell and Larcker's (1981) method of comparing AVE with correlations is a more stringent test for determining discriminant validity (Das et al., 2000, and MacKenzie, Podsakoff and Jarvis, 2005). Viewed collectively, the results show that all variables obtained sufficient validity and reliability.

Table 5.16: Composite Reliability, AVE, Square Root of AVE and Correlations (Strategy and Integrated Manufacturing Practices)

Construct	Composite Reliability	AVE	Ar	Br	Dr	IMP	Pr	Rr
Ar	0.914401	0.780775	0.883615					
Br	0.917574	0.787800	0.897448	0.887581				
Dr	0.831129	0.623365	0.471442	0.458376	0.789535			
IMP	0.866875	0.685845	0.345722	0.426436	0.320906	0.828158		
Pr	0.924514	0.803326	0.730814	0.810291	0.522401	0.489591	0.896285	
Rr	0.858124	0.668969	0.395175	0.408341	0.689015	0.325590	0.567732	0.817905

Note:

Ar = Analyser

Br = Balancer

Dr = Defender

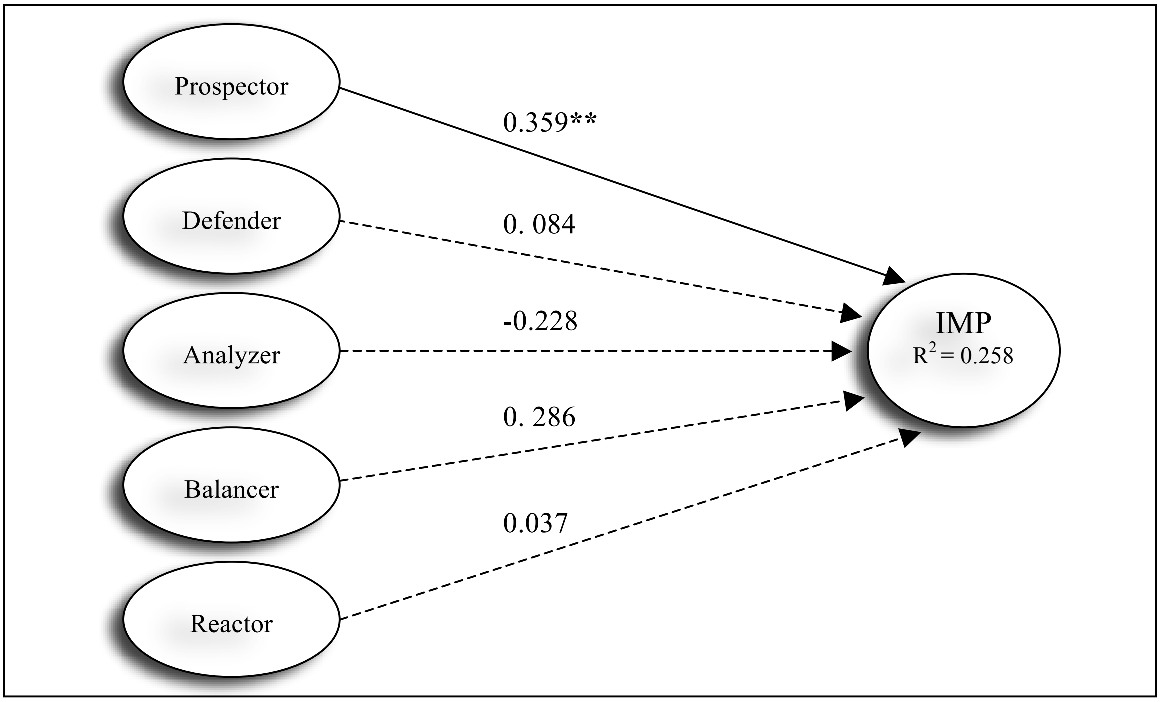
Pr = Prospector

Rr = Reactor

IMP = Integrated manufacturing practices

AVE = Average variance extracted

The next step is to test the effect of each of strategy archetypes on IMP by examining path coefficients, path significances and R^2 values for IMP. As depicted in Figure 5.3, only prospector strategy had a positive and significant impact on IMP, with β equals to 0.359, $p < 0.01$. This is consistent with Miles and Snow's (1978) propositions that prospector strategy is more related to organisations that focus on innovation and flexibility such as IMP firms. The relationship between defender, balancer and reactor with IMP were positive but not significant ($p > 0.05$). The path coefficients from defender, balancer and reactor to IMP were 0.084, 0.286 and 0.037, respectively. In contrast, the relationship between analyser and IMP was negative and not significant ($\beta = -0.228$, $p > 0.05$). The combination of these strategies explained 25.8 per cent variation in IMP.



** Significant at p<0.01

Note:
IMP = Integrated manufacturing practices

Figure 5.3: The Relationship between Strategy and Integrated Manufacturing Practices

5.1.6.2.3 Hypothesis 3: The Relationship between Integrated Manufacturing Practices and Performance

Hypothesis 3 (H3) states that there is a positive relationship between IMP and performance. The test of the overall model found that this hypothesis was not supported. Even though the hypothesised path was positive, but not significant. To further test which of the three manufacturing practices have a significant positive relationship with performance, a separate model consisting of only IMP and performance was tested. In addition, the relationships between each of the IMP dimensions with financial and non-financial performances were also tested.

Table 5.17 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for each dimension of IMP (JIT, TQM and AMT) and both financial (F) and non-financial (NF) performances. Using similar assessments of validity and reliability as in the previous sections, the results reveal that all variables achieved adequate validity and reliability.

Table 5.17: Composite Reliability, AVE, Square Root of AVE and Correlations (Integrated Manufacturing Practices and Performance)

Construct	Composite Reliability	AVE	AMT	F	JIT	NF	TQM
AMT	0.899565	0.817508	0.904161				
F	0.890851	0.671590	0.275169	0.819506			
JIT	0.797397	0.666431	0.483873	0.470461	0.816352		
NF	0.909405	0.715299	0.321578	0.648793	0.489562	0.845753	
TQM	0.862821	0.514377	0.526097	0.449858	0.610285	0.469892	0.717201

Note:

AMT = Advanced manufacturing technology

JIT = Just-in-time

TQM = Total quality management

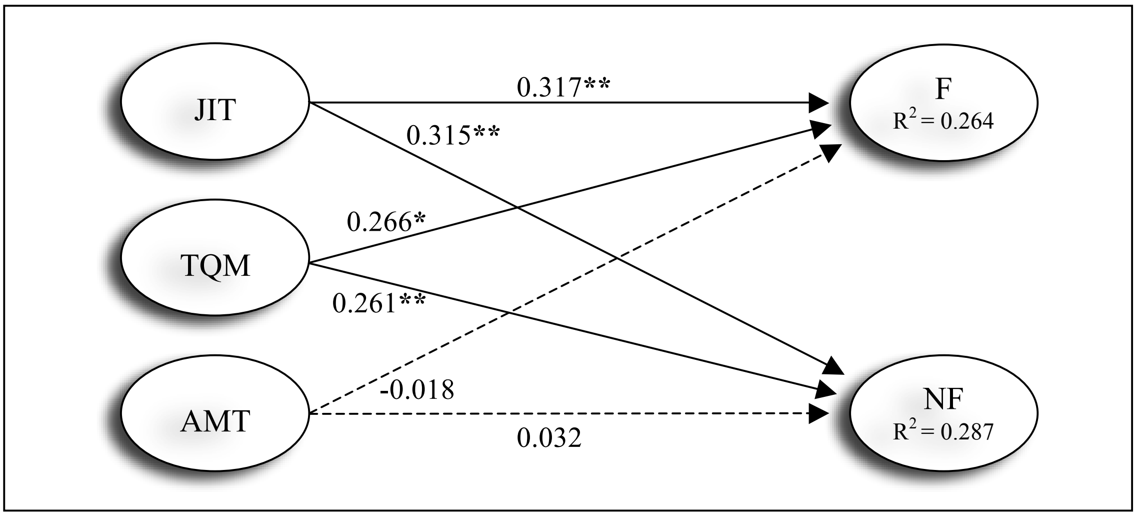
F = Financial performance

NF = Non-financial performance

AVE = Average variance extracted

The examinations of path coefficients, path significances and R^2 values between each dimension of IMP and performance in Figure 5.4 indicate that only AMT had no significant relationship with performance ($p > 0.05$). The relationship between AMT and financial performance was negative ($\beta = -0.018$) but the relationship between AMT and non-financial performance was positive ($\beta = 0.032$). Both JIT and TQM appeared to have significant and positive relationships with performance. The path coefficients from JIT to financial and non-financial performance were 0.317 and 0.315, respectively ($p < 0.01$). The path coefficient from TQM to financial performance was 0.266 ($p < 0.05$)

and the coefficient from TQM to non-financial performance was 0.261 ($p < 0.01$). The combination of these three dimensions of IMP explained 26.4 per cent variation in financial performance and 28.7 per cent variation in non-financial performance.



** Significant at p<0.01
* Significant at p<0.05

Note:
AMT = Advanced manufacturing technology
JIT = Just-in-time
TQM = Total quality management
F = Financial performance
NF = Non-financial performance

Figure 5.4: The Relationship between Integrated Manufacturing Practices and Performance

5.1.6.2.4 Hypothesis 4: The Relationship between Integrated Manufacturing Practices and MAS Information

Hypothesis 4 (H4) that predicts a positive relationship between IMP and MAS information was supported. To test the sub-hypotheses between IMP and each dimension of MAS (scope, timeliness, integration and aggregation), a further analysis was conducted.

Table 5.18 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for IMP, scope (S), timeliness (T), integration (I), and aggregation (A). Using a minimum cut-off value of 0.70 for composite reliability and 0.50 for AVE, and the requirements that the square root of AVEs should be higher than correlations, the results indicate that all variables satisfied all criteria for validity and reliability.

Table 5.18: Composite Reliability, AVE, Square Root of AVE and Correlations (Integrated Manufacturing Practices and MAS Information)

Construct	Composite Reliability	AVE	A	I	IMP	S	T
A	0.930639	0.658466	0.811459				
I	0.932044	0.820593	0.729131	0.905866			
IMP	0.870991	0.693036	0.579200	0.561460	0.832488		
S	0.881400	0.598935	0.469112	0.617757	0.451533	0.773909	
T	0.916160	0.732232	0.559367	0.523890	0.537491	0.450202	0.855706

Note:

IMP = Integrated manufacturing practices

A = Aggregation

I = Integration

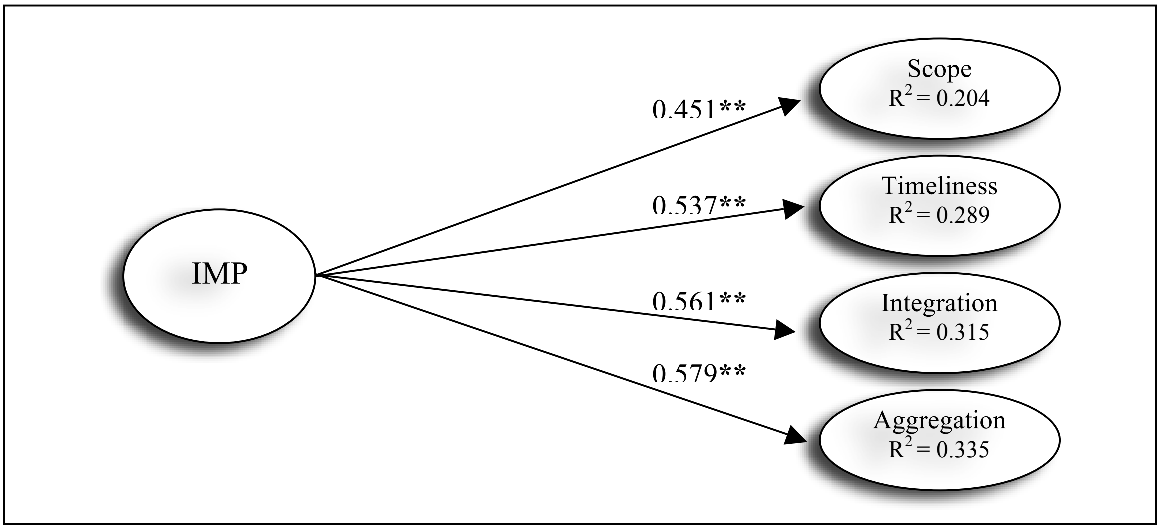
S = Scope

T = Timeliness

AVE = Average variance extracted

Consequently, the direction and significance of the relationships were tested by assessing the path coefficients and path significances. As shown in Figure 5.5, all hypothesised paths from IMP to each dimension of MAS were positive and significant ($p < 0.01$). As such, H4a, H4b, H4c and H4d were supported. The β value from IMP to scope was 0.451 and IMP explained 20.4 per cent variation in scope. The coefficient from IMP to timeliness was 0.537 and IMP explained 28.9 per cent variation in timeliness. The path coefficients from IMP to integration and aggregation were 0.561

and 0.579, respectively. IMP explained 31.5 per cent variation in integration and 33.5 per cent variation in aggregation.



** Significant at p<0.01

Note:
IMP = Integrated manufacturing practices

Figure 5.5: The Relationship between Integrated Manufacturing Practices and MAS Information

5.1.6.2.5 Hypothesis 5: The Relationship between MAS Information and Performance

Hypothesis 5 (H5) states the relationship between MAS information and performance is positive. The analysis of the overall model also found support for H5. To examine the relationship between each dimension of MAS information and performance, a separate test was conducted to test these relationships.

First, the validity and reliability of the latent variables were assessed by looking at the composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations. As depicted in Table 5.19, and using the similar assessments of validity and reliability as in the previous sections, all variables were found to be valid and reliable since they fulfilled all the requirements of validity and reliability.

Table 5.19: Composite Reliability, AVE, Square Root of AVE and Correlations (MAS Information and Performance)

Construct	Composite Reliability	AVE	A	I	Perf	S	T
A	0.930863	0.658929	0.811744				
I	0.932606	0.821967	0.725304	0.906624			
Perf	0.896570	0.812550	0.661702	0.574061	0.901416		
S	0.881229	0.598908	0.466701	0.609990	0.490007	0.773891	
T	0.916288	0.732554	0.559013	0.525637	0.550984	0.452152	0.855894

Note:

A = Aggregation

I = Integration

S = Scope

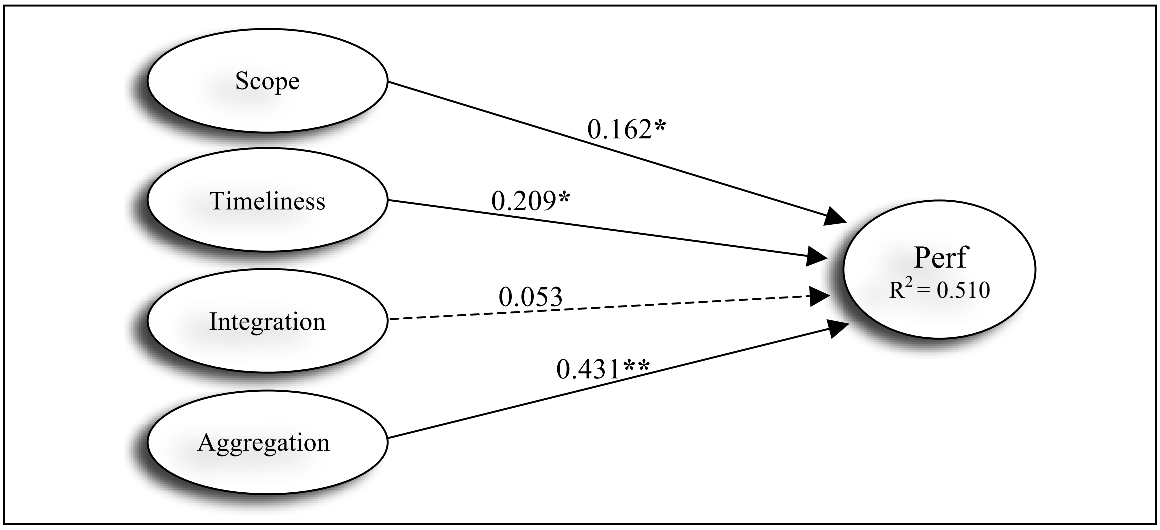
T = Timelines

Perf = Performance

AVE = Average variance extracted

Then, the model in Figure 5.6 was tested. The examinations of path coefficients, path significances and R^2 value between each dimension of MAS information and performance reveal that the relationship between scope and performance was positive and significant ($\beta = 0.162$, $p < 0.05$). Similarly, the relationship between timeliness and performance was also positive and significant ($\beta = 0.209$, $p < 0.05$). Among four dimensions of MAS information, the relationship between aggregation and performance appeared to be highly significant ($p < 0.01$) with β equals to 0.431. In contrast, even though the path between integration and performance was positive ($\beta = 0.053$), however, the relationship was not statistically significant ($p > 0.05$). Therefore, no support was found for H5c. Only H5a, H5b and H5d were supported. These four dimensions of MAS information jointly explained 51 per cent variance in performance.

The results suggest that MAS components of scope, timeliness and aggregation are significant predictors of performance. The most significant contributor (based on β values) is aggregation, followed by timeliness and scope. These results indicate that the respondents perceived the aggregation of information as the most important MAS information in improving business unit performance.



** Significant at p<0.01
*   Significant at p<0.05

Note:
Perf = Performance

Figure 5.6: The Relationship between MAS Information and Performance

5.1.6.3 Analysis of Sub-Groups: The Effect of Size and Industry

This section presents the results of additional analyses on the effect of size and industry in the relationship between IMP, MAS information and performance. As the main objective of this study is to examine the relationship between IMP, the use of MAS information and performance, therefore, further analyses were conducted to test whether the results obtained in the previous section would be different if the analysis was controlled for the effect of size and industry.

5.1.6.3.1 The Size Effect

Size refers to organisational or business unit's size. There are several measures used as proxies for size, such as number of employees, sales turnover and total assets. In this study, size is measured by the number of employees, similar to the study of Mia and Chenhall (1994), Martinez-Lorente et al. (2004), Isa (2005), Mia and Winata (2008), and Dal Pont et al. (2008), among others. Business units with less than 150 full time employees are considered as small and medium business units whereas business units with more than 150 full time employees are considered as large business units. This definition is consistent with the definition of small and medium enterprises (SMEs) as suggested by Small and Medium Industries Development Corporation (SMIDEC) of Malaysia. Mia and Winata (2008) also used similar definition to classify business units into small and large groups.

First, a test of differences (independent sample t-test) was conducted on these two groups to see if there was any significant difference in the mean scores between small and large business units. As tabulated in Table 5.20, with the exception of Performance variable, the mean scores for all main variables used in this study were significantly different between small and large business units at 5% significance level. A further analysis on the mean scores showed that the mean scores for large manufacturing firms were significantly higher than the mean scores for small manufacturing firms for AMT, TQM, JIT and MAS. Therefore, it can be concluded that larger firms tend to use higher level of AMT, TQM, JIT and MAS information. These findings are not surprising as they are consistent with other studies such as Martinez-Lorente et al. (2004) who also found that the implementation of TQM is affected by company size. They found that larger firms have a higher level of TQM implementation than smaller firms. Mia and Chenhall (1994), Agbejule and Burrowes (2007), and Abdel-Kader and Luther (2008), for instance, also suggested that larger firms adopt more formal control systems such as management accounting systems, manufacturing practices and strategies, compared to smaller firms due to their financial capabilities and resources to adopt more advanced techniques and practices.

Table 5.20: Results of Test of Differences in Size (Independent Sample t-test)

Variables	Small (n = 27)		Large (n = 82)			
	Mean	S.D.	Mean	S.D.	t	p
Advanced Manufacturing Technology	2.02	0.983	2.97	1.065	-4.107	.000**
Total Quality Management	3.20	0.644	3.77	0.674	-3.845	.000**
Just-In-Time	3.35	0.616	3.72	0.505	-3.115	.002**
Management Accounting Systems	3.25	0.764	3.59	0.572	-2.480	.015**
Performance	3.70	0.616	3.90	0.603	-1.488	.140

**Significant at $p<0.01$

Since there were differences in the mean scores between small and large business units, additional PLS analyses need to be conducted to examine if size could affect the relationship between IMP, MAS information and performance. Before performing the analyses, the sample was split into two groups: small and large business units, based on the definition explained earlier.

Table 5.21 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for IMP, MAS information and performance, for small business units. The composite reliability for all variables exceeded a minimum value of 0.70 and all variables achieved at least a minimum AVE value of 0.50. The square roots of AVEs (shaded numbers on the leading diagonals) were higher than any pair of their correlations (the lower left of the off-diagonal). All these results indicate adequate validity and reliability.

Table 5.21: Composite Reliability, AVE, Square Root of AVE and Correlations (Integrated Manufacturing Practices, MAS Information and Performance) for Small Firms

Construct	Composite Reliability	AVE	IMP	MAS	Perf
IMP	0.836351	0.633300	0.795801		
MAS	0.925241	0.756963	0.542330	0.870036	
Perf	0.837266	0.720834	0.409208	0.705643	0.849019

Note:

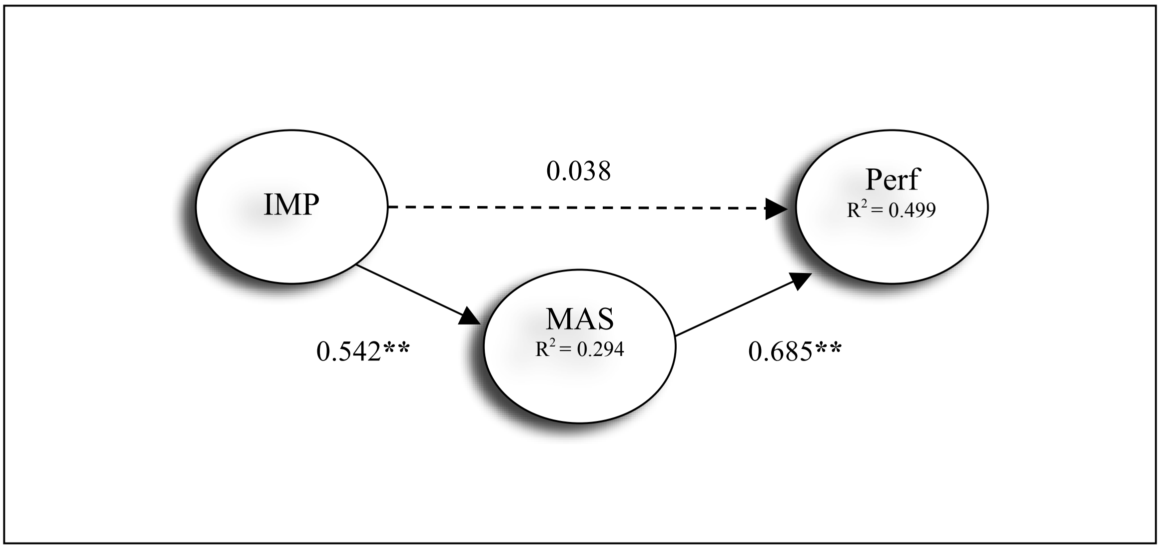
IMP = Integrated manufacturing practices

MAS = Management accounting systems

Perf = Performance

AVE = Average variance extracted

Figure 5.7 summarises the results of the PLS analysis for IMP, MAS information and performance, including the path coefficients (β estimates), path significances (p-values), and variance explained (R^2 values) for dependent variables, for small business units. As shown in Figure 5.7, the relationship between IMP and performance (Perf) was positive but not significant ($\beta = 0.038$, $p > 0.1$). Both hypothesised paths from IMP to MAS as well as from MAS to performance were positive and significant at the 1% significance level with β equal to 0.542 and 0.685, respectively. IMP explained 29.4 per cent of the variance in MAS, whereas almost 50 per cent of the variance in performance was explained by IMP and MAS.



** Significant at p<0.01

Note:
IMP = Integrated manufacturing practices
MAS = Management accounting systems
Perf = Performance

Figure 5.7: The Relationship between Integrated Manufacturing Practices, MAS Information and Performance for Small Firms

Table 5.22 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for IMP, MAS information and performance, for large business units. Using the similar assessments of validity and reliability as in the previous sections, all variables were found to be valid and reliable since they fulfilled all the requirements of validity and reliability.

Table 5.22: Composite Reliability, AVE, Square Root of AVE and Correlations (Integrated Manufacturing Practices, MAS Information and Performance) for Large Firms

Construct	Composite Reliability	AVE	IMP	MAS	Perf
IMP	0.851078	0.657394	0.810798		
MAS	0.863196	0.614847	0.683481	0.784122	
Perf	0.914602	0.842650	0.571248	0.692312	0.917960

Note:

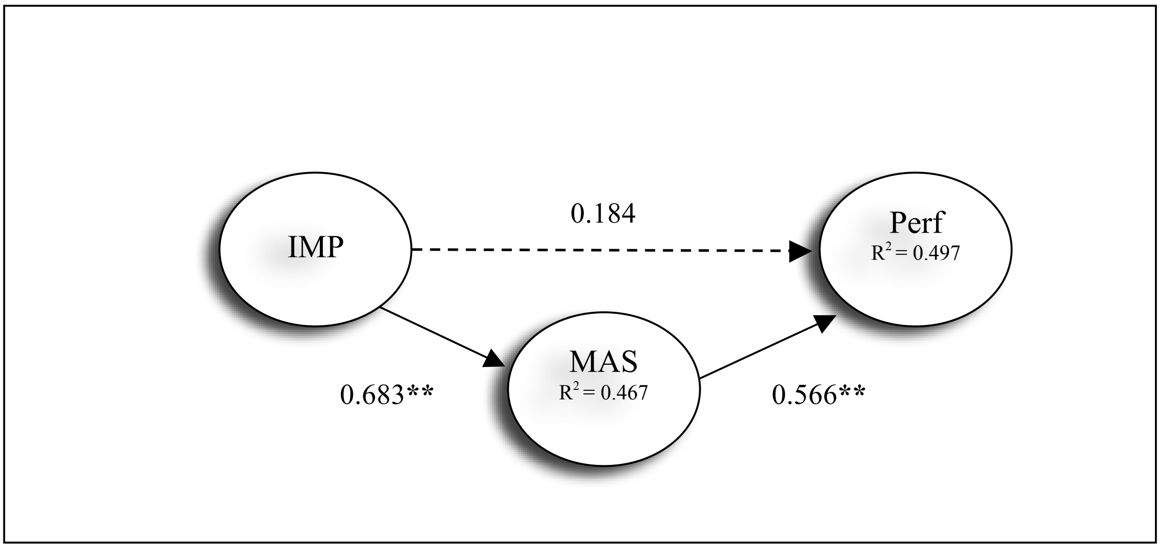
IMP = Integrated manufacturing practices

MAS = Management accounting systems

Perf = Performance

AVE = Average variance extracted

Figure 5.8 summarises the results of the PLS analysis for IMP, MAS information and performance, including the path coefficients (β estimates), path significances (p-values), and variance explained (R^2 values) for dependent variables, for large business units. As shown in Figure 5.8, the relationship between IMP and performance (Perf) was positive but not significant ($\beta = 0.184$, $p > 0.1$). Both hypothesised paths from IMP to MAS as well as from MAS to performance were positive and significant at the 1% significance level with β equal to 0.683 and 0.566, respectively. IMP explained 46.7 per cent of the variance in MAS, whereas IMP and MAS explained almost 50 per cent of the variance in performance.



** Significant at $p<0.01$

Note:
IMP = Integrated manufacturing practices
MAS = Management accounting systems
Perf = Performance

Figure 5.8: The Relationship between Integrated Manufacturing Practices, MAS Information and Performance for Large Firms

Since these results are similar with the previous results before controlling for the size effect, therefore, it can be concluded that size does not affect the relationship between IMP, the use of MAS information and performance. The relationship between IMP and performance is still indirect through the use of MAS information, both for small and large business units. In other words, MAS information still mediates the relationship between IMP and performance, even after controlling for the size effect.

5.1.6.3.2 The Industry Effect

The types of industry could also affect the relationship between IMP, MAS information and performance. For instance, electrical and electronics sector might adopt higher level of technology due to the complexity of the products manufactured. This industry is also expected to be the most advanced in terms of application of IMP, particularly AMT adoption. Therefore, this sector was differentiated from other sectors as it represents high technology adoption. As such, this study categorised the types of industry into two groups. One group consisted of firms in electrical and electronics sector, and another group consisted of firms from other sectors.

Similar to size, a test of differences (independent sample t-test) was conducted on these two groups to see if there was any significant difference in the mean scores between electrical and electronics sector as well as other sectors. As shown in Table 5.23, only the mean scores for AMT and TQM were significantly different between electrical and electronics sector, and other sectors. The difference in the mean scores for AMT was significant at 1% significance level while the difference in the mean scores for TQM was significant at 5% significance level. A further analysis on the mean scores showed that the mean scores for electrical and electronics industry were significantly higher than the mean scores for other industries for these two variables. Thus, similar with earlier expectation, the results of this analysis suggest that the electrical and electronics industry uses higher level of AMT than other industries. These findings are expected due to the complexity of the products manufactured by the electrical and electronics sector that require the use of specialised machines and equipments such as AMT. The findings also suggest that the electrical and electronics sector used relatively more TQM practices compared to other industries, indicating that higher competition intensity forces electrical and electronics sector to strengthen its focus on quality.

Table 5.23: Results of Test of Differences in Industry (Independent Sample t-test)

Variables	Electrical and Electronics (n = 31)		Other Industries (n = 78)			
	Mean	S.D.	Mean	S.D.	t	p
Advanced Manufacturing Technology	3.21	0.960	2.55	1.128	2.882	.005**
Total Quality Management	3.85	0.711	3.54	0.691	2.117	.037*
Just-In-Time	3.71	0.560	3.59	0.553	1.052	.295
Management Accounting Systems	3.66	0.657	3.45	0.626	1.579	.117
Performance	3.91	0.590	3.83	0.620	0.613	.541

**Significant at $p<0.01$
*Significant at $p<0.05$

Since there were differences in the mean scores between these two groups, additional PLS analyses need to be conducted to examine the effect of industry in the relationship between IMP, MAS information and performance.

Table 5.24 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for IMP, MAS information and performance, for electrical and electronics sector. As shown in Table 5.24, the composite reliability for all variables exceeded a minimum value of 0.70 and all variables achieved at least a minimum AVE value of 0.50. The square roots of AVEs (shaded numbers on the leading diagonals) were higher than any pair of their correlations (the lower left of the off-diagonal). These results indicate that all variables achieved adequate validity and reliability.

Table 5.24: Composite Reliability, AVE, Square Root of AVE and Correlations (Integrated Manufacturing Practices, MAS Information and Performance) for Electrical and Electronics Sector

Construct	Composite Reliability	AVE	IMP	MAS	Perf
IMP	0.906887	0.764846	0.874555		
MAS	0.913225	0.725373	0.743785	0.851688	
Perf	0.885705	0.794940	0.621439	0.802110	0.891594

Note:

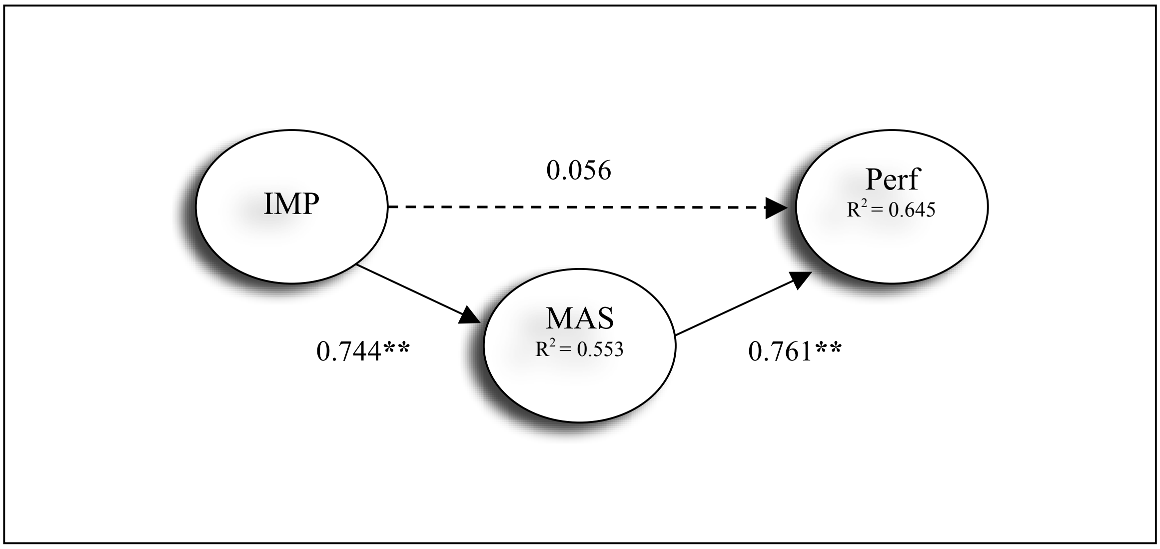
IMP = Integrated manufacturing practices

MAS = Management accounting systems

Perf = Performance

AVE = Average variance extracted

Figure 5.9 summarises the results of the PLS analysis for IMP, MAS information and performance, including the path coefficients (β estimates), path significances (p-values), and variance explained (R^2 values) for dependent variables, for electrical and electronics sector. As shown in Figure 5.9, the relationship between IMP and performance (Perf) was positive but not significant ($\beta = 0.056$, $p > 0.1$). Both hypothesised paths from IMP to MAS as well as from MAS to performance were positive and significant at the 1% significance level with β equal to 0.744 and 0.761, respectively. As shown by the R^2 values, IMP explained 55.3 per cent of the variance in MAS, whereas IMP and MAS explained nearly 65 per cent of the variance in performance.



** Significant at p<0.01

Note:
IMP = Integrated manufacturing practices
MAS = Management accounting systems
Perf = Performance

Figure 5.9: The Relationship between Integrated Manufacturing Practices, MAS Information and Performance for Electrical and Electronics Sector

Table 5.25 tabulates the results for composite reliability (ρ_c), AVE, square root of AVE and latent variable correlations for IMP, MAS information and performance, for other sectors. Using the similar assessments of validity and reliability as in the previous sections, all variables were found to be valid and reliable since they fulfilled all the requirements of validity and reliability.

Table 5.25: Composite Reliability, AVE, Square Root of AVE and Correlations (Integrated Manufacturing Practices, MAS Information and Performance) for Other Sectors

Construct	Composite Reliability	AVE	IMP	MAS	Perf
IMP	0.849230	0.654198	0.808825		
MAS	0.875153	0.639206	0.591714	0.799504	
Perf	0.897734	0.814448	0.504793	0.653459	0.902468

Note:

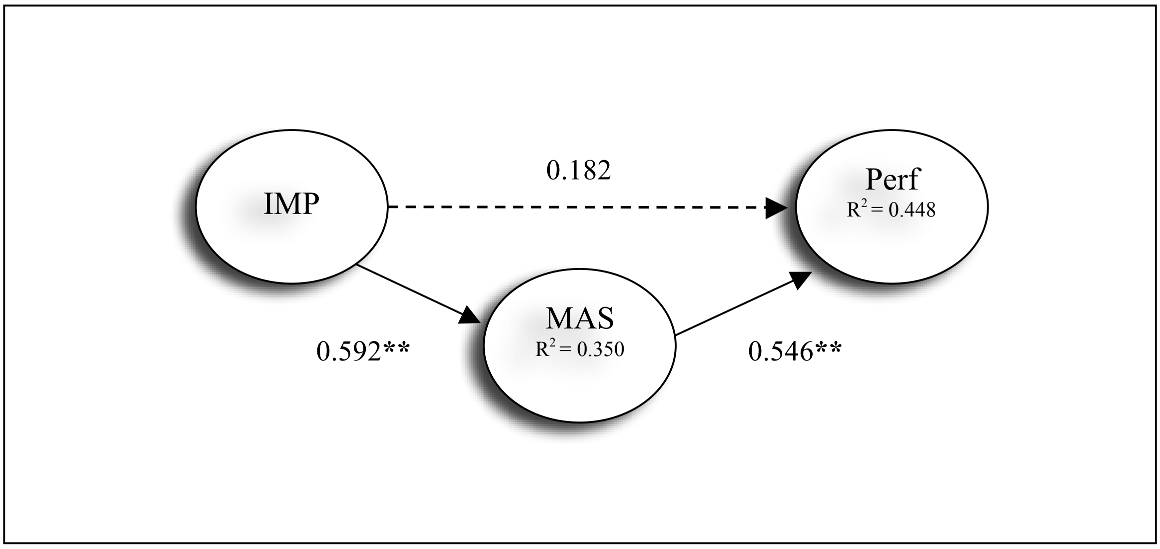
IMP = Integrated manufacturing practices

MAS = Management accounting systems

Perf = Performance

AVE = Average variance extracted

Figure 5.10 summarises the results of the PLS analysis for IMP, MAS information and performance, including the path coefficients (β estimates), path significances (p-values), and variance explained (R^2 values) for dependent variables, for other sectors. As portrayed by Figure 5.10, the relationship between IMP and performance (Perf) was positive but not significant ($\beta = 0.182$, $p > 0.05$). Both hypothesised paths from IMP to MAS as well as from MAS to performance were positive and significant at the 1% significance level with β equal to 0.592 and 0.546, respectively. As shown by the R^2 values, IMP explained 35 per cent of the variance in MAS, whereas IMP and MAS explained about 45 per cent of the variance in performance.



** Significant at p<0.01

Note:
IMP = Integrated manufacturing practices
MAS = Management accounting systems
Perf = Performance

Figure 5.10: The Relationship between Integrated Manufacturing Practices, MAS Information and Performance for Other Sectors

The above analyses show that there is no difference in the results for the relationship between IMP, the use of MAS information and performance, between electrical and electronics, and other sectors. Hence, it can be concluded that the types of industry do not influence the relationship between IMP and performance. The use of MAS information still mediates the relationship between IMP and performance, even after controlling for the size and industry effect, indicating the importance of MAS information in enhancing organisational performance of Malaysian manufacturing firms.

5.1.7 Summary of Hypotheses Testing

Table 5.26: Summary of Research Objectives, Hypotheses and Results of Hypotheses Testing

Research Objectives	Hypotheses	Results
1) To examine the relationship between intensity of market competition and the use of integrated manufacturing practices.	H1: There is a positive relationship between the intensity of market competition and the use of integrated manufacturing practices.	Supported
	H1a: There is a positive relationship between the intensity of market competition and JIT implementation.	Supported
	H1b: There is a positive relationship between the intensity of market competition and TQM implementation.	Supported
	H1c: There is a positive relationship between the intensity of market competition and AMT implementation.	Supported
2) To examine the relationship between strategy and the use of integrated manufacturing practices.	H2: There is a positive relationship between the prospector strategy and the use of integrated manufacturing practices.	Supported

Table 5.26: Summary of Research Objectives, Hypotheses and Results of Hypotheses Testing (continued)

Research Objectives	Hypotheses	Results
3) To examine the relationship between integrated manufacturing practices and business unit performance.	H3: There is a positive relationship between integrated manufacturing practices and performance.	Partially supported
	H3a: There is a positive relationship between JIT implementation and performance.	Supported
	H3a1: There is a positive relationship between JIT implementation and financial performance.	Supported
	H3a2: There is a positive relationship between JIT implementation and non-financial performance.	Supported
	H3b: There is a positive relationship between TQM implementation and performance.	Supported
	H3b1: There is a positive relationship between TQM implementation and financial performance.	Supported
	H3b2: There is a positive relationship between TQM implementation and non-financial performance.	Supported

Table 5.26: Summary of Research Objectives, Hypotheses and Results of Hypotheses Testing (continued)

Research Objectives	Hypotheses	Results
	H3c: There is a positive relationship between AMT implementation and performance.	Not supported
	H3c1: There is a positive relationship between AMT implementation and financial performance.	Not supported
	H3c2: There is a positive relationship between AMT implementation and non-financial performance.	Not supported
4) To examine the relationship between integrated manufacturing practices and MAS.	H4: There is a positive relationship between integrated manufacturing practices and managers' use of MAS information.	Supported
	H4a: There is a positive relationship between integrated manufacturing practices and managers' use of broad scope MAS information.	Supported
	H4b: There is a positive relationship between integrated manufacturing practices and timeliness of MAS information.	Supported
	H4c: There is a positive relationship between integrated manufacturing practices and managers' use of integrated MAS information.	Supported

Table 5.26: Summary of Research Objectives, Hypotheses and Results of Hypotheses Testing (continued)

Research Objectives	Hypotheses	Results
	H4d: There is a positive relationship between integrated manufacturing practices and managers' use of aggregated MAS information.	Supported
5) To examine the relationship between MAS and business unit performance.	H5: There is a positive relationship between managers' use of MAS information and performance.	Supported
	H5a: There is a positive relationship between broad scope MAS and performance.	Supported
	H5b: There is a positive relationship between timeliness and performance.	Supported
	H5c: There is a positive relationship between integration and performance.	Not supported
	H5d: There is a positive relationship between aggregation and performance.	Supported
6) To examine whether MAS mediates the relationship between integrated manufacturing practices and business unit performance.		Mediating effect of MAS is confirmed

5.1.8 Discussion of Survey Findings

5.1.8.1 Market Competition and Integrated Manufacturing Practices

The results of hypotheses testing provide support for the hypothesis that market competition and IMP are positively related, which is consistent with our expectation. Generally, the findings of this study support the study of Khandwalla (1972, 1973) that market competition influences the use of management controls, and that of Das et al. (2000), Chong and Rundus (2004), and Ax et al. (2008) that market competition influences the use of certain practices such as quality practices, TQM and target costing.

The rapidly changing business environment has led to intense market competition. To survive and prosper in such environment, manufacturing firms have to cope with an increase in product range, a decrease in product life cycles (Mia and Clarke, 1999) and changes in manufacturing technology, as well as drastic changes in their cost structure, control and process, which demand continuous revision of their strategy and manufacturing techniques. One of the techniques is the adoption of integrated manufacturing practices. In this study, market competition was found to have a positive and significant relationship with all three dimensions of IMP: JIT, TQM and AMT. The results are expected because firms that face market competition will take strategic actions to compete with their rivals. For example, they have to produce and market high quality products that meet certain quality standards to satisfy customer needs (Das et al., 2000). To achieve this, manufacturing firms adopt TQM practices that focus on continuous improvements in products and processes. Furthermore, due to intense competition, firms face uncertain customer demands and are constrained by tight budgets. One of the methods that can assist firms to manage these is JIT system. JIT is based on the concept of the pull system, where inventories are only ordered when they are going to be used in the production process, according to the customer demand. Thus, costs could also be reduced due to less space being needed for inventory storage.

In today's modern environment, adoption of AMT is a necessity for most manufacturers. In the condition of high competition, speed is very crucial. The faster the information is received, the speedier the new product enters the market, which could help the firm to achieve competitive advantage. In this regard, the advancement in technology could speed up the production process and retrieval of information. In the manufacturing environment, the adoption of AMT could help the firms to produce large quantities in a shorter period of time.

5.1.8.2 Strategy and Integrated Manufacturing Practices

Miles and Snow (1978) show that different typologies exist to categorise different types of business strategy in organisations. They further suggest that different types of strategy are suitable for different functions and conditions. As discussed in previous chapters, strategy could also influence the type of control system adopted by organisations.

Similar to other types of organisations, manufacturing firms also need to find the appropriate strategy in order to sustain and remain competitive. The strategy adopted should suit the nature of their business. Similar to Dansky and Brannon (1996), Kotha and Swamidass (2000), and Prajogo and Sohal (2006), the findings of the current study suggest that the business strategy adopted by the firms influences the use of manufacturing practices. Specifically, only prospector strategy is related to the use of IMP. This result is expected due to the characteristics of the prospector strategy, which are consistently looking for product and market opportunities and able to work in a flexible and uncertain environment (Miles and Snow, 1978). In addition, the literature on manufacturing strategy also found that JIT is related to cost, quality, and flexibility strategies (Swamidass and Newell, 1987), AMT is suitable with strategies focusing on flexibility (Jaikumar, 1986 and Parthasarthy and Sethi, 1992), and TQM is related to quality, delivery and scope flexibility strategies (Dean and Snell, 1996). Furthermore, as the objective of implementation of integrated manufacturing practices is to gain competitive advantage, the prospector strategy is more likely to be applied in organisations adopting integrated manufacturing practices.

5.1.8.3 Integrated Manufacturing Practices and Performance

The results of the overall model showed that overall IMP is not significantly related to performance. However, further examination of individual IMP dimensions indicates that JIT and TQM have a significant positive relationship with performance, whereas AMT has no significant relationship with performance. The results are consistent with Dean and Snell (1996) who also found that the overall set of IMP was not significantly related to performance, and that only TQM has a significant positive relationship with performance. Moreover, Dal Pont et al. (2008) also found that JIT and TQM have a direct and positive impact on performance.

As expected, this study found that JIT practices were positively related with performance, both financial and non-financial performance. This result is consistent with Crawford et al. (1988), Banker et al. (1993), Balakrishnan et al. (1996), Mia (2000), Callen et al. (2000), Fullerton et al. (2003), Chenhall (2003; 2007), Matsui (2007), Dal Pont et al. (2008), and Mackelprang and Nair (2010). This is expected due to the objectives of JIT systems being to eliminate waste and reduce costs. By eliminating waste in the production process through the reduction of set up times and preventive maintenance programmes, it will lead to improvements in productivity and product quality, which, in turn, will reflect in performance indicators. Similarly, by reducing costs such as inventories and storage (warehouse), the firm profitability will increase. Balakrishnan et al. (1996) suggested that JIT firms could improve their profitability in at least three ways: (a) by enhancing competitive advantage in the firms' product markets due to increases in manufacturing flexibility, higher production quality, and lower manufacturing lead time; (b) lower inventory levels; and (c) by reducing the cost of physical assets such as warehouses.

The relationship between TQM and performance was also found to be positive and significant. Past studies (McCabe, 1996; Idris et al., 1996; Dean and Snell, 1996; Choi and Eboch, 1998; Hendricks and Singhal, 1997; Kaynak, 2003; Rao et al., 2004; Dal Pont et al., 2008) also reported similar findings. The TQM philosophy aims to continuously improve quality from the acquisition of resources until after sales service (Kaynak, 2003). Due to the holistic approach of TQM, firms could improve their performance as a result of an improvement in quality in every process. For example, improvement in production processes should result in lower scrap and rework costs. The reduction in these costs will consequently be reflected in improved productivity, quality and financial performance. Also, as the quality of the products and services improve, firms can charge higher prices and gain a higher profit margin. In addition, improvement in quality will help to enhance customer satisfaction and, thus, could promote loyalty.

The relationship between AMT and performance is not significant. In fact, the relationship between AMT and financial performance is inverse (β = -0.018). A possible explanation could be the high costs incurred for investment in AMT equipment and technology, which outweigh the benefits of AMT implementation in shorter term. Another plausible explanation might be because the benefits of AMT implementation could only be seen after a certain period of implementation. Even though this result is not consistent with earlier expectation, the results of previous studies such as Dean and Snell (1996) also reported similar findings.

5.1.8.4 Integrated Manufacturing Practices and MAS Information

Consistent with earlier expectations, the results show that IMP has a significant and positive relationship with all dimensions of MAS information. This implies that the implementation of IMP demands greater use of MAS information. These findings are similar to Mia and Winata (2008), who found JIT application is related to higher use of broad scope MAS information. Mia (2000) argued that the use of MAS information is very critical in the JIT environment due to the lack of slack resources to cushion against the problems such as defective raw materials and production errors. The use of MAS information could help managers to ensure that there are no defective raw materials or errors in the production process. Hoque and Alam (1999) also showed that TQM implementation led to changes in management accounting and reporting processes.

Similarly, Isa and Foong (2005) also found that the adoption of AMT requires changes in the cost structure and information needs of managers.

The results of this study suggest that manufacturing firms that adopt IMP used more broad scope MAS, timeliness, integration and aggregation. This is consistent with the proposition made by Chenhall (2003; 2007) that TQM is associated with broadly based MCS, such as timely and external information, and advanced technologies, such as JIT and FMS, are associated with broadly based MCS.

In advanced manufacturing environment, MAS information should be broader in scope. Broader scope means the information focuses more on non-financial data, future oriented data and external information. The implementation of IMP requires broad information. For example, JIT and AMT would require non-financial information such as machine efficiency, output rates and scrap levels to monitor the production processes. This information is also useful for TQM to monitor the quality. Future oriented information such as the probability of an event occurring is needed for IMP firms because the information could help them to plan for the future. Proper planning is important for manufacturing firms in order to compete with their rivals and ensure they gain competitive advantage. Similarly, information that is external to organisations such as economic conditions, population growth, technological development and labour market is also useful for IMP firms to remain competitive. For example, these firms should be aware of the current economic conditions and labour market in order to determine the product price, costs and workforce.

All firms, regardless of JIT, TQM and AMT, would require timely information. If the information arrives immediately upon request, is supplied as soon as the process is completed, with no delay in reporting, and reports are provided in a timely manner, it would help managers to act faster and make more accurate decisions. For instance, the delay in information supplied would affect the efficiency of the production processes. High rework costs and an increasing number of defective products due to machine inefficiency or low quality materials could be detected and properly addressed if timely information is being reported.

The implementation of IMP also requires integrated information. The information for every section, department, and business unit should be integrated to ensure the smooth running of the operation. The assembly department, for example, needs information from the warehouse and machining departments before the production starts. If the information is not integrated between the departments or sections, production might stop unexpectedly due to insufficient raw materials or machine breakdown. If this happens, it would result in huge loss and poor quality performance, especially for JIT firms that do not have any buffer stock to fall back on. Integrated information is also needed for AMT firms. By using information from other departments, it is easier for the managers in AMT firms to integrate computers and machines.

The information among sections, departments, and business units should also be aggregated. Aggregated information provided by MAS ranges from provision of raw and unprocessed data to aggregation around periods of time or areas of interest such as responsibility centres or functional areas (Chenhall and Morris, 1986). Aggregated information could assist managers to make managerial decisions. The coordination and pool of information from various departments or periods of time is more valuable and informative than information based solely on a single department or at one point of time. As TQM focuses on a holistic approach to improve quality, aggregated information from various departments is crucial to ensure the successful implementation of this practice. JIT firms also need aggregated information, especially for inventory analysis. Aggregated information would help managers in JIT firms to estimate the re-order point so that only an adequate amount of inventory is maintained at all times. In fact, aggregated information is useful to all firms since the information can be used to make financial analyses and formal decision models such as discounted cash flow analysis for capital budgeting, incremental analysis and credit policy analysis.

5.1.8.5 MAS Information and Performance

Among the four dimensions of MAS information, this study found that broad scope, timeliness and aggregation are positively related to performance, while integration has a positive but weak relationship with performance (not significant). This result indicates that the respondents perceived the integration of information between sections, departments, or business units do not have a significant relationship with performance. However, the overall result showed that MAS information has a positive impact on performance ($\beta = 0.599$, $p < 0.01$). Therefore, the use of MAS information by managers could help the organisation to achieve better performance, which is similar to the study of Chenhall and Morris (1995), Sim and Killough (1998), Mia and Clarke (1999), Mia (2000) and Hoque (2011), among others.

The broader the scope of MAS information, the better the organisation could achieve its performance targets. This means that if managers use more non-financial, external and future oriented information provided by MAS, the higher the chances of meeting their performance targets. A possible explanation could be because the performance indicators consist of financial performance as well as non-financial performance. Furthermore, if the information used by managers is not limited to internal and historical oriented information, they could see a broader view of the situation. For example, external information on the economic conditions and the possibility of certain events occurring could help managers identify ways to achieve the desired performance targets. Similarly, the information provided on a timely basis could help managers to meet their performance targets. This is because they could detect any significant variances that exist in the report earlier and take immediate action to correct them. The early detection of problems and fast action could have a positive impact on performance. The aggregated information could also help managers to ensure better performance. When the information is aggregated either by periods of time or areas of interest, the managers could assess the performance of the organisation as a whole. This information enables managers to analyse trends and take corrective action if any deviations from the targeted performance exist.

Even though the relationship between integration and performance is not significant, it is in the expected direction. Thus, we can conclude that the integration of information between sections, departments, or business units could help firms to achieve better performance targets, albeit the strength is not strong.

5.1.8.6 Integrated Manufacturing Practices, MAS Information and Performance

This study also found that the MAS information mediates the relationship between IMP and performance, consistent with the findings by Sim and Killough (1998), and Mia (2000). Sim and Killough (1998) showed that the use of inappropriate management accounting systems by the firms is an important factor that contributes to the unsuccessful implementation of TQM or JIT. Mia (2000) found that JIT firms that had a higher amount of MAS information performed better compared to those firms that had a lower amount of MAS information. Therefore, the use of the information provided by the MAS assists managers to adopt and implement manufacturing practices more efficiently and effectively. Consequently, the findings provide evidence that support the argument that today's firms need broader information, more timely, aggregated and integrated information to sustain their performance. The results add further empirical evidence in the context of Malaysian manufacturing firms that MAS play an important role in enhancing performance.

5.2 Results of the Semi-Structured Interviews

The second phase of data collection involved semi-structured interviews. The aim of the semi-structured interviews was to obtain further insights and gather in-depth information concerning the issues pertaining to IMP and the role of MAS in manufacturing firms in Malaysia. The qualitative data gathered from interviews could supplement the earlier findings obtained from the questionnaire survey as well as providing possible explanations for any unexpected findings.

The earlier findings from the survey revealed that the relationship between AMT and non-financial performance was positive but not significant. Furthermore, the relationship between AMT and financial performance was in the opposite direction than expected. Similarly, the integration of information was found to be positive but not significantly related to performance. Since these findings are unexpected, further clarification is needed. Thus, it is hoped that the explanations and opinions gathered from the selected managers through interviews could provide additional explanation and further insights to supplement the survey findings.

5.2.1 Sample Profile

The prospective respondents for the semi-structured interviews were selected from the survey respondents. Those survey respondents who provided their contact details and were located in the Klang Valley were identified. Since the main purpose of the interview is to supplement the survey findings and due to time constraints, only ten respondents from manufacturing firms operating in the Klang Valley were chosen. Isa (2005) also interviewed ten respondents to support her survey findings. After they were identified, telephone calls were made to each of them to seek their permission to be interviewed. Once they agreed to be interviewed, an appointment was made at a suitable time and venue chosen by the interviewees.

Before starting the interview session, the researcher introduced herself and her affiliation. Then, the researcher briefly explained the objective of the interview. The interviewees were also assured that the information provided would be used solely for academic purposes and the identity of the participants and the organisations they represented would not be disclosed. In addition, a letter formally requesting their participation in the interview was also given to the interviewees. The letter contained the background of the researcher, objectives of the interview, and confidentiality of the information provided. A copy of the letter is attached in Appendix B-1.

Several definitions of the terms that are going to be used in the interview process were briefly explained so that the participants could understand and be well prepared before the session began. The researcher also requested the participants' permission to tape the session. Only when the consent is granted, does the researcher have the right to record the interview. Five participants agreed to be recorded while the remaining five preferred not to be recorded because of the confidentiality of the information, or it was against company policy, or because they found it inconvenient.

Table 5.27 depicts the profile of the interviewees. As shown in Table 5.27, the participants held various positions. Two of them were Production Managers, three were managers in charge of various departments, while the remaining five were Engineer, Accountant, Senior Manager, Factory Controller and Head of Manufacturing Department. They were selected because of their broad knowledge of the overall operation of the firms. Furthermore, all of them had more than ten years working experience in the current firms. Thus, based on their positions and working experience with the firms, it can be concluded that the participants have the expert knowledge on issues related to the research problems of this study, and are capable of providing accurate and reliable information on the operation of the firms as a whole. Their perceptions and opinions provide valuable insights into the research issues because they are directly involved in the operations and decision making processes. With the exception of one participant, the rest of them were male. Most of them (7) were between 30 to 39 years old, while three were aged between 40 to 49 years.

Table 5.27: Profile of Interviewees

Interviewee	Designation	Working Experience (years)	Gender	Age
1	Engineer	15	Male	39
2	Accountant	13	Female	36
3	Manager, Finishing Unit	20	Male	47
4	Senior Manager	12	Male	36
5	Factory Controller	13	Male	36
6	Manager, Moulding Division	15	Male	39
7	Production Manager	22	Male	39
8	Production Manager	18	Male	44
9	Manager, Occupational Safety and Health	18	Male	43
10	Head of Manufacturing Department	13	Male	37

Table 5.28 tabulates the profile of the firms that the participants represented. In order to obtain various information, opinions and perceptions, the participants were selected from manufacturing firms representing various industries. Two of them were from the electrical and electronics industry, others were from machinery and equipment; iron, steel and metal products; building materials, cement, concrete, ceramics and tiles; food and beverage; rubber and plastic products; tobacco; household products and appliances; and transport and automotive parts/components. Even though two firms were from the electrical and electronics industry, their product lines were different. While the former firm produces electrical and electronic products, the latter firm manufactures electrical and electronic parts. Thus, these firms might face different types of competition and adopt different types of strategy and technology. They could also have different opinions and perceptions on the issues pertaining to competition, strategy, IMP, MAS and performance.

Similar to the survey, the sample firms comprised a combination of small, medium and large firms. Half of them were from big firms with employees of more than 500, four of them had between 151 to 500 employees, and one firm represented small and medium sized (SME) firms with less than 150 employees. All firms had operated more than ten years, indicating that they are established firms. In terms of ownership structure, eight were foreign owned firms while two were locally owned firms. Among the foreign owned firms, four firms were from European countries (France, Switzerland and Sweden), three firms originated from Japan, and another firm was from India.

Table 5.28: Profile of Sample Firms

Interviewee	Type of Industry	No. of Employees	Years in Operation	Ownership
1	Electrical and electronic products	400	33	Japan
2	Machinery and equipment	130	32	Local
3	Iron, steel and metal products	400	50	India
4	Building materials, cement, concrete, ceramics and tiles	300	24	France
5	Food and beverage	914	39	Switzerland
6	Electrical and electronic products (parts)	600	24	Japan
7	Rubber and plastic products	600	22	Japan
8	Tobacco	230	37	Switzerland
9	Household products and appliances	1,250	14	Sweden
10	Transport and automotive parts/components	1,200	19	Local

5.2.2 Discussion of Interview Findings

Before discussing the interview findings, it is useful to revisit the findings of the survey. The following findings were revealed from the survey:

1. There was a positive relationship between the intensity of market competition and the use of integrated manufacturing practices (supports H1).
2. There was a positive relationship between prospector strategy and the use of integrated manufacturing practices (supports H2).
3. The relationship between integrated manufacturing practices and performance, as well as between AMT and non-financial performance, were positive but not significant. Furthermore, the relationship between AMT and financial performance was inverse. Thus, H3 was partially supported.
4. There was a positive relationship between integrated manufacturing practices and managers' use of MAS information (supports H4).
5. There was a positive relationship between managers' use of MAS information and performance (supports H5). However, the relationship between integration and performance even though positive, was not significant.

To gain additional insight on the findings, these issues were revisited during the interviews.

5.2.2.1 Market Competition and Integrated Manufacturing Practices

The findings from the survey showed that market competition is positively related with the use of IMP. Further examination on individual components of IMP also produced similar findings. When firms perceived a high level of market competition, they use higher level of JIT, TQM and AMT. To find additional insights on these findings, opinions on this issue were sought during the interviews.

The results from the interviews revealed that five out of ten respondents perceived the current level of competition faced by their organisations were very intense and challenging. The intensity of market competition faced by these firms has resulted from various factors such as customer demands for the product in the market, the frequency of technological change and development in manufacturing technology and knowledge in the industry, frequency of new product introduction, number of competitors competing with each other to secure the contract, and increasing cost of raw materials and logistics. The other five respondents stated that they faced low competition, as there are only a few market players. For example, Interviewee 2 (Accountant) perceived that her organisation faced very low competition because there are less than ten players in the market. In addition, the company has an additional competitive edge as it obtained a licence from Mitsui Babcock (industry-based quality certification body), and this allows the company to secure many orders. Similarly, Interviewee 3 (Manager) perceived very low competition faced by his organisation because there are only two aluminium plants in Malaysia, furthermore, the other plant is a smelting plant and produces different aluminium products. In fact, they are the largest manufacturer of aluminium rolled products in the world. Interviewee 7 (Production Manager) also perceived very low competition faced by his organisation because the company produces unique products. Even though there are a few competitors in this market segment, the company is not adversely affected as it is the pioneer in the market and has established a good relationship with its customers. Interviewee 8 (Production Manager) also agreed that the very small competition faced by his organisation is due to the established market in which there are only three producers of tobacco in Malaysia. Interestingly, he added, that "In the tobacco industry, we do not compete among each other but we work together". He further stated that counterfeit products, access to marketing channels and changes in government rulings and regulations on smoking contribute the most to the intensity of market competition in the tobacco industry. Hence, all tobacco manufacturers must work hand in hand with the government to handle these issues, especially concerning counterfeit products.

To minimise the impact of competition, almost all of the respondents agreed that controlling and maintaining quality is the most important factor. Two respondents (Interviewees 6 and 10) indicated that their organisations stressed Quality, Cost and Delivery (QCD) to gain competitive advantage. If they do not control and monitor these three factors, their customers could terminate the contracts and switch to others. The importance of quality is further confirmed as Interviewee 6 stressed that his organisation's motto is "Quality is Priority". With regard to quality, Interviewee 10 (Head of Manufacturing Department) added that:

> "Compliance to international industry standards and providing the highest quality assurance from industry-based certification bodies help our company to stand out from the competition"

Most of the respondents stated that their firms have obtained certain quality standards such as ISO/TS 16949, ISO 9001, ISO 18001 and ISO 14001. To ensure quality, they must also implement modern and advanced technologies. As Interviewee 7 pointed out, “In order to achieve a certain quality standard, we have to improve our technology”. In addition, as Interviewee 6 supplemented:

> “To maintain quality, we have carried out various “never ending” improvement activities. We called it “never ending” improvement activities because we believe that continuation becomes strength”

All interviewees also agreed that JIT and AMT assist their organisations to sustain their market position. For example, Interviewee 3 agreed that JIT could help to reduce costs and increase inventory turnover. The Factory Controller from the food and beverage company (Interviewee 5) also agreed that JIT leads to improved working capital and reduces waste, as well as cost in terms of stockholding. Similarly, Interviewee 1 and 5 suggested that AMT contributes to significantly faster manufacturing process turnover, reduced error and improved productivity. They believed that manufacturing processes should not depend on humans.

The Production Manager from the tobacco company (Interviewee 8) had a different opinion on how JIT, TQM and AMT could assist the organisation in sustaining its market position. According to him, the implementation of these three techniques could motivate employees to work harder.

> “For me, JIT, TQM and AMT are effective if they can be used to motivate employees. Before implementing these techniques, we have to send our employees for training to enhance their skills and knowledge. They become multi-skilled employees and, subsequently, gain higher pay. Thus, the implementation of JIT, TQM and AMT would motivate employees to work harder and improve their own performance as well as company’s performance”

The Head of Manufacturing Department of a local company (Interviewee 10) also agreed that by combining hardware (machinery) and software (skilled workers), they are able to cater to a diverse range of customer expectations and requirements.

Therefore, consistent with the survey findings, the opinions gathered from the semi-structured interviews also suggested that firms adopt IMP to survive competition. As competition intensifies, manufacturing firms try to find ways to satisfy customers and gain a competitive advantage. The adoption of IMP assists firms to produce quality products, enhance productivity and reduce costs to be able to compete in the condition of high competition.

5.2.2.2 Strategy and Integrated Manufacturing Practices

The findings from the survey indicate that there is a positive relationship between strategy and the use of IMP, particularly, suggesting that the prospector strategy is positively related with the use of IMP. Further information was sought during the interviews to support these findings.

A review of the responses of the interviews revealed that these firms adopt different types of strategy. The strategies vary from those that focus on innovation and technology, market opportunities and introduction of new product (prospector/ differentiation), to strategies that emphasise a high profit margin and low cost (defender/cost). However, the majority of the respondents indicated that their firms adopt the prospector/differentiation strategy. As one of the interviewees responded, "Of course, we also consider the costs but primarily, our focus is on product innovation". They believe that focussing on innovation and advancement in technologies assists them to survive in the competitive environment. There are also firms that employ a combination of strategies. One firm adopts a diversified strategy that requires multi-skilled employees and machine flexibility.

The majority of the interview participants (eight interviewees) also agreed that the types of strategy adopted are influenced by the types of industry, product line and business unit. According to the Engineer from the electrical and electronic firm (Interviewee 1), a strategy that focuses on innovation is more suitable for fast moving products. He further added that the adoption of a certain strategy also depends on the technology curve for those products. The Factory Controller from the food and beverage company (Interviewee 5) also believed that types of industry, product line and business unit influence the adoption of a certain strategy, regardless of whether the firm is a market leader or not. He stressed that the strategy that his firm adopts depends on the products that they produce. Since they have a range of product categories, they currently adopt different strategies. Interviewees 6 and 7 opine that different industries, product line and business units require different types of competition. Therefore, they need different strategies depending on the type of competition that they face. Other respondents also asserted that different industries, product line and business units have different types of strategy because the strategy adopted by a firm depends on the competitors, product costs, current economic situation as well as fulfilling customers and the board of directors' requirements.

With the exception of two participants (Interviewees 2 and 10), others agreed that business strategy influences the use of JIT, TQM and AMT. As for Interviewee 10, he believes that IMP is a must regardless of the strategy that the firm adopts as IMP is necessary to ensure continuous improvement. Those who agreed that business strategy influences the use of IMP gave various opinions. The Manager from an Indian based company opines that the company would find the best way to utilise resources and maximise firm performance. One way is through the adoption of IMP that suits the business strategy adopted by the firm. The respondent from a Switzerland based company gave a different view. According to him, the business strategy that the company adopts requires them to satisfy customers' needs. In fulfilling the consumer and retailer's demands, especially in terms of packaging, size, colour etc., the company needs to use IMP because of its flexibility and quality.

Regarding the type of strategy that is more suitable for the use of IMP, almost all respondents agreed that strategies that focus on innovation, quality and change product line frequently (prospector) are more suitable for the use of IMP because this strategy requires flexibility, fast response, stable and reliable system. The Production Manager from the Swiss based company responded:

> "…..because new innovation must be of high quality and enter the market as fast as possible before other competitors introduce their innovations. Therefore, innovation requires TQM and high technology for speedier production processes"

Even though all of the respondents suggested that the prospector strategy is more suitable for the use of IMP, two of them (Interviewees 6 and 10) also recognised that all types of strategy are actually suitable for the use of IMP because IMP is good and applicable for all.

Thus, from the discussion on the interview results above, it can be concluded that the business strategy adopted by manufacturing firms influences the use of IMP. Specifically, the prospector strategy is more related with the use of IMP. The results are consistent with the findings from the survey.

5.2.2.3 Integrated Manufacturing Practices and Performance

Contrary to expectation, the results from the survey failed to find a significant positive relationship between IMP and performance, or between AMT and non-financial performance. In fact, the relationship between AMT and financial performance was in the opposite direction than expected. Thus, it is important to validate whether these findings hold in actual practice. It is expected that the opinions gathered from the interviews could provide further explanation to these issues.

Except for Interviewee 2, all respondents agreed that the implementation of IMP could help an organisation to achieve its performance target. The Engineer from the Japanese based electrical and electronic firm replied:

> "Yes, because it helps the company to fulfil production demand due to faster production processes and reduces human error. With IMP, we are able to monitor and plan the performance. For example, we know when to re-order the materials etc., so that the production line would not stop unexpectedly and it could help us to meet our performance target"

He provided two reasons why IMP, especially AMT, is crucial in the electrical and electronics industry. First, the size of electronic parts is normally small and compact, which require specialised machines or equipments to manufacture. Therefore, they must use AMT. Second, the need for multi functions and flexibility in the manufacturing process requires the use of AMT. For example, one motherboard shares different functions. There are too many things embodied in it. Therefore, they need robots and computers to do the tasks in the manufacturing process.

Interviewee 3, who also agreed that IMP could help an organisation to achieve its performance target, gave the following reasons:

> "…because IMP can reduce costs and mudas (wastage), ensure effective use of raw materials, and the *kaizen* concept will ensure continuous improvement in every process to control and monitor quality"

Other reasons include the ability of the JIT system to reduce costs due to less stock holdings, ensure on-time delivery and sustainability of supply in the market; the ability of TQM to satisfy customers by producing quality products; and the ability of AMT to increase productivity and machine efficiency, fast data retrieval and ease of monitoring of progress and performance.

The Senior Manager from the French based company felt that the implementation of IMP could only help an organisation achieve its performance target if it is being implemented in the organisation as a whole, not partially implemented for certain departments. He stressed:

> "Everyone must be involved. If not, the employees will be demoralised and become like a virus in a system. All departments must aim to one target. It is like a pyramid system"

The Production Manager from the Swiss based company had a different opinion regarding the way IMP assists organisation to achieve its performance targets. He opined:

> "IMP makes people stay focussed, more disciplined and cooperative, creates stronger teamwork, and enhances skills and knowledge. These factors would contribute to higher productivity with no defects and help the organisation to achieve its performance target"

The PLS results showed that the direction between AMT and non-financial performance was positive but the direction between AMT and financial performance was negative.

With regards to the negative relationship between AMT and financial performance that was found from the survey, the respondents felt that this could be due to several factors. The increase in the cost of spare parts, maintenance, and manpower are among the factors that contribute to the negative impact of financial performance for AMT firms, as highlighted by Interviewee 4. He added:

> "The increase in the price of spare parts and expensive technical support from Original Equipment Manufacturers (OEM) may exceed the budget limit. However, to be more advanced, you have to invest more. If we use conventional methods, we could still rely on a "trial and error" basis. But with AMT, we need highly specialised technical personnel. Even though less workers, we still incur high costs due to specialised employees."

Three respondents suggested that the time factor is the main reason for AMT companies experiencing a negative financial impact. As Interviewee 1 answered:

> "It relates to the ability of the company to sustain within a short term. AMT requires huge financial investment. So, the financial performance will be affected in the short run. The situation will get worse, especially during a financial crisis environment. However, in the long run, it will be profitable. The only problem with AMT is when the machine breaks down. It will incur high cost either to repair or to buy a new one"

Similarly, Interviewee 8 expressed a similar view. He replied:

> "True, because the high costs of AMT machines would be expensed out as depreciation over several years. In Malaysia it normally takes between 5 to 7 years. Within these periods, there is a tendency that the company will suffer net losses as the result of depreciation expenses. Only after certain years of implementation, will the benefits of AMT be reflected in the form of profit because the benefits outweigh the costs of implementation. To minimise the negative financial impact of AMT, we supplemented it with other manufacturing techniques or systems that could generate less wastage and gain high quality. So, the impact is not so severe"

To further minimise the impact of financial loss in the near future, the Accountant from a local firm (Interviewee 2) suggested that the AMT firms capitalise the costs and amortise them over a longer period.

Interviewee 3 thought that the inverse relationship between AMT and financial performance depends on the product mix. If the firms have the right product mix, the problem will not exist because they could adjust the costs using the product mix. Interviewee 5 felt that the impact of AMT implementation on financial performance depends on the cost of labour. In countries where labour costs are high, the implementation of AMT will result in favourable financial performance because the hiring costs outweigh AMT implementation costs. In contrast, in countries where labour costs are low, the implementation of AMT could result in unfavourable financial performance. Therefore, to avoid the negative impact, he recommended that manufacturing firms compare labour costs and AMT implementation costs as well as the benefits gained after the installation of AMT. Interviewee 7 also suggested that another possibility as to why AMT firms experience negative financial performance might be because no feasibility study was carried out by that company before implementing the system.

In terms of the use of performance indicators, the results show that the respondents used both financial and non-financial indicators. While four of them used more financial indicators, the other four preferred to use non-financial indicators. Two respondents placed equal emphasis on both indicators. However, when they were asked to indicate the relative importance between the two, six of them chose financial performance to be more important than non-financial indicators even though they recognised that both types of indicator are important. This is because at the end of the day, people will look at the bottom line. In addition, financial performance is crucial for the management and shareholders to assess the survival of the company as well as indicators for the calculation and declaration of the bonus and dividend. This is similar to the finding of

Mia and Patiar (2001) who found that general managers used more financial than non-financial performance indicators in evaluating department managers' performance. The Accountant from the machinery and equipment company stated:

> "We don't have to be worried about non-financial performance because our quality is there. We only need to maintain the quality"

An analysis of the trend in the use of performance indicators showed that the majority of the respondents experienced changes in the use of performance indicators. Most of them suggested that their usage changed from financial to non-financial over the last 10 years. According to The Factory Controller from the Swiss based company, non-financial indicators have led over the past five years because they are more integrated. Moreover, The Manager from the household products and appliances firm commented:

> "Non-financial has been recently gaining more attention by most manufacturing based companies. With more highly educated employees joining the manufacturing sectors, the non-financial performance indicators have gained a significant position. If not higher, at least it gets more recognition from the business leaders. For manufacturing based business, the sale of quality products started from the production floor and the control is more related to non-financial"

This result supports the studies of Gordon and Narayanan (1984), Chenhall and Morris (1986), Mia (1993), Mia and Chenhall (1994), Naranjo-Gil and Hartmann (2006; 2007), Boulianne (2007), and Mia and Winata (2008), among others, that organisations nowadays use a broader scope of information that emphasises the use of non-financial information rather than financial information.

Overall, the information gathered from the interviews provides additional explanation for the relationship between IMP and performance. The perceptions and opinions obtained from the interviewees also give further insights into the relationship between AMT and performance.

5.2.2.4 The Role of MAS Information

The survey findings revealed that the use of MAS information by managers has mediated the relationship between IMP and performance. This finding suggests the importance of MAS information in improving organisational performance. The importance of MAS in assisting managers in their daily operations was further sought during the interviews.

All interview participants revealed that MAS information is very important in their day-to-day operations. They used information provided by MAS to monitor sales, collection and inventory level. The Manager of a Moulding Division stated that they used MAS information to tabulate and analyse the division's performance for the monthly managers' meeting. The information assists them in determining whether they have achieved their target. Therefore, good execution of MAS information could help organisations improve performance.

Among the four types of MAS information, the respondents rated Timeliness and Aggregation of information as more useful compared to others. The participants also did not agree that the integration of information is not related to performance. The Accountant (Interviewee 2) rated Integration as the most useful MAS because, for her, communication between departments is very important and is needed to ensure the smooth flow of operations between departments. The Engineer (Interviewee 1) also felt that the integration of information is very crucial.

> "Integration of information is crucial. For example, the integration of information between the warehouse and sales and marketing department could be used to monitor inventory level. As such, integration is an essential tool. If the information is not integrated, it would be difficult to perform tasks"

Interviewee 3 indicated that the integration of information could help to rectify problems quickly and enable fast action to improve and enhance performance. Interviewee 5 believed that an organisation will be left behind and gain no competitive advantage if the information is not integrated. According to Interviewee 8:

> "Integration is the backbone. That is why its relationship with performance is not visible. Integration involves various departments. Everyone does his or her role without realising that their works would improve the company's performance by integrating them with others"

Interviewee 4 had an interesting view about this issue. According to him, without integration, the culture of an organisation will not improve. With integration, people will be more open, promote teamwork, avoid individualism, and encourage the share of skills and knowledge. The improvement in the culture of an organisation will lead to an improvement in organisational performance.

With regards to the relevancy of MAS information in managing firms in today's advanced environment, all respondents felt that MAS is not just relevant, but that its usage is increasing from day to day in line with the advancement in technology. Interviewee 3 suggested that with the advancement of technology, MAS information would be more upgraded. For instance, with the paperless information system, the information could be disseminated very quickly using online systems. This could assist them to make fast decisions and it will save time, space and cost. This view was also supported by Interviewee 7, who suggested that the increasing information flows such as electronic mails and teleconference meetings make MAS more important. When asked about this issue, one of the interviewees who strongly disagreed with the statement, replied:

> "The concept of MAS is applicable to all. It depends on us on how we gather the information and make it relevant. One of the strong pillars of MAS is its ability to help us sustain our market competition. If there is no MAS, we will get incorrect information because there is no basis. For our company, it is very important"

The MAS information could help the firm to survive and cope with today's competition because they could provide useful information for decision-making. Another respondent suggested that ownership of MAS should be given to all. MAS could assist the company to meet its vision and mission.

Interviewee 8 portrayed that the timeliness of MAS information could improve the reputation and professional image of the company. Moreover, as indicated by the Department Head of transport and automotive parts company, accuracy and timeliness of information are very important for ISO compliance companies. To maintain the standards, the use of MAS information is crucial in their daily operations. He added that all four types of MAS information are interrelated to ensure efficiency of operation.

The findings from both the survey and interviews reveal the importance of MAS information in enhancing organisational performance. The MAS information is becoming more useful from day to day in line with the complexities of the business environment. The MAS information continues to play a significant role in spite of the increasing use of information technology.

5.3 Chapter Summary

This chapter discusses the results from the questionnaire survey, as generated by SPSS and PLS path modelling, as well as the results from the semi structured interviews. Overall, the results indicate that both contextual factors examined in this study (market competition and strategy) influence the use of integrated manufacturing practices. The more intense the market competition, the more likely the firms use IMP. Similarly, the business strategy adopted by the manufacturing firms also influences the use of IMP. Specifically, the prospector strategy is more suitable with the use of IMP. The results also suggest that the relationship between IMP and performance is indirect through the use of MAS information. Thus, MAS information acts as a mediator in the relationship between IMP and performance.