Chapter 4

METHODOLOGY

4.0 Introduction

The primary purpose of this chapter is to elaborate on the research design for this research, including research site, sampling and data collection procedures, as well as questionnaire design. The measurement for each research variable, including independent and dependent variables are discussed and the way in which these variables are operationalized for the purpose of this study. Lastly, the data analysis techniques used in this study are presented.

4.1 Research Site

Manufacturing firms that are operating in the Chinese mainland were selected in this study. Many previous studies carried out on Activity-Based Costing success implementation mainly focused on developed countries, and less attention was paid to developing countries, especially, in China (Lana & Fei, 2007). China experienced rapid economy growth, it has shifted from "social central planned economy" to "Market economy", and it has become the catalyst for the whole world's economy. Since China joined the WTO in 2001, advanced management accounting, such as standard costing, target cost, participative budgeting, balanced scorecard, total quality control, and Activity-Based Costing system has become more and more popular among the Chinese manufacturing firms (Yaren, Wenbin & Thomas 2008). However, Lana and Fei (2007) stressed that it is uncertain that modern management accounting practices such as ABC can be successfully adopted and implemented in developing nations, such as in the

Chinese context. Also Sulaiman *et al.* (2004) observed that China makes little progress in adopting the advanced management accounting techniques. It may create barriers for the Chinese organizations to improve performance and compete both domestically and globally (Lana & Fei, 2007). Thus, it is necessary to conduct research to find out whether ABC could be implemented successfully in the Chinese context.

This research will focus on the manufacturing sector in China. It is necessary to confine the research site in the manufacturing sector. As Rotch (1990) stated that compared to manufacturing firms, non-manufacturing firms are very different from each other in terms of characteristics. For instance, the hotels' operations are different from schools, and also the output of non-manufacturing firms are extremely hard to determine. Moreover activities in non-manufacturers, especially in the service sectors are hard to be predicated, and moreover a large proportion of total costs are accounted for by joint cost, which leads to difficulties in assigning costs to output. Rotch's (1990) view is agreed by Clarke *et al.* (1999), and they highlighted that the significant differences exist in terms of cost structure between manufacturers and non-manufacturers. In the non-manufacturing sector, direct labor and direct material cost are almost equal to zero, and fixed overhead costs are the dominant cost in the cost structure. The difference leads to difficulties in researching ABC application in different types of industries. Thus, this study focuses on manufacturing industry.

In addition, the research samples are ABC adopters among manufacturing firms, so size is also an important factor. Past literature shows that ABC adoption is influenced by the size of the firms (Bjørnenak, 1997; Cllarke, Hill, & Stevens, 1999; Innes, Mitchell, & Sinclair, 2000; Khalid, 2005). The larger the size is, the more likely the firm would

adopt ABC. Bjornenak (1997) argued that large sized firms are more capable of adopting ABC than smaller firms due to the possession of required resources, such as time, financial resources, and needed equipments. In addition, large sized firms normally have a higher level of production diversity. Production diversity refers to "the variety of type and/or volume of products and/or product lines that are manufactured by a firm" (Alsaeed, 2005, p. 288). The more products a firm manufactures, the larger the amount of overhead costs, and are more possible to implement ABC (Bjørnenak, 1997; Gosselin, 1997; Khalid, 2005; Krumwiede, 1998a).

In this research, the size of the firm is measured by the total number of full time employees and annual sales revenue. Firms, which have more than 150 employees, and with an annual sales of more than 25RMB million were chosen as research respondents.

4.2 Sampling Design and Data Collection Procedure

The mail questionnaire survey adopted in this research is to collect data. Mail questionnaire survey is considered as the most suitable approach for current study. As Gosselin (1997, p. 110) stated that "Mail questionnaire enables researchers to survey a large random sample of a population at a relatively low cost. Unlike interviews, mail survey focuses on facts rather than on personal opinions. It also places less pressure on an immediate response and provides the respondents with a feeling of anonymity". Shields (1995) also expressed the advantages of mail survey method, and stated that mail survey is a cost-effective method to collect data and to analyze a large sample. The mail questionnaire survey was also employed by prior researchers to investigate factors influencing ABC success implementation and adoption, for example, Baird et al. (2007) adopted mail questionnaire survey to examine the effect of organizational culture and

organizational factors, such as top management support, training in designing and implementing ABC system and so on. Mohammed and Drury (2007) also used mail-out survey to test whether ABC success implementation is affected by behavioral and organizational factors, just to name a few. Based on the discussion above, mail survey is considered as the most appropriate way to gather data in this study as the respondents are located in different regions in China.

Respondents were manufacturing firms, which manufacture a wide range of products, such as electrical and electronics products, iron, steel and metal products, food and beverage products, rubber and plastic products, paper, printing, packaging, and labeling products, chemicals and chemical products, pharmaceutical, medical equipment, cosmetics, toiletries, and household products, furniture and wood related products, textile, clothing, footwear, and leather products, machinery and equipment products. Hence, the unit of analysis of this study is organization.

Respondents for this study were randomly chosen from the directory of Chinese Chamber of Commerce and Industry 2008 version, which listed more than 30,000 manufacturing firms in the Chinese mainland areas. Firms were chosen from various locations, which comprised Southeast, Southwest, Northeast and South regions of China. However, the website does not state the annual sales of each company, but the products produced can be found. This study selected the firms which manufacture more than three products as the research sample. As discussed above, a wide range of products manufactured leads to a higher percentage of manufacturing overhead costs to the total manufacturing costs, this make it suitable for ABC implementation (Yanren, Wenbin, & Thomas, 2008).

In this research, the Chief Financial Officer (CFO) or Financial Controller of each firm was chosen as respondents. They are considered as the most suitable respondents as they are most likely to have a clear understanding of management accounting practices and also responsible for designing and implementing ABC in their companies. However, some companies may not have the position of CFO or Financial Controller. Under these circumstances, finance managers are assumed to be suitable respondents for this study.

The questionnaire together with a cover letter and a reply postage-paid envelop were sent to selected firms. Each questionnaire was pre-coded. Pre-coded questionnaires make it possible to trace and follow up non-respondents. In this research, if the researcher did not receive a reply from the respondents two weeks after the first mailed-out, then a follow-up telephone was made and a follow-up questionnaire was emailed. And if the questionnaires were either completely unanswered or partly answered, a follow-up telephone call was made and a follow-up questionnaire was also emailed to respondents to remind them to complete the questionnaire.

4.3 Questionnaire Design

A survey questionnaire was designed to bring forth reply from targeted respondents related to their perceptions on factors influencing ABC success implementation among manufacturing firms in the Chinese context, and to test the relationship between ABC success implementation and manufacturing performance/business performance. The questionnaire for this study was adapted from prior empirical studies. A close-ended response approach was used in the current research, where respondents were required to respond to a 5-point likert scale item against a specific statement.

A pilot test was conducted before the final version of the questionnaire was sent to respondents with the purpose of assessing the appropriateness of the research questionnaires. Many researchers pointed out the advantages of a pre-test, according to Sekaran (2003), reliability and validity of research instrument can be ascertained through pilot test, and the relevance of questionnaire could be made sure through conducting pilot test on representative sample or people (Cavana, Delahaye, & Sekran, 2001). In this study, one academician and two CFOs from manufacturing firms were chosen to participate in the pilot test. After the pre-test, a discussion was held with each one of them, and then questionnaires were revised and modified according to the suggestions and comments of experts on the questionnaires.

The survey questionnaire consists of five sections and 11 pages. Section 1 aims to collect background information, both respondents and companies' profile. Section 2 contains items related to the implementation of ABC system. Section 3 aims to examine the effect of various variable namely behavioral and organizational variables, technical factors, organizational culture, as well as organizational structure on ABC success implementation. Section 4 represents the measure for ABC success from four different perspectives. And finally, the changes in terms of manufacturing performance and business performance after ABC implementation were examined in the section 5.

Originally, the questionnaire was designed in English. However, since the people in China use Chinese as the official language, thus, it is necessary to translate the questionnaire into Chinese. The double-back translation procedure was applied in this study. Firstly, the translation was conducted by the author of this study, then reviewed by a Chinese citizen, who obtained his PhD in Management Accounting in Singapore,

in order to ensure there was no significant difference between the English and the Chinese version. The translated questionnaire and the original one were also examined by a CFO working in a US-based manufacturing firm in China. Modifications were made according to the comments and advices of experts. Finally, the finalized Chinese version questionnaire was translated back to English to ensure the meanings are similar. Both English and Chinese versions of the questionnaires are attached in the Appendix B.

4.3.1 Background Information

Table 4.1 provides a summary of the contents of the questionnaire. Section 1 contains questions related to gather background information of the respondents and their organizations. Part A covers question 1 to question 6, which relate to personal information, such as gender, age, educational level, job title and how long they have been working in the accounting or finance area.

Part B covers question 7 to question 10 which are designed to gather background information of each firm, major products manufactured by each firm, total number of employees, annual sales, and the ownership structure.

Table 4.1: Summary of Questionnaire Survey

Section	Variable determined in questionnaires	Questions
1	Background Information 1a. Respondents' background 1b. Companies' characteristics	 1-6 7-10
2	Implementation of ABC	11-19
3	Factors influencing ABC success implementation 3a. Behavioral and Organizational variables 3b. Technical Variables 3c. Organizational Culture 3d. Organizational Structure 3e. Type of strategy	 20-26 27 28-31 32-48 49
4	ABC success implementation	50
5	Firms' performance 5a. Manufacturing performance 5b. Business performance	 51 52

4.3.2 The Implementation of ABC

In the second section, the status of ABC implementation was investigated. In order to make respondents understand ABC clearly, at the beginning of section 2, the definition of ABC was provided.

The purpose of Question 11 is to differentiate the ABC adopters and ABC non-adopters, and also divided ABC adaptors into two categories: 1) firms that fully implement ABC system and 2) firms that partially implement aspects of ABC system.

For those who fully implement ABC system, they were requested to answer questions 12 to 18. In question 12, respondents need to address the stage of ABC implementation. According to Krumwiede (1998a), the stages of acceptance, routinizaiton and infusion or integration are considered as ABC users. Acceptance means ABC is occasionally

applied by top management for decision making but it is still considered as a project model, and ABC system is updated infrequently. At routinization stage, ABC system is frequently used by non-accounting upper management to make decision, and ABC system has been considered as the normal part of information system. At infusion or integration stage, ABC is comprehensively applied and fully combined with primary financial system, in which the benefits of ABC can be clearly identified.

Question 13 to question 16 require the respondents to state how long their firm has been implementing ABC, who initiated ABC, how they first learn about ABC, and the extent to which ABC is implemented.

Question 17 requests respondents to state the purpose of the application of ABC. The main purpose of a firm to implement ABC system are stock valuation, pricing policy, cost reduction, budgeting, new product or service design, customer profitability analysis, activity performance measurement and improvement, and cost modeling (Innes & Mitchell, 1995; Innes *et al.*, 2000).

The purpose of question 18 is to investigate the respondents' perception on benefits gained from ABC implementation. The instrument used to measure the benefits of ABC was drawn from Innes and Mitchell (1995, 2000). In this question all the benefits are measured by a five-point likert scale of 1 (strongly disagree) to 5 (strongly agree). Respondents were asked to rate one item which could best describe the benefits they accomplish through the use of ABC.

Question 19 aims to identify another type of ABC adopters. These firms are those that do not implement the full concept of ABC, but implement only some aspects of ABC. The instrument was taken from Yanren *et al.* (2008). In question 19, ABC implementation are broken down into four perspectives, such as using multiple cost drivers or bases to allocate overhead costs, increasing the cost drivers or allocation basis substantially in number, allocating period costs, such as R & D cost, general administrative costs to finished products, as well as increasing proportion of period costs traced to finished costs (Yanren *et al.*, 2008). The respondents need to rate the current management accounting practices on a five-point of Likert scale of 1 (strongly disagree) to 5 (strongly agree) against the four statement (mentioned above). If respondents selected "3" or above against any statements of question 19, they were considered as implementing certain aspects of ABC system and they were also suitable respondents for this study. In this study, there were 45 firms were considered as ABC partially users. The same procedures were also used by Yaren *et al.* (2008) to determine ABC users in China. At the end of question 19, a statement asking "if your firm is using any of the practices in Question 19, your firm can be considered as ABC user" is highlighted. It indicates that those firms are also considered as appropriate respondents for the current research.

4.3.3 Measurement of Variables

Section 3 aims to investigate the effect of various factors on ABC success implementation. Those factors comprise the behavior and organizational variables, technical variables, organizational structure, corporate culture, and an additional factor type of strategy. The detailed measures for each variable are as follows:

4.3.3.1 Behavioral and Organizational Factors

Part A refers to behavioral and organizational variables. This variable is made up of seven indicators, which were summarized by Shields and Young (1989) and Shields (1995). They are top management support, adequate resources, training in designing and implementing ABC, link to performance evaluation and compensation, link of cost management system to competitive strategy, non-accounting ownership, consensus about and clarity of the objectives of the cost management system. Even though it was developed in the year of 1989, they are still applied by many prior studies as the critical factors to influence ABC success implementation. Typical example are Shields (1995), Anderson and Young (1999), Lana and Fei (2007), and the latest research by Mohammed and Drury (2007). Hence, this study also adopts all these seven indicators for behavioral and organizational variables.

Top Management Support

Question 20 deals with top management support. The measure for top management support was drawn from Anderson and Young (1999), and later used by Mohammed and Drury (2007). Top management support is designed to ask the respondents to rate on a five-point scale from "1= strongly disagree to 5= strongly agree" against the following five statements: "top management provide visible support for the ABC initiative", "support for implementing ABC comes from both manufacturing operation and finance groups", "support for implementing ABC is widespread", "top management provides sufficient fund to support ABC information", "top management have a clear commitment to use ABC as the basis for decision making". The purpose of the five statements are to examine whether top management could provide visible support during ABC implementation, and commit themselves to use information generated by ABC as the basis for decision making. The measure for top management

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support was based on mean score for the above five items. High mean score indicated the high level of support provided by top management to the implementation of ABC system.

Adequate Resources:

Question 21 refers to adequate resources. The purpose of this question is to examine whether the firms have sufficient resources and what resources they needed to implement ABC. The instruments were adopted from Anderson and Young (1999), which requested the respondents to answer the survey using the following scale: "1= strong disagree to 5= strong agree" against three statements, such as necessary equipments and materials, access to the people from whom they needed to get information, and so on. The measure for adequate resources was based on mean score for the above three items. High mean score suggested that respondents possess sufficient resources during ABC implementation.

Training:

Question 22 is designed to examine whether firms provide adequate training for the process of ABC implementation and adoption. The measure is adopted from Anderson and Young (1999), and Mohammed and Drury (2007). This measure requested respondents to indicate the survey item ranging from "1=strongly disagree" to 5= "strongly agree" against four statements of adequate training was provided for designing, implementing, using, and understanding the benefits of ABC. The measure for training was based on mean score for the above four items. High mean score indicated high level of training provided by top management to ABC users.

Link ABC to Performance Evaluation and Compensation:

The link to performance evaluation and compensation is examined by question 23. The measurement for this indicator is adapted from Foster and Swenson (1997). This question requested respondents to indicate the same scale with previous questions against two statements. The statements were "ABC data has been used for performance evaluation" and "Compensation systems in the company are designed to motivate employees to implement ABC". Question 23 aims to examine whether ABC system has been tightly linked to performance and evaluation and compensation system. The measure for Link ABC to performance evaluation and compensation was based on mean score for the above two items. High mean score represented that performance measure and compensation were closely linked to ABC implementation.

Non-Accounting Ownership:

Question 24 deals with the participation of non-accounting staffs into the ABC implementation stage. Respondents were asked to rate their views on two statements, which are aimed to examine whether accounting staffs shared ABC information with non accounting staffs, and whether non-accounting staffs participate in the ABC implementation by using the scale of "1=strongly disagree" and "5=strongly agree". The instrument for this question were taken from Shields (1995), and subsequently used by Chongruksut (2002) to examine the factors influencing ABC success in Thai environment. The measure for was based on mean score for the above five items. The measure for non-accounting ownership was based on mean score for the above two items. High mean value indicated that high level of participation of non-accounting staff in the implementation of ABC.

Linkage of ABC System to Competitive Strategy, especially quality initiative:

Question 25 deals with the linkage of ABC system to the competitive strategy, especially quality initiative. Shields (1995) employed a survey instrument to examine the degree to which ABC is linked to the competitive strategy, especially quality initiative. This instrument also was adopted in this study. This instrument requested respondents to indicate their agreement with the statement of the degree of linkage of ABC to quality initiative and to competitive strategy on a five point Likert scale ranging from "1= to a little extent" to "5= to a great extent". High mean score means ABC system was closely linked to competitive strategy.

Clarity of ABC Objectives:

Question 26 has one statement: "when the ABC initiative began, objectives of ABC were understood clearly both by the designers and users". This instrument was employed by Shields (1995), and subsequently adopted by Mohammed and Drury (2007). This instrument asked respondents to indicate their opinions on a scale ranging from "1=strongly disagree" to "5=strongly agree". The measure for clarity of ABC objectives was based on mean score for the above item. High score indicated that the objectives of ABC were understood clearly by users and designers.

4.3.3.2 Technical Problems

Part C deals with technical variables which may influence the success of ABC implementation. Question 27 is related to the practical problems firms may encounter during ABC implementation process. Lana and Fei (2007) reviewed prior research about technical problems that a firm may experience when using ABC, and summarized eight technical variables that relate to ABC implementation are software

packages, gathering data on cost drivers, identifying activities, designing the system, knowledge of data requirement and data collection, the involvement of external consultants and so on. This study also employed technical problems and its measure, which was adopted by Lana and Fei's (2007) research.

The respondents were asked to rate their perceptions by using a five-point likert scale of "1=strongly disagree" to "5=strongly agree" on eight common problems (summarized in the above paragraph) that a firm may experience at the stage of ABC implementation. The measure for variable of technical problems was based on overall average score for the above eight items. Low score suggested that low of technical problems experienced by respondents during ABC implementation.

4.3.3.3 Organizational Culture

Part C listed a set of values that may be adopted to portray the nature of the work context. The purpose of this part is to examine whether there exists a significant relationship between ABC success implementation and corporate culture.

The measure for organizational culture was initiated by O' Reilly *et al.* (1991). In their research organizational culture was measured by 26 items. They then carried out a factor analysis, and four factors that could explained 64 percent of total variances were retained, namely outcome orientation, team orientation, innovation, and attention to details. The four dimension of organizational culture was subsequently adopted by Baird *et al.* (2007) to investigate the effect of organizational culture on activity

management practices success implementation. So this study also employed the four dimension of organizational culture.

Part C consists of four questions (question 28 to question 31) that assess the four cultural dimensions: outcome orientation, team orientation, innovation and attentions to details. Each question represents one aspect of organizational culture, and each question is followed by a number of items. Respondents were requested to rate the extent to which each item was valued in their business unit. All items used five Likert-scales with a range of "1=not valued at all" and 5="value to a great extent". A high score represents a high value on the dimensions; on the other hand a low score refers to a relatively low value on the dimension. The measures for organizational culture were based on the mean score for each dimension of organizational culture.   High score suggested that respondents valued highly on each dimension of organizational culture.

4.3.3.4 Organizational Structure

Part D deals with the relationship between the organizational structure and ABC success. Two dimensions of organizational structure were used as indicators to test the impact of organizational structure on ABC success implementation. They are centralization and formalization.

Centralization:

Question 32 to question 38 is multiple choice questions that deal with the degree of formation. Each question has 5 items. Respondents were asked to select one of five items which could best describe their organizations. If respondents select item A, they

would get one point, item B would get two points, and item E would get 5 points. The instrument used in this study was employed by Robbins (1983), and the measure was subsequently adopted by Gosselin (1997) to investigate the impact of organizational structure on activity management. The purpose of these questions is to examine the extent to which rules, policies and procedures are standardized. The mean score for question 32 to question 38 was used to measure centralization. High mean score suggested the high level of centralized structure.

Formalization:

Question 39 to question 49 deal with the degree of centralization. The instrument employed in this study was taken from Robbins (1983), which also applied by Gosselin (1997). The purpose of these questions is to determine the authority of decision-making at a top level in the hierarchy. The Mean score for question 39 to question 49 was used to measure formalization. High mean score indicated that the structures are highly formalized.

4.3.3.5 Type of Strategy

Type of strategy is an additional variable in the current study. Gosselin (1997) stated that type of strategy produces different effect on the various stages of activity management practices, and it also applies to Activity-Based Costing.

Part 3e is made up of question 49. Question 49 listed three statements about the characteristics of three major types of strategy, namely, prospectors, analyzers and defenders. These characteristics were adapted from Miles and Snow (1978), and

subsequently adopted by Jusoh and Parnell (2008). Respondents were requested to choose one statement which could best describe the strategy that their firms adopt. The purpose of part 3e is to determine which type of strategy is currently adopted by the respondents.

4.3.4. The ABC Success Implementation

In the current study, ABC success implementation is measured by question 50. Question 50 has four parts. It was used to measure the respondents' perceptions on ABC success implementation, namely users' attitude, technical characteristics rating, perceived usefulness in improving user job performance and impact on organizational process. Each part measures one aspect of ABC success. McGowan (1998) also used the same items to measure the success implementation of Activity-Based Costing Management, and McGowan's (1998) instrument was subsequently employed by Byrne *et al.* (2009) to examine ABC success in the Australian context. The details for each dimension are as follows.

<u>Users' Attitude:</u>

Part 4a of Question 50 refers to user attitude, which is represented by a statement as follows: "my overall attitude toward the ABC implementation is". Respondents were asked to circle their response to the statement on a five-point likert scale ranging from "1=strongly unfavorable to 5=strongly favorable". The measure for users' attitude was based on the mean value for question 50.

Technical Characteristics:

Part 4b deals with the technical characteristics. In this study, technical characteristics are composed of five aspects: accuracy, accessibility timeliness, reliability and understandability. Respondents were asked to make a comparison between ABC information and information produced by the previous traditional accounting systems on all of these five technical characteristics using a scale of "1=strongly disagree" to 5="strongly agree". The measure for technical characteristics was based on the mean score for these five aspects.

Perceived Usefulness in Improving Users' Job Performance:

Part 4c was designed to examine the perceived usefulness in improving user job performance. This part was made up of six statements. These statements include various measures for the improvement in job performance, such as quality of job, effectiveness of job, and overall job performance. Respondents were requested to rate their view on the improvement in their job performances by the application of ABC information by using a five-likert scale anchored "1=strongly disagree" to "5=strongly agree". The measure for perceived usefulness in improving users' job performance was based on the mean value for the above six statements

Impact on Organizational Process:

The final part of the questionnaire was the impact of ABC success on organizational process. Part 4d consisted of quality decisions, efficiency, waste reduction, innovation, relationships across functions, and communications across functions, and the overall focus on the goal of the entity. Respondents were required to rate their perception about the impact that ABC implementation has had on the five dimension of organizational

process by choosing a survey item ranging from 1="strongly disagree" to 5="strongly agree". The measure for the impact on organizational process was based on the mean score of these items above in part 4d.

In the data analysis section, the measure for ABC success implementation was based on overall mean value of users' over attitude toward ABC implementation, technical characteristics, perceived usefulness in improving users' performance, and impact on organizational process. High score represented that high level of ABC success implementation.

4.3.5 Performance

The dependent variable is the firms' performance, which consists of two parts, namely, manufacturing performance and business performance.

4.3.5.1 Manufacturing Performance

Part A of Section 5 was designed to examine the improvement in manufacturing performance after ABC implementation. Quality, time and cost were used to measure the enhancements in manufacturing performance based on Ittner *et al*. (2002), who used all these measures to examine the association between Activity-Based Costing and manufacturing performance. These instruments and measures were subsequently used by Banker *et al*. (2008) to examine the effect of Activity-Based Costing on manufacturing performance. This study also adopted quality, time and cost to examine the association between ABC success and manufacturing performance.

Question 51 is made up of four statements. They are related to improvement in finished product first pass quality, decrease in manufacturing cycle time and customer lead time, as well as reduction in manufacturing cost. Respondents were requested to indicate their perceptions on the statements using a scale "1=strongly disagree" to "5=strongly agree". The mean score for the four statements above was employed to measure the perceived manufacturing performance. A High score indicated a high level of improvements in manufacturing performance that respondents perceived after ABC implementation.

4.3.5.2 Business Performance

Question 52 deals with the measurement for perceived business performance. The measure was adapted from Mia and Clarke (1999). Mia and Clarke (1999, p. 151) provided the definition for business performance:

> The extent to which the unit had been successful in achieving its planned targets, such as achievement of planned productivity, costs, quality, delivery schedule, sales volume, market share, and level of profit.

In their research, respondents were asked to indicate their actual performance compared to the budgeted performance during the last three years by choosing one item from a seven-point likert scale of 1="very poor performance" to 7="very excellent performance". Mia and Clarke (1999) also justified why the financial performance indicators such as 'return on investment' or input or output ratio were excluded from their research. They argued that financial performance measure only incorporated quantitative aspects, and ignored qualitative aspects, they also stressed that the performance assessment criteria should incorporate qualitative and quantitative, financial and non-financial perspectives.

Mia and Clarke's instrument was employed by Isa and Foong (2005) to examine the effect of the management accounting system changes on business performance among Malaysian manufacturing firms.

In the current research, the measures for business performance also adapted from Mia and Clarke's (1999) work with the purpose of testing whether ABC success implementation could lead to the improvement in business performance. Respondents were requested to rate the perceived performance of their own firms on a five-point Likert scale of 1 (Very poor performance) to 5 (Very excellent performance) after ABC application. High (Low) score means high (low) level of attainment against the planned performance. It is believed that the measure for business performance comprise all aspects of performance, both quantitative and qualitative, both financial and non-financial. The measure for business performance was based on the mean value for the 7 items above in question 52. A High score indicated a high level of enhancements in manufacturing performance that respondents perceived after ABC implementation. Table 4.1 presents a summary of questions covered in the questionnaire.

4.4 Data Analysis Technique

In this study, the primary data were obtained through the distribution of the survey questionnaires.

In this study, Statistical Package for the Social Sciences (SPSS) program was employed to analyze data collected from questionnaires. The detailed data analysis techniques are described as follows:

4.4.1 Descriptive Analysis

In this study, frequency distribution was carried out to depict company and respondents profiles. For instance, respondents' background (Question 1-6), and companies' characteristics, such as major products manufactured by each firm (Question 7), number of employees (Question 8), annual sales turnover (Question 9), and ownership status (Question 10).

Furthermore, descriptive analysis was also used to show the frequency distribution for items related to confirming whether firms are adopting ABC to trace overhead costs or not (Question 11), stages of ABC implementation (Question 12), how long firms have been using ABC (Question 13), who initiated ABC (Question 14), how did firms first learn ABC (Question 15), confirming whether firms apply ABC company widespread or in selected divisions (Question 16), the main purpose of implementing ABC (Question 17), and the current accounting practices (Question 19).

4.4.2 Factor Analysis

The primary objective of factor analysis is to reduce research data and recap essential information included in the variables (Hair *et al*., 2006). Factor analysis is commonly employed by researchers as an exploratory approach to extract the structure of a set of research variable (Coakes & Steed, 2003). Malhotra (2004, p. 560) summarized the circumstances that factor analysis could be applied:

- To discover the core factors, that could account for the correlations among a set of variables.

- To produce a new and smaller number of uncorrelated variables, to partially or

completely substitute the original set of correlated variables in succeeding regression or cluster analysis.

- To create a smaller set of significant variables from a large number of variables to apply in succeeding multivariate analysis.

Factor analysis has two main methods: Principal components analysis (PCA) and common factor analysis. PCA is widely used by researchers who want an empirical summary of the data set (Pallant, 2001). Hair *et al.* (2006, p. 118) stated that "PCA could focus on the minimum number of factors needed to account for the maximum portion of the total variance represented in the original set of variables". Hence, in this study, exploratory factor analysis by way of Principal components analysis (PCA) was applied to conduct factor analysis. PCA is recommended by a number of researchers as the most appropriate approach to conduct factor analysis. For instance, Coakes and Steed (2003) cited that this is the most suitable method for the summarization of a large number of data. Malhotra (2006, p. 564) argued that "principal components analysis is recommended when the primary concern is to determine the minimum number of factors that will account for maximum variance in the data for use in subsequent multivariate analysis".

4.4.3 Reliability Analysis

After factor analysis, a reliability test was carried out to exam the extent to which the items in the questionnaire are correlated to each other and can be determined and an overall index of internal consistency of the scale as a whole can be obtained, and items with low internal consistency which should be deleted from the scale could be identified (Sekaran, 2003). This research adopted Cronbach's alpha which it is considered as the most popular measurement to assess the reliability of the multi-item

measurement scale in the questionnaires (Cavana *et al.*, 2001; Peter, 1979). Normally, the closer the value of Cronbach's alpha is to 1, the higher the internal consistency reliability is. According to Hair *et al.,* (2006), high reliability represents that items in measured variables are strongly correlated with each other and more reliable of that variable to measure the construct, and high reliability value also shows confidence that each variable are measuring a single construct.

Generally, if the reliability's value is less than 0.6, it is considered as poor. On the other hand, if the value of the reliability is greater than 0.7, it should be considered as acceptable. However, Cronbach's alpha sometimes still can be decreased to values between 0.5 or 0.6 (Nunnally, 1978). This study considered 0.6 as an acceptable level, if the overall reliability's value for one item is less than 0.6, adjustments were made to improve the reliability.

In addition, data collected from the survey questionnaires are all interval data, so Pearson correlation was used to examine the correlation and direction of relationship between main variables. The coefficient of Pearson correlation ranges from -1 and 1. The results of reliability test were depicted in chapter 5.

4.4.4 Multiple Regression Analysis

Next, multiple regression technique was employed for hypothesis testing. In this study, the multiple regression technique was employed to examine the abilities of behavioral and organizational variables, technical variables, organizational structure and culture factors in explaining the variations in ABC success implementation by using the

coefficient of determination (R^2). According to Hair *et al.* (2006), R^2 is applied to measure how many percent of the variance of dependent variable could be explained by all the independents variables together. The coefficient ranges from 0 to 1, The higher the value of the coefficient, the better the prediction of the dependent variables (Hair, Anderson, Tatham, & Black, 2006). In this research, it is expected that behavioral and organizational variables, technical variables, organizational culture and structure could account for a large proposition of variation in ABC success, as well as the sub components of each main variable could explain the large variation in ABC success.

4.4.5 Other Statistical Technique

Other statistical methods, such as one way ANOVA and T-Test were employed to check the response bias; all the participants were divided into two groups, namely early and late reply, the aim of T-Test was to examine whether significant difference exists in terms of the main research variables between those two groups. In addition, one way ANOVA was used to examine whether there is any significant difference in ABC success between prospector, defender and analyzer firms.

Furthermore, Structural Equation Modeling with AMOS was used to examine whether the relationship between firms' performance and main independent variables, namely behavioral and organizational variables, culture, technical problems, as well as structure was mediated by the success of ABC implementation.

4.5 Summary

This chapter contains discussions related to the research methodology employed in this study. This chapter begins with an introduction and followed by a discussion on research samples in section 4.1. In section 4.2, the data collection method and questionnaire survey used in this study are discussed. Section 4.3 presents a discussion on the design of questionnaires. Lastly, a discussion on the technique of data analysis is presented in section 4.4.