CHAPTER 5

RESEARCH METHODOLOGY

5.0 Overview of Chapter 5

The aim of this chapter is to present the research design and research models employed in this study. The research design will explain the details of the research methods to be used in this study, such as the unit of analysis, population, sampling frame, sampling techniques and sample size, sources of data, as well as the data collection and data analysis methods. The details of the instrumentation used in this study are also presented. Lastly, the data analysis method which is the Partial Least Square (PLS) is also discussed.

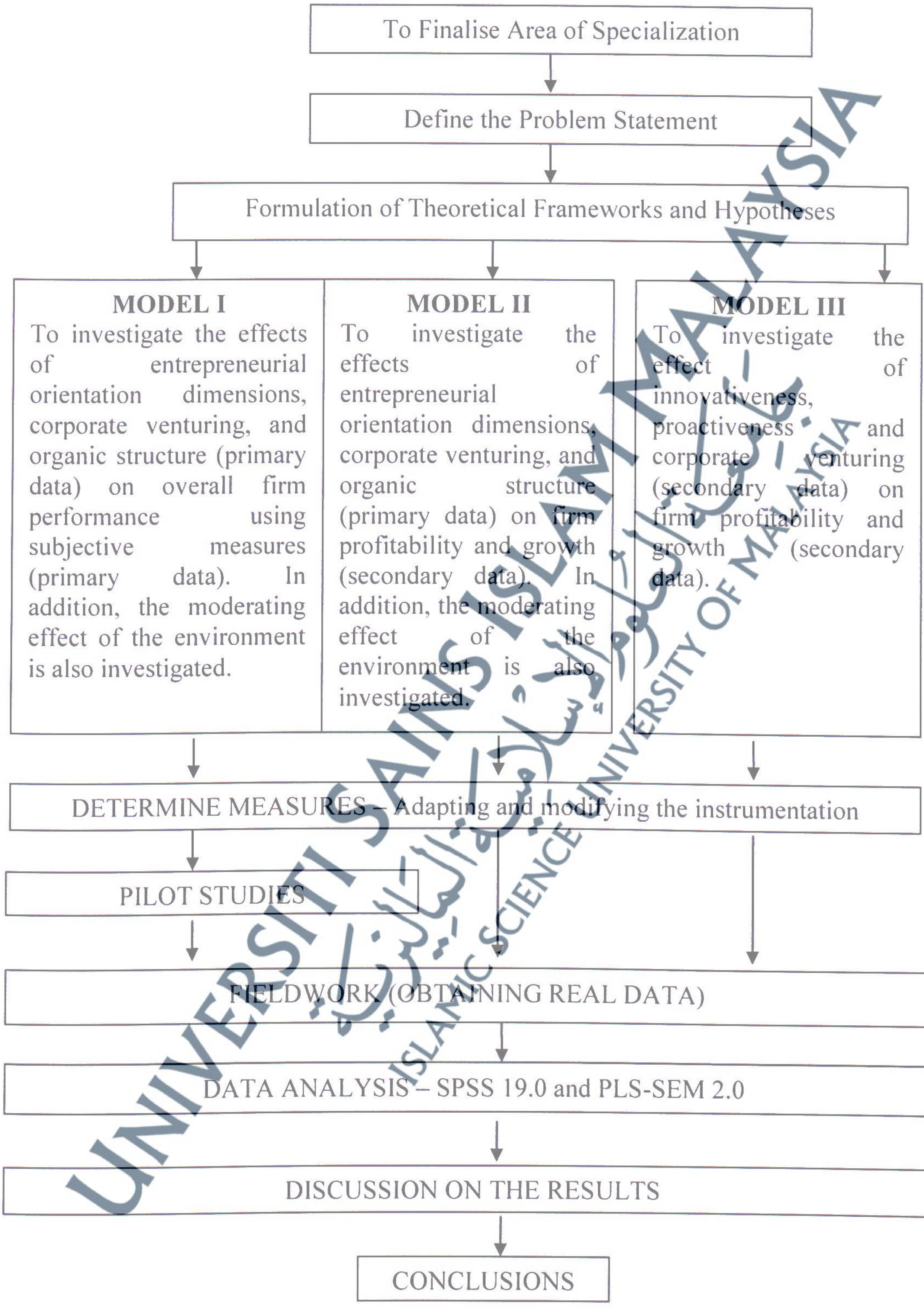
5.1 The Research Process

The research process depicted in Figure 5-1 summarizes the steps taken in this study. The first step involved an extensive literature review on the research area, to finalise the research topic and area to be studied, followed by identification of the research problem to define the purpose of the study. Next, the theoretical frameworks and hypotheses of this study were developed in order to solve the research problem. In order to strengthen the results of this study, three models were developed. Furthermore, the researcher determined the appropriate measures to test the hypotheses under study. Next, the instruments were tested by conducting pilot studies for Model 1 and 2. After doing minor modifications on the initial instrumentation, the fieldwork or collections of real data were conducted. The final step involved the data

analysis, its interpretations, discussions, and conclusions of the study. These steps were used in conducting this study. The objectives of the study, as mentioned in Chapter 1, are stated below:

1. To investigate the relationship between each of the entrepreneurial orientation dimensions (innovativeness, proactiveness, and risk taking) and firm performance;
2. To investigate the relationship between corporate venturing and firm performance;
3. To examine the relationship between organic structure and firm performance;
4. To determine whether the environmental dynamism and hostility moderate the relationship between the independent variables (entrepreneurial orientation dimensions, corporate venturing, and organic structure) and dependent variables (firm performance).

Figure 5-1: The Research Process in Hypothetic-Deductive Method



5.2 Research Models

There are five independent variable constructs in this study, namely, innovativeness, proactiveness, risk taking, corporate venturing and organic structure. Firm performance will be measured according to the firms' sales growth, return on assets (ROA), and return on sales (ROS). In accordance with previous studies on corporate entrepreneurship-performance relationship, the measurement of firm performance is conducted using a unidimenisonal and multidimensional construct which are growth and profitability. The proxy for the firm's growth is the sales growth, whilst the ROA and ROS were chosen as the proxy for profitability. The one moderating variable used in this study is environmental dynamism and hostility (one construct).

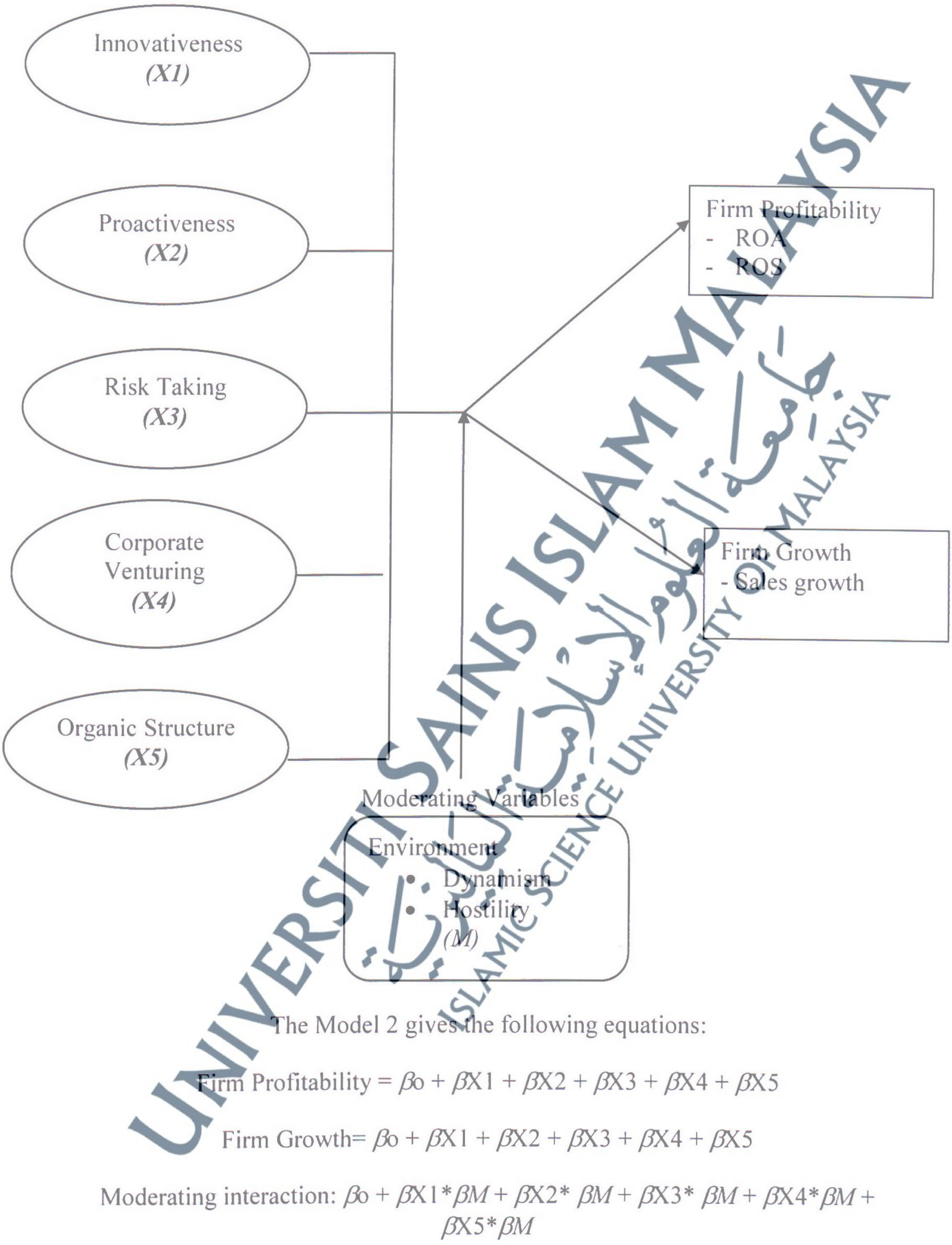
In order to achieve the objectives of the study and ensure its robustness, three models were developed to test the hypotheses. The first model consisted of 138 firms with all the data obtained from primary data sources. Unlike the two models, in this Model 1, firm performance is a unidimensional construct although corporate entrepreneurship may influence growth and profitability differently. This is because of high correlations (r = .498, .557, and .758) among the firm performance dimensions (ROA, ROS and sales growth), thus overall firm performance index was constructed to serve as the dependent variable in the analysis.

The second model comprised of 130 respondents, which were drawn from the first model. The data were drawn from the first model because these firms provided the names of their company in the questionnaire, and it was therefore possible to obtain their financial data from the company's annual reports and online sources. The independent variables and moderating variable are similar to the first model. The differences are the sources of the data and sample size. The source of the dependent

variable in the second model was from secondary data or using objective or actual data. Figure 5-2 and Figure 5-3 illustrates the Theoretical Framework of Model 1 and 2.

Figure 5-4 illustrates the Theoretical Framework of Model 3. There are only three independent variables in this Model 3 due to data constraints. The formula used to obtain innovativeness and proactiveness was adopted from Miller and Breton-Miller (2011). The third model in this study used secondary data for both the independent and dependent variables. Due to the unavailability of the data required in the analysis, there are only 35 samples in this model. The sample were drawn from manufacturing companies in the main market, Bursa Malaysia. These two sectors usually provide information regarding Research and Development (R & D) costs (Aniza et al., 2008) which is essential in Model 3. However, unlike the public listed firms in developed countries, developing countries do not make it mandatory to report the research and development (R&D) budget. Only a few firms reported this activity, leading to limitations in the sample size used. The summary of characteristics of each model are shown in Table 5-1.

Figure 5-3: Model 2



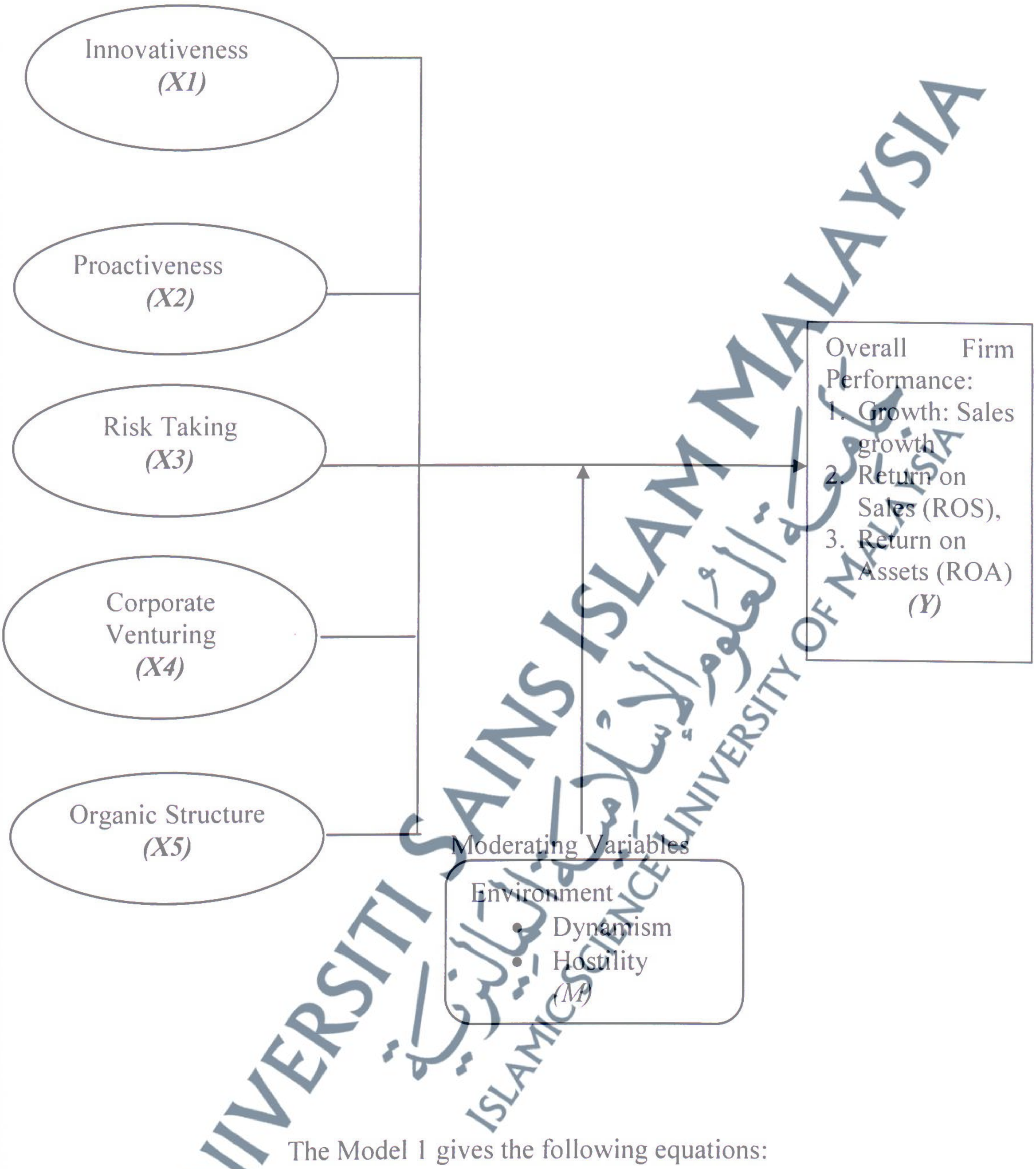
The Model 2 gives the following equations:

$$\text{Firm Profitability} = \beta o + \beta X1 + \beta X2 + \beta X3 + \beta X4 + \beta X5$$

$$\text{Firm Growth} = \beta o + \beta X1 + \beta X2 + \beta X3 + \beta X4 + \beta X5$$

$$\text{Moderating interaction: } \beta o + \beta X1 * \beta M + \beta X2 * \beta M + \beta X3 * \beta M + \beta X4 * \beta M + \beta X5 * \beta M$$

Figure 5-2: Model 1

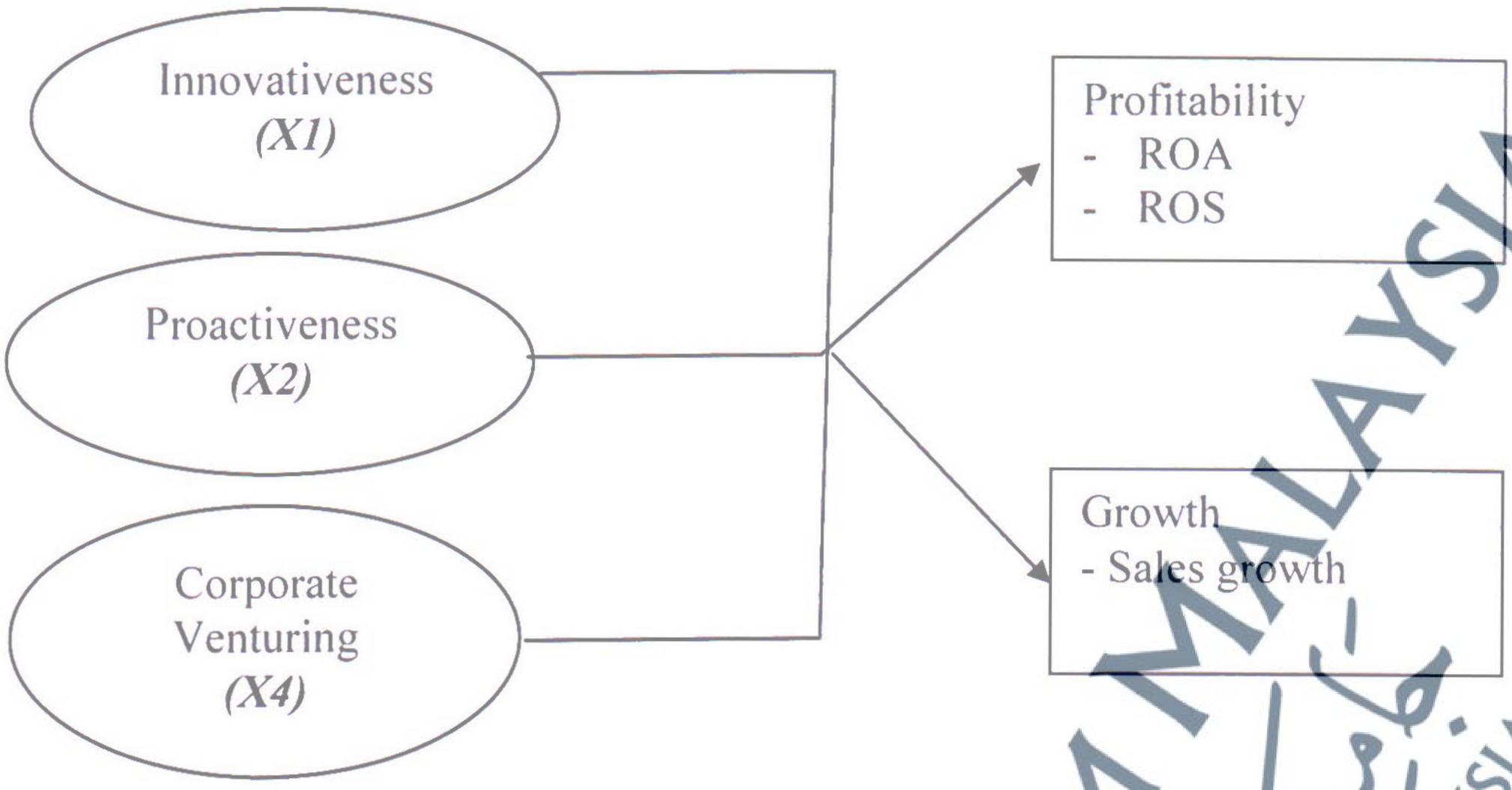


The Model 1 gives the following equations:

Direct Effect: Overall Firm Performance = $\beta o + \beta X1 + \beta X2 + \beta X3 + \beta X4 + \beta X5$

Moderating interaction: $\beta o + \beta X1 * \beta M + \beta X2 * \beta M + \beta X3 * \beta M + \beta X4 * \beta M + \beta X5 * \beta M$

Figure 5-4: Model 3



The Model 3 gives the following equations:

Firm Profitability = $\beta o + \beta X1 + \beta X2 + \beta X4$

Firm Growth = $\beta o + \beta X1 + \beta X2 + \beta X4$

Table 5-1: Summary of the Models

Characteristics	**Model 1**	**Model 2**	**Model 3**
Number of Firms	138	130	35
Type of Industry	Various industries	Various industries	Manufacturing only
Source of the Data	Primary only	Primary and secondary	Secondary only
Independent Variables	• Innovativeness • Proactiveness • Risk taking • Corporate Venturing • Organic Structure	• Innovativeness • Proactiveness • Risk taking • Corporate Venturing • Organic Structure	• Innovativeness • Proactiveness • Corporate Venturing
Dependent Variables	Unidimensional: Overall firm performance	Multidimensional: • Profitability • Growth	Multidimensional: • Profitability • Growth
Moderating Variables	Environmental dynamism and hostility	Environmental dynamism and hostility	None

5.3 Units of Analysis

This study focused on the firm as the unit of analysis as corporate entrepreneurship refers to the entrepreneurial efforts at the firm level.

5.4 Population

This research was conducted among the large firms in public listed companies in Malaysia between July 2011 to December 2011, with 842 publicly listed companies in Bursa Malaysia.

5.5 Sampling Frame

For Models 1 and 2, the sampling frame was drawn from the latest list (between July 2011 to December 2011) of Malaysian public companies listed on the main market, Bursa Malaysia, across various industries. Various industries were selected to improve the representativeness of the sample compared to focusing on a single industry. Besides, due to the normally low response rates of Malaysian firms in various studies, it was decided that all industries should be included to increase the number of respondents. Model 3 only included the manufacturing sectors which comprise Industrial and Consumer Products. This is because these two sectors usually provide information regarding Research and Development (R & D) costs (Aniza et al., 2008) which is essential in Model 3. The reasons for choosing these samples were two-fold. First, listed firms are large in terms of their sizes and normally well established. Second, they are representatives of all sectors of the Malaysian economy and are active across the country.

5.6 Sampling Technique

This research employs three different models, each of which used different sampling techniques due to the nature of the data.

5.6.1 Model 1 and 2 (Stratified Sampling)

In Models 1 and 2, it was more relevant to select a simple random sample from each stratum separately than taking samples from an entire population (Albright et al., 2003). Therefore, the stratified sampling technique was employed. Stratified sampling method was chosen because stratification could ensure; i) homogeneity within a group, such as in this study the public listed companies in a particular sector and, ii) heterogeneity across group such as different sectors (Cavana et al., 2001; Hair et al.,2007).

In the sampling process, population was first divided into meaningful segments or sectors. On this basis, it was assumed that there is heterogeneity across groups (sectors) but there was homogeneity within each groups (public listed companies). After the population was stratified, a certain percentage of respondents were drawn out from each stratum (Sekaran & Bougie, 2010). In this study, the percentage extracted from each stratum was seventy eight (78%), based on the value of the total number of subjects in each sectors divided by the total number of elements in each sector (i.e. 660 divided by 860). However, two sectors (i.e. Close-End Fund and Mining) only have one company under them. Thus, the percentage was 100% to ensure an adequate number of respondents represent each sector.

The advantage of this sampling technique which is considered the most efficient amongst all probability designs, is that the appropriately defined strata results in more accurate population estimates. The details on how the stratified sampling is based on the sample sectors are shown in the following Table 5-2.

Table 5-2: Disproportionate Stratified Sampling of the Respondents (Model 1 and 2)

Item	Stratum by Sector	Number of Elements in Stratum	Number of Subjects in Sample
1	Consumer Products	141	110
2	Construction	48	37
3	Trading/ Services	175	137
4	Finance	37	29
5	Properties	89	70
6	Industrial Products	250	196
7	IPC (Infrastructure Project Companies)	7	6
8	Hotels	4	3
9	Plantations	41	33
10	Technology	31	24
11	Real Estate Investment Trusts	14	11
12	Close-End Fund	1	1
13	Mining	1	1
14	Exchange Trade Fund	3	2
		842	**660**

5.6.2 Model 3 (Judgmental Sampling)

For Model 3, the judgmental sampling method was used. This is the most suitable sampling method as the researcher needs to choose the sample based on the availability of the data in annual reports. For example, in this study, information such as Research and Development (R & D) cost is required in order to calculate the objective measure of innovativeness. Thus, only firms that provide the report of the R & D budget were included in the analysis. Judgemental sampling which is one of the non-probability sampling technique has the purpose of obtaining information relevant to and available only with certain groups. Thus, respondents are selected based on their expertise in the area being investigated (Sekaran & Bougie, 2010: 280).

5.7 Sample Size

According to the population and sample tables by Sekaran and Bougie (2010), the appropriate sample size for such population (N=842) is 234 respondents (Model 1

and 2). The top management teams of the large firms were selected as respondents in this research. Since Model 3 used the Industrial and Consumer Products industries (N=391), the sample size should be at least 210 firms.

The names of the top management teams were obtained from the firms' websites. In cases where the names are not stated on the website, the firms were contacted via telephone to elicit names and their exact designations. The senior management teams of the large firms were randomly selected with varying designations of senior manager, chief executive officer, group financial controller, vice president, president, and executive director. The top management team was chosen because they comprise the most knowledgeable individuals in the firm, accruing from their involvement in decision-making, familiarity with company policies, strategies, and perceptions of external business conditions (Brazeal, 1993; Weaver et al., 2002). Besides, the top management level is more likely to participate in the survey.

5.8 Source of Data

As mentioned earlier in this chapter, both primary data and secondary data were utilized in this study. While primary data were used for all independent, dependent and moderating variables in Model 1, secondary data were used only for the dependent variables in Model 2. In Model 3, both the independent and dependent variables used secondary data.

5.9 Data Collection Method

There are two types of data sources; primary and secondary data (Sekaran & Bougie, 2009). In this study, both of the data sources were used to obtain the data. The primary data or raw data refer to information obtained first-hand by the researcher and was collected through a mail survey by means of a structured questionnaire. The self-

administered mail survey approach is widely used and appropriate for pervasive research program (Zikmund, 2000). The primary strengths of this method are convenience, anonymity, reduced interviewer bias, confidentiality and free expression and fair temporal response (Bush & Hair, 1985; Davis, 2000; Jogartnam & Tse, 2006). This method has also been widely used in strategic management research and is characterised by less interruption from the researcher. Other than that, it also facilitates the avoidance of unavailability of records and assists to produce uniform data from different respondents (Sutton, 2000). Another important advantage of this method is that it is cost saving compared to other methods (Jogartnam & Tse, 2006).

Considering all these advantages, this method was used in this study to collect data economically within the time frame given. However, as in other methods, this method also has a few limitations. Past researchers face difficulties from a low response rate among the organizations in Malaysia. In order to solve this problem, the researcher distributed as many survey questionnaires as possible. All 842 firms listed on the main market, Bursa Malaysia between July 2011 and December 2011 were considered by checking the website for their addresses and list of top management. In the case that the top management list is not on the website, phone calls were made to enquire about the top management who are able to participate in the study. However, only 660 firms provided the names and addresses, and only 138 firms responded to the survey. Follow up phone calls were made within four weeks of the mail being sent out.

Secondary data refers to the information obtained from sources that are readily available and has been collected by individuals or organizations for their own purposes. These data are cheaper and more quickly obtainable than primary data. For example, annual reports, online data, and others. For the purpose of this study,

secondary data were obtained from the firm's annual report that was available online in their websites.

5.10 Questionnaire (Model 1 and 2)

The survey questionnaire developed to measure the study constructs was based on previously established scales. The initial draft of the survey was reviewed by a number of postgraduate students, lecturers, and experts in the strategic management field to ensure the face reliability and validity of the scale items. Based on their feedback, no major changes needed to be made to the scale items. However, the wordings of the demographic questions in the questionnaire were slightly changed to make them simple and easy to understand. There are also no negatively worded questions to avoid confusion because in the Malaysian work culture, which is characterised by high power distance, the persons are more likely to select the extreme responses on a questionnaire (Johnson et al., 2005).

The questionnaire is divided into seven parts as presented in Appendix B. Part 1 was designed to measure the innovativeness, proactiveness, and risk taking of the firm for the past three years. Part 2 was designed to measure the firm's opinion on corporate venturing of the firm for the past three years. Part 3 measures the firm's mechanistic-organic structure. Part 4 measures firm's perception of environmental uncertainty. Part 5 measures firm's perception of firm performance. Finally, part 6 and 7 are designed to gather demographic information about the respondents and the firm. The details of the measurement items used in this study are illustrated in the next section.

5.10.1 Independent Variables (Model 1 and 2)

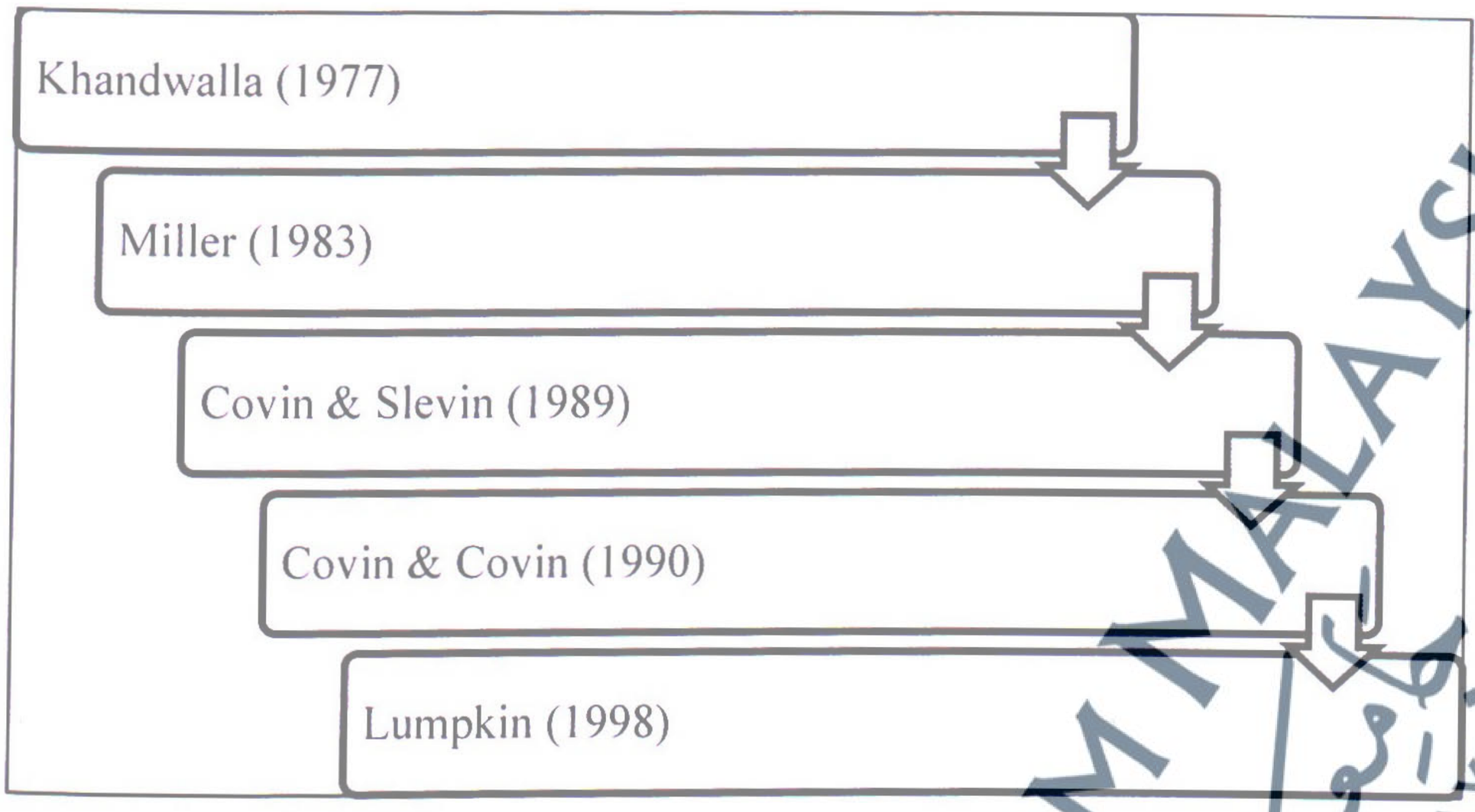
This section discusses the measurement for Model 1 and 2. There are five independent variables in this study which constitute the three entrepreneurial

orientation dimensions: innovativeness, proactiveness, and risk taking, corporate venturing, and organic structure. All scales are 7-point scales.

5.10.2 Measurement of Entrepreneurial Orientation

Previously established and widely used questionnaires were adapted for this research. The three dimensions of entrepreneurial orientation namely: innovativeness, proactiveness, and risk-taking were used to measure the level of entrepreneurial orientation of the large firm. The respondents were asked to rate their firm's entrepreneurial orientation on a scale from 1 to 7 (from strongly disagree to strongly agree). Initially, the scales were developed and tested for reliability by Khandwalla (1977), Miller (1983), Covin and Slevin (1989), and Covin and Covin (1990). The scales were further refined by Lumpkin (1998) by adding on fives new items. Firstly, two items were added on for innovativeness which are "my firm prefers to design its own unique new processes and methods of production", and "in general, the top managers of my firms favour experimentation and original approaches to problem solving". Secondly, two items was added on for risk-taking; "in general, the top managers of my firm are quick to spend money on potential solutions if problems are holding us back", and "the top managers of my firm are quick to seize opportunities that we think will give us a good payoff". Thirdly, one item was added on for proactiveness; "the top managers of my firm have a strong tendency to be ahead of other competitors in introducing novel ideas or products". The evolution of the literature in developing the entrepreneurial orientation instrument is shown in Figure 5-5.

Figure 5-5: Literature on the Development of the Entrepreneurial Orientation Instrument



The items in the multidimensional measurement of entrepreneurial orientation are as follows:-

Table 5-3: Instrumentation for Innovativeness

	Innovativeness
1.	Our firm has marketed many new lines of products or services for the past 3 years.
2.	Changes in products or services lines have been quite dramatic in our firm for the past 3 years.
3.	In general, the top managers of our firm favour strong emphasis on Research and Development (R & D), Technological leadership and Innovations.
4.	The top managers of our firm favour strong emphasis on experimentation and original approaches to problem solving.
5.	The top managers of our firm prefer to design its own unique new processes and methods of production.

Table 5-4: Instrumentation for Proactiveness

	Proactiveness
1.	In dealing with its competitors, our firm is very often the first firm to introduce new processes (e.g. Production methods, service delivery systems, pricing approaches and etc.).
2.	In dealing with its competitors, is very often the first firm to introduce new administrative techniques, operating methods, and new technologies
3.	In dealing with its competitors, our firm typically initiates actions to which competitors then respond to.
4.	In dealing with its competitors, typically adopt a very competitive, 'undo-the-competitors' posture.

5.	In general, the top managers of our firm have a strong tendency to be ahead of other competitors in introducing novel ideas or products or services.

Table 5-5: Instrumentation for Risk Taking

	Risk taking
1.	In general, the top managers of our firm believe that owing to the nature of environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.
2.	In general, the top managers of our firm favour high-risk projects with chances of very high return.
3	In general, the top managers of our firm favour a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities.
4.	In general, the top managers of our firm are quick to spend money on potential solutions if problems are holding us back.
5.	In general, the top managers of our firm are quick to seize opportunities that we think will give us a good payoff.

5.10.2 Measurement of Corporate Venturing

The instrument for corporate venturing was adapted from Zahra (1996) and Dalziel (2005). There are six items used to capture the corporate venturing activities in a firm which are as follows:-

Table 5-6: Instrumentation for Corporate Venturing

	Corporate Venturing
1.	Over the past 3 years, our firm has entered many new industries.
2.	Over the past 3 years, our firm has established many new branches / outlets / subsidiaries.
3.	Over the past 3 years, our firm has acquired many companies.
4.	Over the past 3 years, our firm has diversifying into new business.
5.	Over the past 3 years, our firm has establishing or sponsoring new venture activities.
6.	Over the past 3 years, our firm has financing start-up business activities.

5.10.3 Measurement of Organizational Structure

The instrument for organizational structure was adapted from Khandwalla (1977). The eight item scale was used to measure the firm's structural organicity. These measurement items were built upon the Burns and Stalker (1961) operationalisation of the organic versus mechanistic continuum. There are three

dimensions identified in this mechanistic-organic structure scale, namely, formalization, specialization, and centralization (Khandwalla, 1977). This scale had consistently demonstrated high Cronbach alpha values in previous studies on entrepreneurship and was the primary reason for choosing it. For example, the study by Naman and Slevin (1993) achieved a 0.827 Cronbach alpha value, and the value of 0.89 in Slevin and Covin's (1997). This study employed 8 items with a seven-point scale ranging from (1) "strongly disagree" to (7) "strongly agree." The items are as follows:

Table 5-7: Instrumentation for Organic Structure

	Organic Structure
1.	Loose, informal control and heavy dependence on informal relationships and norms of cooperation for getting work done.
2.	A strong emphasis on getting things done even if it means disregarding formal procedures.
3.	A strong emphasis on adapting freely to changing circumstances without too much concern for past practice.
4.	Managers' operating styles allowed to range freely from the very formal to the very informal.
5.	A strong tendency to let the requirements of the situation and the individual's personality defined proper on-job behaviour.
6.	Open channels of communications in the entire business system.
7.	Important information such as financial and operating information, flowing quite freely throughout the organization.
8.	A strong tendency to let the expert in a given situation have the most say in decision making, even if this means temporary bypassing of formal line authority.

5.10.4 Moderating Variables

The definition of moderating variables according to Barron and Kenny (1986:1174) is "a variable that affects the direction and/or strength of the relationship between an independent or predictor variable and a dependent or criterion variable". The moderation takes place when the independent variable and moderator have a mutual effect in increasing the variance in dependent variables more than that explained by the direct effects (Cohen & Cohen, 1983). The dynamism and hostility of the environment were used as a moderator in this study because when it is high,

entrepreneurial efforts such as innovativeness, proactiveness, risk taking and corporate venturing leads to increased performance of the firm (Lumpkin & Dess, 2001; Miller & Friesen, 1982; Zahra, 1996). Moreover, the organic structure is more effective when environmental uncertainty is higher. Thus, it is imperative to understand the impact of environmental uncertainty as moderators to the relationship between corporate entrepreneurship dimensions, organizational structure, and firm performance.

There are two dimensions of the environment used in this study, namely; dynamism and hostility. Environmental dynamism was measured using five items, and environmental hostility was measured using three items. Each of the items used the 7-point scale. These scales were developed by Miller and Friesen (1982) and were widely used by previous authors who affirmed their reliability and validity(e.g. Miller 1983a; Dess et al., 1997; Moreno & Casillas, 2008; Zahra & Garvis, 2000). These two dimensions were combined into a composite index of environment measure (Dess et al., 1997; Moreno & Casillas, 2008). The items are as follows:

Table 5-8: Instrumentation for the Environment

	Dynamism
1.	Our firm must change its marketing practices extremely frequently to keep up with the market and competitors (for example, semi-annually).
2.	The rate at which products and services are becoming obsolete is very high in our industry.
3.	Actions of competitors are unpredictable.
4.	Demand and tastes are almost unpredictable (for example, high fashion good).
5.	The modes of production / service technology change often and in a major way (for example, advanced electronic components).
	Hostility
1.	Situations in the industry are very stressful, exacting, hostile; very hard to keep afloat.
2.	A dominating environment in which our firm's initiatives count for very little against the tremendous political, technological, or competitive forces.
3.	Situations in the industry are very risky, and a false step can mean our firm's undoing.

5.10.5 Dependent Variables (Primary Data)

There were two methods used in obtaining the dependent variables in this study; primary and secondary. For the primary data, the scales from Dess, Lumpkin and Covin (1997) was used to capture the subjective measure of firm performance. The firm responses to three performance indices were assessed with a 7-point Likert type scale ranging from 1 = 'Low Performer' to 7 = 'High Performer'. The three performance dimensions used in this study are sales growth, ROA, and ROS. The questionnaire required the top management to assess their performance over the last three years relative to their competitors. The three years were used to measure average firm performance to reduce the impact of variation of time due to short term conditions. Besides, three years was widely used as the time frame to investigate the effects of certain strategies on the performance of large firms (Delmar, 2006). The shorter time frame was required for new ventures. The respondents were also required to compare their firm performance to competitors in similar industries to avoid industry bias. The items representing firm performance used in this study are as follows:-

Table 5-9: Instrumentation for Firm Performance

	Firm Performance
1.	Please assess, to the best of your knowledge, your firm's Sales Growth over the last 3 years relative to your competitors.
2.	Please assess, to the best of your knowledge, your firm's Return on Assets (ROA) over the last 3 years relative to your competitors.
3.	Please assess, to the best of your knowledge, your firm's Return on Sales over the last 3 years relative to your competitors.

5.11 Measurement for Secondary Data (Model 2 and 3)

The second model of this study used secondary data as an objective measure for firm performance in Models 2 and 3. These include the ROA, sales growth and ROS. For Model 3, both independent and dependent variables were obtained from

secondary sources. This constitutes one of the strengths of this study which is the objectivity (Miller, 2011) of the method. This method is rarely used in corporate entrepreneurship studies (Miller & Breton-Miller, 2011) and will be discussed in the next sections.

5.11.1 Independent variables

There are three independent variables that used secondary data in this study, namely innovativeness, proactiveness and corporate venturing. The actual data for independent variables are used in Model 3. This is discussed in the following sections and shown in Table 5-10.

5.11.1.1 Innovativeness

The innovative firm tends to spend more on research and development activities to produce new products, services, process, technologies, and others compared to conventional firms (Hall, 2002; Hansen, 1992; Lee & O'Neill, 2003). It was possible to obtain accurate information on research and development expenses in the public listed companies. However, unlike the public listed firms in developed countries, developing countries do not make it mandatory to report the research and development (R&D) budget. Only a few firms reported this activity, leading to limitations in the sample size used. Following Miller and Breton-Miller's (2011) suggestions, the formula for measuring actual innovativeness in a firm is the research and development (R&D) to sales ratio.

5.11.1.2 Proactiveness

Proactiveness is the tendency of firms to engage in proactive behaviour to build the business (Miller, 1983: Miller & Breton-Miller, 2011). Thus, the measuring of proactiveness using publicly available financial data can be illustrated by the aggregate investment practices of the firm in the short term. This was assessed using

the average percentage of profits reinvested in the company for a three-year period. This percentage of annual earnings reinvested is important for future planning. Proactive planning is important to ensure a firm is ahead of its competitors. This was also adapted from Miller and Breton-Miller (2011). The formula is as follows:-

Proactiveness = (This year earnings – Last year earnings) / Profit for This Year x 100

5.11.1.3 Corporate Venturing

The total number of venturing initiatives by the firm such as launching of new businesses, mergers, acquisitions and financing new business in the last three years (2009,2010,2011).

5.11.2 Dependent Variables Measurement for Secondary Data

Actual data from secondary sources for firm performance were used in Models 2 and 3. Prior research indicated that firm growth and profitability influenced corporate entrepreneurship differently, thus both dimensions of firm financial performance were collected. These two dimensions of firm performance which are very common in entrepreneurship research (Murphy et al., 1996) were tested separately. Sales growth was examined as the company growth measure and was taken from the amount of sales in the Statements of Comprehensive Income. The 3-year average was taken (2009, 2010, 2011). The growth measures were based on the percentage average annual change in sales as follows:-

Sales Growth Rate= (Current Year's Sales - Last Year's Sales) / (Last Year's Sales)

Average return on assets (ROA) and average return on sales (ROS) for three consecutive years (2009, 2010, 2011) were the two profitability measures used in the current research. Following Zahra and Covin (1995), the ROA and ROS measures were calculated as follows:

ROA = Net Profit/Total Assets

ROS = Net Profit/Company Sales Revenues

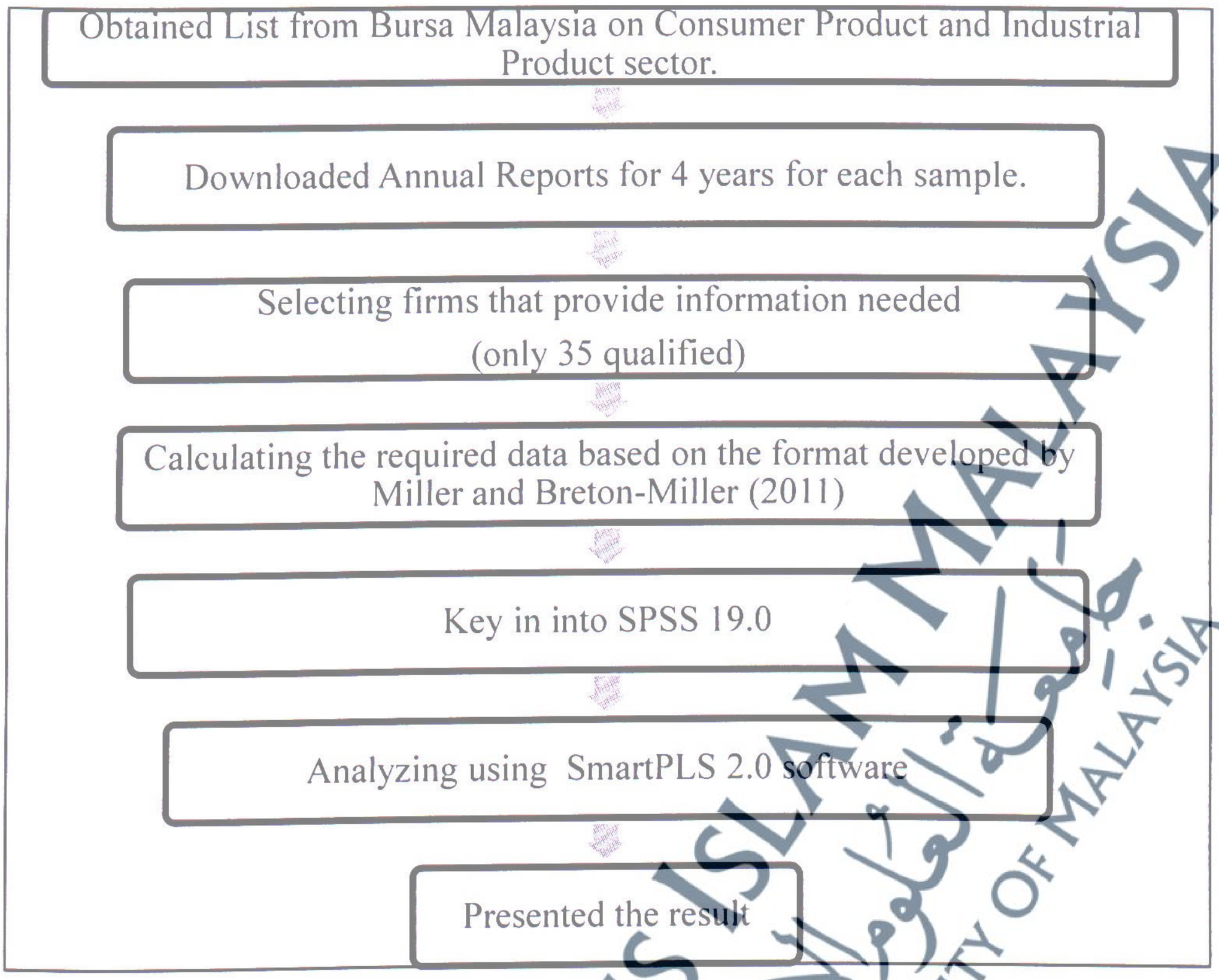
The information on total assets was taken from the firm's Statements of Financial Position/Balance Sheets while the net profit and company sales revenue were obtained from the firm's Statements of Comprehensive Income/Income Statements.

To prepare the secondary data for firm performance in Model 2, the difference between a company's performance score and its industry average was computed, and then divided by the industry's average. The outcome of this process was then multiplied by 100. The results showed how much better (or worse) a company performed than its average industry competitor (Zahra & Covin, 1995:53). This step is important because the sample in Model 2 consists of various industries. Thus, it is essential to control for variations in industry performance prior to testing the hypotheses. This was done following the approach suggested by Sousa de Vasconcellos e Sa and Hambrick (1989), and Zahra and Covin (1995).

Table 5-10: Instrumentation for Model 3

Construct / Sources	**Formula**
Innovativeness Miller & Breton-Miller (2011)	Research and development expenses divided by total sales. (Average in 3 years)
Proactiveness Miller & Breton-Miller (2011)	The percentage of annual earnings reinvested. (Average in 3 years)
Corporate Venturing	Total number of new businesses, mergers, acquisitions, and financing new venture in 3years
Firm Performance (Actual)	Average Sales Growth in 3 years
	Average ROA in 3 years Average ROS in 3 years

Figure 5-6: Processes of Model 3 Development



5.12 Pretesting for Model 1 and 2

In the early stages, a draft of the questionnaire was tested on five postgraduate students to check the clarity of the instruments. After receiving their comments and suggestions, the instruments were then reviewed by experts to assess whether the variables and elements in the questionnaire were appropriate, relevant, and sufficient to describe the phenomena of the research. The experts reviewed and checked the validity of the questionnaire with suggestions for minor revisions. All comments on the clarity of the questionnaire, and its design were taken into account and further improvements were made.

Pilot testing was administered through mailed surveys to 150 senior management teams of public listed companies listed on the main market, Bursa Malaysia. Only 32 respondents managed to complete the questionnaires and returned

them. Backstrom and Hursch (1963) indicated that a sample of 30 is adequate for pretesting sample. The respondents were asked to leave comments on the clarity of the questionnaire. A few comments were made about grammatical errors and on a confusing, demographic question, namely; "the year of being accepted in public listed companies". It was argued that the question should ask for the total number of years instead of stating the year of being accepted as a publicly listed company. In addition, the respondents also asked that the questions be made shorter and simpler. These comments were considered and the necessary rectifications and improvements were made.

The purpose of the pilot study is to test the instruments before it was distributed to the respondent to increase the main study's likelihood of success (van Teijlingen & Hundley, 2001). The pilot study also represents the final stage in the questionnaire development process. It is compulsory to conduct the pilot study to test the earlier version of the instruments to ensure that the respondents fully understand the requirements of the questions in the context of the study (Neuman, 2003).

5.13 Data Analysis Techniques

In order to analyse survey data, this study used two statistical techniques. First, the Statistical Package for Social Sciences (SPSS) version 19.0 was used in the initial stage. The SPSS 19.0 was used to generate descriptive analyses for demographic and variables such as means, standard deviations, and frequencies. The missing data were also assessed using SPSS. The second statistical technique used was Partial Least Squares (PLS) approach to Structural Equation Modelling (SEM) using SmartPLS 2.0 software (Ringle et al., 2005). The PLS approach was used to test the measurement model such as the reliability and validity of the instruments and the structural model used to test the hypotheses under study. The SEM overcomes the limitations of

Ordinary Least Square regression (OLS) or the first-generation techniques such as a regression-based approaches, and factor or cluster analysis (Haenlein & Kaplan, 2004). Basically, in OLS, the researcher is analyzing the mean of the respondents instead of analyzing the individual responses. Therefore, the OLS technique will abandon some data and will be theoretically inefficient and statistically less accurate. As a result, the hypothesis testing using two different methods namely OLS and SEM are inconsistent in some cases. The SEM method, an extension of the OLS, was developed to cater to the limitations of the OLS (Zainudin, 2012). In other words, the SEM is known as a second generation statistical technique to analyse the inter-relationships among multiple variables in a model. SEM allows the simultaneous modeling of relationships among multiple independent and dependent constructs (Gefen et al., 2000).

5.13.1 Partial Least Square (PLS)

The researcher chose the PLS analysis to evaluate the measurement model within the context of structural models. PLS is a structural equation modeling tool that produces loadings and weights between items and constructs for a path between constructs produces standardized regression coefficient estimates such as the β-coefficients (Claver-Cortés et al., 2012; Croteau & Bergeron, 2001). The PLS is a variance based approach and has its advantage over the covariance approach. A covariance based approach such as AMOS is a 'confirmatory approach that focuses on the model's theoretically established relationships and aims at minimizing the difference between the model implied covariance matrix and the sample covariance matrix. In contrast, PLS-SEM is a prediction-oriented variance-based approach that focuses on endogenous target constructs in the model and aims at maximizing their explained variance (e.g, their R^2 value)' (Hair et al., 2012: 1).

Among the advantages of the PLS approach is that the technique does not require normal data distribution and accommodates small sample sizes (Chin & Newsted, 1999). This is suited to this research, which has a relatively small sample especially for Model 3. The PLS path modeling or component-based structural equation modeling is also suitable in testing the hierarchical model of this study, emphasizing theoretical parsimony rather than model complexity. Besides, it is suggested that PLS can handle both the formative and reflective variables that jointly occur in one structural model (Falk & Miller, 1992). However, in this study, all constructs are reflective measurements. Although there are study that modelled firm performance as a formative construct, but it actually depends on how they define firm performance and the indicators used. When the measures are conceptualized as interchangeable, they are expected to covary at a high level and are also expected to have similar antecedents and consequences, omitting one of them would not be expected to alter the conceptual domain of the construct. It is then appropriate to model it as a reflective measure. For example, in this study, firm performance is divided into two groups, which are growth and profitability where, the ROA and ROS measure the profitability of the firm and should be correlated (Podsakoff et al., 2006).

The following Table 5-1-1 illustrates the comparison between PLS and other methods in SEM especially the covariance-based approach (CB-SEM) such as EQS, AMOS, SEPATH, COSAN, LISREL and MPLUS. First, the PLS approach is for theory development and predictive applications (Henseler et al., 2009), while, CB-SEM is for theory testing. Second, CBSEM is theory-oriented, on the other hand, PLS is primarily intended for causal predictive analysis in situations of high complexity but little theoretical information (Jöreskog & Wold, 1982). Third, PLS can use as an alternative for theory testing if CBSEM premises such as distributional assumptions,

acceptable sample size, or maximal model complexity are violated. However, according to Henseler & Sarstedt (2013) the simulation shows that the Goodness of Fit (GoF) metrics is not suitable for model validation in PLS. The GoF only commonly used in covariance-based structural equation modelling.

Table 5-11: Comparing PLS to Covariance Approaches of SEM

Criterion	**PLS**	**Covariance-based**
Research Objective	Prediction oriented	Parameter oriented
Approach	Variance	Covariance
Assumption	Predictor specification (nonparametric)	Typically multivariate normal distribution and independent observations (parametric)
Parameter estimates	Consistent as indicators and sample size increase (i.e., consistency at large)	Consistent
Latent variable scores	Explicitly estimated	Indeterminate
Epistemic relationship between an LV and its measures	Can be modeled in either formative or reflective mode	Typically only with reflective indicators. However, the formative mode is also supported.
Implication	Optimal for Prediction	Optimal for parameter estimation
Model Complexity	Large complexity (e.g., 100 constructs and 1,000 indicators)	Small to moderate complexity (e.g., less than 100 indicators)
Sample Size	Power analysis based on the portion of the model with the largest number of predictors. Minimal recommendations range from 30 to 100 cases.	Ideally based on power analysis of specific model—minimal recommendations range from 200 to 800.
Type of optimization	Locally iterative	Globally iterative
Significance tests	Only by means of simulations; restricted validity	Available
Goodness of Fit (GoF) Metrics	Not suitable.	Established GoF metrics available

Source: Chin and Newsted (1999)

5.13.2 Stages and Processes in Partial Less Squares (PLS)

There are two major steps involved in the analysis and interpretation of the PLS model (Barclay et al., 1995). First, the measurement model must be analyzed by assessing its reliability and validity. The measurement model shows the relationship

between items and constructs. It defines the construct and assigns items to them (Bollen, 1989; Gefen et al., 2000). The second step is the assessment of the structural model wherein the relationships between constructs will be tested (Fornell & Larcker, 1981). The two stage processes of PLS will be explained further in the next subsection.

5.13.3 Stage One: Assessment of the Measurement Model

In the first step, the goodness of the measures will be assessed using validity and reliability as illustrated in Table 5-12. The reliability test is performed to determine how consistently the measuring instrument measures the concept used in the study (Sekaran & Bougie, 2010). Reliability can be analysed using the internal consistency reliability. Whilst for individual item reliabilities; the researcher looked at their loadings on the respective constructs.

Similarly, the purpose of the validity test determines how well the instrument developed to measures the particular concept actually measures what is intended to be measured (Sekaran & Bougie, 2010). Validity can be analysed using indicator reliability, convergent validity, and discriminant validity.

The types of assessments, cut off value and detail description are summarize in Table 5-12 for the reliability and validity measurement model assessment. The internal consistency reliability, indicator reliability, convergent validity and discriminant validity must be assessed first before moving to the hyphotheses testing stage.

Table 5-12: Assessment of the Measurement Models

Validity and Reliability	**Criterion**	**Cut off Value**	**Description**
Internal consistency reliability	Composite reliability (CR)	CR > 0.70 (Fornell & Larker, 1981)	Interpreted like a Cronbach's alpha for internal consistency reliability (CR) estimate, a CR of 0.70 or greater is considered acceptable (Fornell & Larcker, 1981). However, the CR focused on individual item's loadings. In contrast, the Cronbach's alpha assumes that each item contributes similarly to its construct (Barclay et al, 1995).
Indicator Reliability	Items Loadings	Loadings > 0.50 (Hair et al., 2010)	The indicator reliability can be measured by examining the items loading. Thus, it is important to have a satisfactory indicator reliability for a measurement model, whereby, each item's loading is at least 0.50.
Convergent Validity	Average variance extracted (AVE)	AVE > 0.50 Fornell & Larcker (1981)	The average variance extracted (AVE) measures the variance captured by the indicators relative to measurement error, and it should be greater than 0.50 to justify using a construct (Barclay et al., 1995).
Discriminant Validity	Cross-loadings	Not applicable	The discriminant validity indicates the degree to which one construct differs from the others. It can be assessed by using two measures: 1) Fornell and Larcker's (1981) criterion, and 2) Cross loading. The loadings of the indicators must be higher on their respective construct compared to other constructs.
Discriminant Validity	Fornell-Larcker Criterion	Not applicable	The second measure of the discriminant validity is the Fornell-Larcker criterion. There are two ways of assessing the Fornell-Larcker criterion (Chin, 2010): i) compare the square root of AVE to construct correlations, and; ii) compare the AVE with the squared correlations among the construct correlations The aim is to ensure the AVE / square root of AVE should be greater than each of the construct correlations. This is to ensure that the measurement model demonstrated adequate discriminant validity (Fornell & Larcker, 1981).

Sources: Urbach & Ahlemann (2010)

5.13.4 Stage Two: Assessment of the Structural Model

5.13.4.1 Estimates for Path Coefficients

The second step in evaluating the model in PLS analysis is assessment of the structural model. The structural model covers the relationships among hypothetical constructs. Bootstrapping is used to assess the structural model in PLS. The number of bootstrap samples used in this study was 1,000, and the number of cases is equal to the number of observations in the original sample. In contrast to covariance-based approaches, the PLS path modeling does not provide any global goodness-of-fit criterion, which is mainly due to the assumption of distribution-free variance. Alternatively, non-parametrical tests can be applied to evaluate the structural model's quality (Henseler et al., 2009). Similar to a multiple regression's coefficients, in the PLS method, the evaluation of the model's quality should also be based on the path coefficients' directions and significance levels (Chin, 1998b).

The individual path coefficients in the PLS structural model represent standardized beta coefficients resulting from the least-squares method or estimation. The t-statistic of the path coefficients estimated in PLS can be obtained by resampling methods. The insignificant paths or contrary relationship means it does not support a prior hypothesis, while significant paths showing the hypothesized direction empirically support the proposed causal relationship (Gotz et al., 2010). This study employed a one-tailed test because of the directional relationship in the hypothesis. Thus, the critical t-values for a one-tailed test are 1.28 (significance level = 10 percent), 1.64 (significance level = 5 percent), and 1.96 (significance level = 1 percent).

5.13.4.2 R^2 of Endogenous Latent Variables and Effect Size (f^2)

Another assessment of the model's quality in PLS is the determination coefficient or R^2. The R^2 reflects the level or share of the latent construct's explained variance and therefore measures the regression function's "goodness of fit" against the empirically obtained manifest items (Backhaus et al., 2003). R^2 is a normalized term that can assume values between 0 and 1. No generalizable statements can be made about the acceptable threshold values of R^2 (Backhaus et al., 2003). Thus R^2 is highly dependent on the field or individual study (Gotz et al.,2010). However, larger R^2 reflects the larger percentage of variance explained. In marketing research, R^2 values of 0.75, 0.50, or 0.25 for endogenous latent variables in the structural model can be described as substantial, moderate, or weak, respectively (Hair et al., 2011). In corporate entrepreneurship research, the R^2 values ranged from 0.01 to 0.348 as shown Table 5-13.

Subsequently after inspecting the R^2 of all endogenous variables and checking the result of the hypotheses, the effect size or moderating effect will be assessed. The change in the R^2 shows whether the moderating variables have a substantial contribution in the model. According to Cohen (1988), when $f^{2\,2}$ is assessed as 0.02 , this represents a small effect, 0.15 represents medium effect while 0.35 is considered a large effect. The moderating effect can be assessed by comparing the proportion of variance explained (R^2) of the main effect model (without moderator) with the variance explained (R^2) of the full model (with moderator) (Henseler & Fassot, 2010). However if the moderating variable did not significantly moderate the relationship between independent and dependent variables, there is no point in doing the effect size calculation. Effect size f^2 is not automatically given in PLS. Thus, this calls for manual calculation, the formula to calculate the effect size is as follows (Chin et al. 2003):

$$f^2 = \frac{R^2_{Included} - R^2_{Excluded}}{1 - R^2_{Included}}$$

Table 5-13: Example of R^2 in Corporate Entrepreneurship Research

Literature	R^2
Andersen (2010)	0.01 – 0.03
Antoncic & Hisrich (2003)	0.16 - 0.24
Arbaugh et al. (2005)	0.22
Barrett & Weinstein (1999)	0.11
Bojica & Fuentes (2012)	0.199
De Clercq et al., (2010)	0.301
Morgan & Strong (2003)	0.14
Naldi et al., (2007) and Wiklund (1999)	0.260
Rodrigues & Raposo (2011)	0.197
Wang & Zhan (2009)	0.348
Wiklund & Sheperd (2003)	0.21
Wiklund & Shepherd (2005)	0.29

5.13.4.3 Prediction Relevance (Q^2)

In some cases, the model's predictive validity can be tested by means of the non-parametric Stone–Geisser test (Geisser, 1975:320; Stone, 1975; Fornell & Cha, 1994:71–73; Chin 1998a:15). This test uses a so-called "blindfolding" procedure. The blindfolding procedure is only applied to endogenous latent variables that have reflective measurement model operationalization (Henseler et al., 2009: 305). The Q^2 test or predictive relevance developed by Geisser (1975) and Stone (1974) is used to assess the predictive relevance of the endogenous constructs. This test is an indicator of how well observed values are reproduced by the model and its parameter estimates. Two types of Q^2 can be obtained, depending on the form of prediction: cross-validated communality and cross validated redundancy (Fornell & Cha, 1994). Chin (1998b) suggests using the latter to examine the predictive relevance of the theoretical/structural model. A Q^2 value that is greater than 0 implies that the model has predictive relevance whereas a Q^2 less than 0 suggest that the model lacks

predictive relevance (Barroso et al., 2010: 434-435). The formula for Q^2 is as follows:-

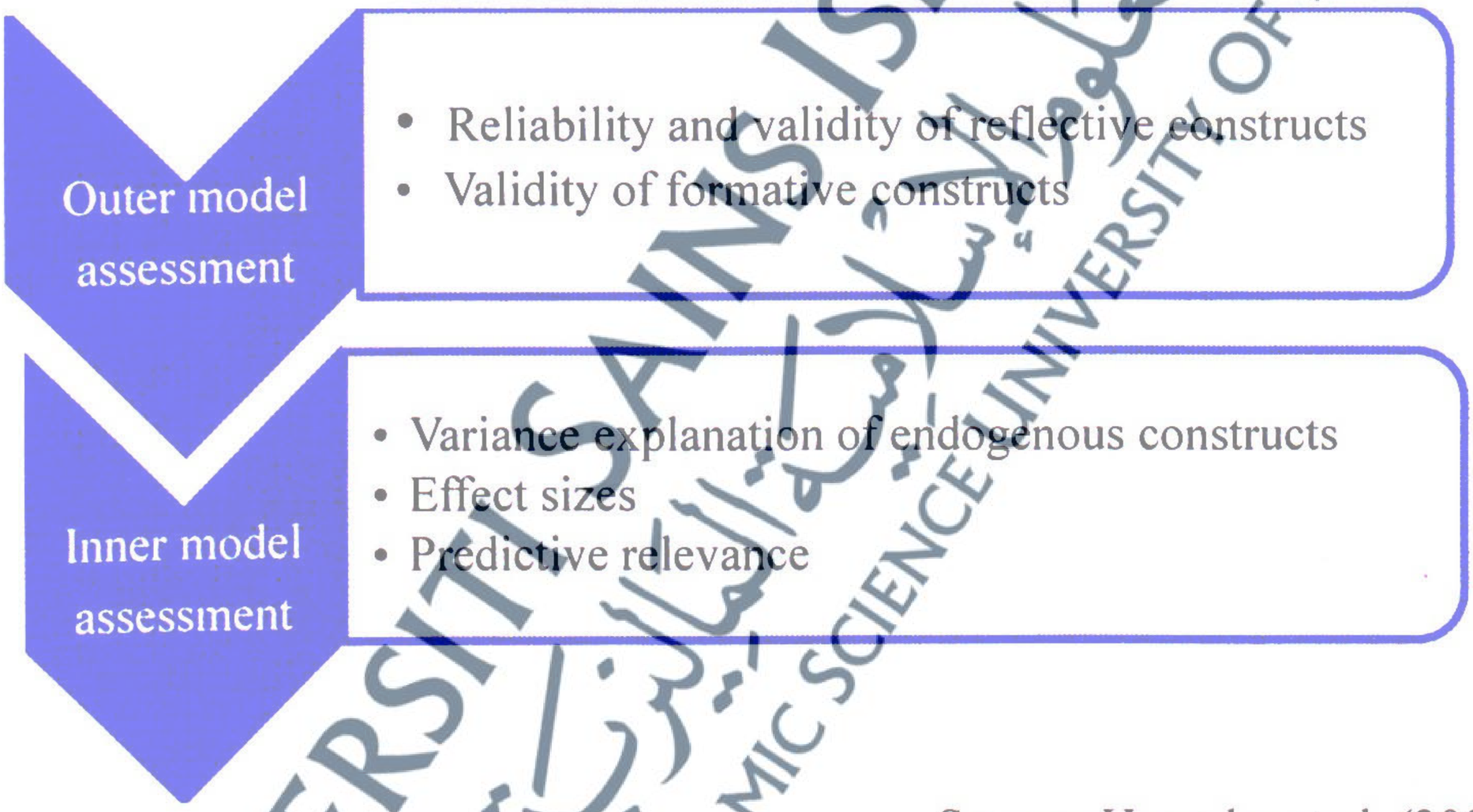
$$Q^2 = 1 - \frac{\sum_D E_D}{\sum_D O_D}$$

Where,

E = The sum of squares of prediction error
O = The sum of squares error using the mean for prediction
D = Omission distance

The summary of the two-step process in PLS path modeling encompassing (1) the assessment of the outer model and (2) the assessment of the inner model is depicted in Figure 5-7.

Figure 5-7: A Two-Step Process of PLS Path Model Assessment



Source: Henseler et al. (2009)

5.14 Summary of Chapter 5

Chapter 5 discussed the models, research processes, research design, instrumentation, and data analysis technique involved in doing the research using the three models. The research design such as how the samples, constructs, and items were selected, sources of the data as well as the instrumentation used were presented in this chapter. Finally, this chapter illustrated the data analysis technique which is the

PLS-SEM method used in this study. The results of the statistical analysis and hypotheses testing will be presented in the following chapter.