CHAPTER 4
RESEARCH METHODOLOGY

4.0 Introduction

This chapter presents the research method adopted. First, the chapter discusses the rationale for the chosen research approach and presents an overview of the research process. Second, the chapter describes the details of the survey including its design and development, the research environment and setting, and research participants.

4.1 Overview of Research Design

This study concentrates on particular aspects of post implementation of ERP of organizations, and as such, a research method that gathers a large data set on each of these aspects is appropriate, i.e., survey. As a research strategy, the survey maximizes the representative sampling of the adoption behavior of SMEs that are involved with the chosen innovative IS (Kerlinger and Lee, 2000). The survey provides an explanation that establishes the existence of a causal relationship between constructs and/or variables (Pinsonneault and Kraemer, 1993). Data sources are classified as being either primary sources or secondary sources. A source is primary if the data collector is the one using the data analysis. A source is secondary if one

organization or individual has compiled the data to be used by another organization or individual. In this study, primary sources of data which are interviews and distributed questionnaires are used to analyze the data gathered. The questionnaire items were adopted from the previous researches. We conducted interviews with five managers in local manufacturing plant as an additional means of ensuring the questionnaire items corresponded to the theoretical constructs as intended. The instrument or measure used is a structured questionnaire that was developed by researcher based on the literature review on the relevant topics.

The development of the final survey paper is going through proper stages.

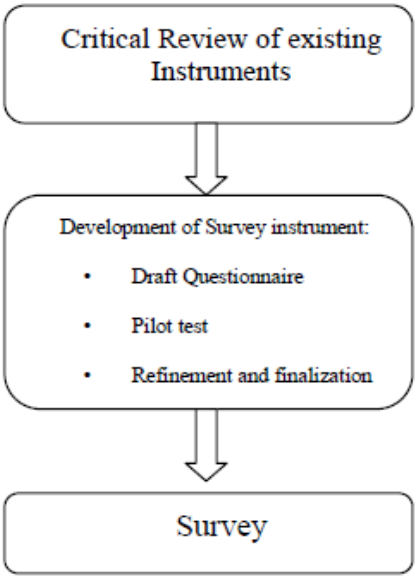


Figure 4.1. Stages in the Development of the Survey

4.2 Research Design

The basic idea of a research design is to specify methods and procedures for collecting and analyzing the required information. It is thus designed in the following ways to increase the validity of the questionnaire and gain more responses.

Descriptive design has been used to identify the relationships and interaction between IS Sophistication, Interdependence, Differentiation, Customization, Time Elapsed after ERP Implementation and the ERP intermediate benefits .

It is vital to monitor the efforts of based on information gathering through opinion polls, research and analysis (De Vicente, 2004). Therefore, a survey research is most appropriate to explain the behavioral patterns since it is able to capture a wide range of respondents. In the data collection effort, respondents have given a self-administered, seven items questionnaire containing measurements of firm IS sophistication, interdependence, differentiation, level of ERP customization, coordination improvements, task efficiency, overall ERP benefits to the firm and as well as the measurements for demographic variable. In order to improve the response rate, respondents was ensured anonymity and confidentiality. Care was exercised to ensure that the composition of respondents reflects the population composition in the manufacturing segment chosen in this study. The survey stretched over four weeks.

4.3 Sampling Design

There are two restrictions when choosing the respondents:

i. The respondents' company must have implemented an ERP solution (from post implementation perspective).
ii. The respondents' company should be involved in the manufacturing or distribution activities.

This study focus on the post implementation of ERP. Hence, internal staffs who work in the company that has implemented with an ERP solutions in are the target respondent for this study. Due to time constraints and the inability to reach the entire manufacturing companies nationwide, this study relied on convenience sampling technique. A sample size of 500 respondents was selected. Questionnaires were sent out by using convenience sampling method through hand-delivery and e-mail. The questionnaires were sent out in Klang Valley to the workers (managers, supervisor and department head) who are working at the manufacturing/distribution plant. The user groups mostly consisted of operations people (operation managers, production and inventory control managers and line supervisors) and did include some IT staffs and the key ERP end users from various departments (procurement, shipping/distribution, account receivable, accounts payable). Potential participants were either sent or given a pencil and paper survey with a traditional cover letter, or were given an e-mail solicitation inviting them to fill in the softcopy of the survey forms with a parallel version of the survey.

However, even among the traditional mailing lists, we could not cull out or filter the companies that had not implemented ERP, and presumably these individuals had little motivation to return the survey. Since computing the overall response rate (especially the response among companies with ERP) is problematic, we need to consider the possibility that we have a response bias. Even for individuals in organizations that have implemented ERP, the motivation to fill out the survey is probably higher when the system is relatively successful. Thus we might assume that our results are reflective of organizations that have been relatively successful with ERP. In order to reduce the possibility of response bias, proper instructions to fill up the survey form has been stated in the survey form. Respondent reluctant can be reduced by assuring respondents of the confidentiality of their replies. In constructing the questions for the questionnaire, wording and structure are to be considered. Utilization of jargons and technical terms has been reduced. In addition, we included both positive and negative questionnaires items for a particular construct. Negative questions can be used to reprimand the respondent answer. The validity of their responses would be checked afterwards. We hoped that this would discourage dishonest or uncertain response behavior. We follow up on this notion in the discussion section.

4.4 Questionnaire Design

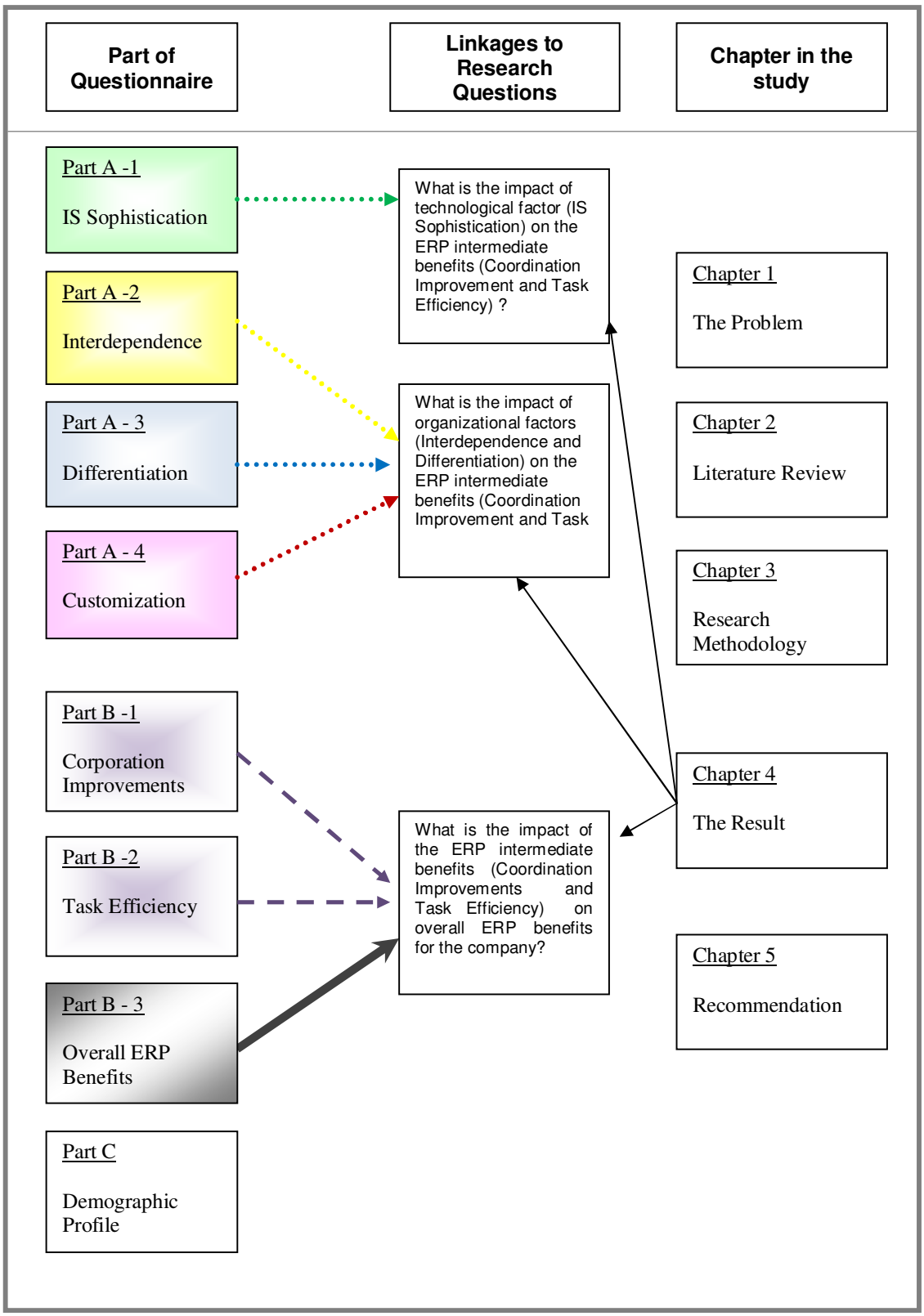
A survey instrument was developed to measure the constructs needed to test the above hypotheses. The initial structured questionnaire was generated based on interviews with managers involved in ERP implementation. The development of a personally administered questionnaire was done after several consultation sessions with the research supervisor.

There were seven major constructs in the questionnaire based on the literature review at the previous chapter. The seven major constructs were IS sophistication, interdependence, differentiation, customization, coordination improvements, task efficiency and overall ERP benefits to the company.

As illustrated at Figure 4.2, the schematic layout design indicates how the construct of the questionnaire answers the research questions.

The questionnaire is divided into three parts and lasts for 4 pages. The questions in Part A to Part B were designed in closed questions using seven – points Likert Scale (from “Strongly Agree” to “Strong Disagree”). In Part A, respondents’ perception toward IS Sophistication, Interdependence, Differentiation and customization were collected. There were thirty-six statements in Part A which comprised of nineteen statements on perceptions concerning IS Sophistication, six statements on Interdependence, eight statements on Differentiation and four statements on customization.

Figure 4.2. Schematic of Research Layout Design



In Part B - 1, respondents were presented with four items that measure their perception on the ERP intermediate benefits level towards the Coordination Improvements. Part B – 2 consists of four items to measure respondents' perception on the Task Efficiency. Part B - 3 consists of 4 items that were designed to measure the respondents' view on the ERP Overall Benefits to the company.

Demographic variables such as gender, age, citizenship, marital status, education level and monthly income level were collected in Part C. A few determinant-choice questions were used in Part C - which is a type of fixed-alternative question that require a respondent to choose one (and only one) response from several possible alternatives.

Questionnaires have been distributed to most of the respondents via hardcopy. In addition, online questionnaire was distributed to the respondents via electronic mail. The online questionnaire has been modified in order to ease the respondents in filling-up the questionnaire via compute.

(Refer to Appendix 1 – Questionnaire Form)

4.5 Pilot Test

The next stage was a pilot test of the instrument using participants whose background was similar to the target population of the final study. The primary aim of this test was to ensure that the various measures demonstrated the appropriate levels of reliability. Therefore, a pilot test had been carried out in order to gauge the understanding level of respondents towards each relevant question in the questionnaire set.

Prior to the distribution of final questionnaire, we have conducted interviews with two operation managers in local manufacturing facilities and they were asked filled out a prototype questionnaire. This is to ensure the questionnaire clarity, applicability and content validity.

The pilot study (with a total of 10 responses) was conducted with the managers at Klang Valley. Potential problematic areas were checked and the clarity was improved. Subsequent changes were made to the questionnaire. Responses from the pilot test were not included in the final sample.

4.6 Demographic Profile of Respondents

Respondents' company background and activities was asked in Part C of the survey questionnaire. Nine questions were developed to find out respondent's company demographic characteristics. These include the company's primary business activity, industry, years of operation, numbers of employees, country of origin, number of branches or manufacturing sites, participant job function, ERP software vendor and time elapsed after ERP implementation.

4.6.1 Demographic Profile Characteristics

The data collection involved traditional manufacturing firms, distributors, wholesalers and retailers who has implemented with ERP system. The targeted firms included a mix of small, medium and large organizations. The country of origin of the respondents for majority of the and respondents is Malaysia (59%) Each of the following industries was represented by at least eighty percent of respondents: Food and Beverage, Electric and Electronic, Furniture and Fixture, Plastic and Chemicals products.

Today, there are more than 100 ERP systems vendors in the market but only five of them share sixty percent of the ERP market: SAP, Oracle, JD Edwards, People Soft, and BAAN. Each of these main players has its own salient feature (Botta-Genoulaz and Millet, 2006). Of the responses, thirty-six percent implemented with SAP and twenty percent with Oracle. Twenty-four percent do not have the instant name recognition of SAP or Oracle and dominant vendors

and these packages are consolidated as “other”. The Summaries of the respondents profile is shown in the Table 4.1.

Table 4.1. Summary of the Respondents Profile in the Sample

Demographic/Control Variables	Category	Frequency (n=131)	Percent (%)
Respondents company primary business activity	Manufacturing or Processing of Industrial Goods	42	32
	Manufacturing or Processing of Consumer Goods	33	25
	Wholesaling	19	15
	Retailing	26	20
	Services	11	8
Respondents company business industry	Plastic Products	20	15
	Others	21	16
	Furniture & Fixture	10	8
	Construction-related	8	6
	Food & Beverages	31	24
	Chemical Products	8	6
	Textile & Clothing	7	5
	Electric & Electronics	16	12
	Rubber Products	3	2
	Automotive / Autoparts & Transportation	7	5
Respondents company years of operation	Less than 1	16	12
	1 to 2	17	13
	2 to 3	14	11
	3 to 4	12	9
	4 to 5	10	8
	5 to 10	17	13
	More than 10	45	34
Respondents company numbers of employees	Less than 50	28	21
	50 to 100	41	31
	100 to 300	30	23
	300 to 500	12	9
	500 and above	19	15

Table 4.1. Summary of the Respondents Profile in the Sample (continued)

Demographic/Control Variables	Category	Frequency (n=131)	Percent (%)
Respondents company country of origin	Malaysia	78	60
	ASEAN countries (Thailand, Vietnam, etc)	17	13
	Europe (UK,France, etc)	7	5
	Middle East (UAE, Qatar, Saudi Arabia, etc)	11	8
	Asia (China, Taiwan, Hong Kong, Korea, etc)	9	7
	Americas (United States, Canada, South America, etc)	5	4
	others	4	3
Respondents company numbers of branches or manufacturing sites	1	62	47
	2	32	24
	3 or more	37	28
Respondents Job Position	Scheduler/Planner/Buyer	30	23
	Materials Manager/Purchasing Manager	29	22
	Operations Manager	27	21
	Plant Manager	14	11
	Other Position	31	24
Respondents ERP Software Vendors	SAP	47	36
	JD Edwards	3	2
	QAD	2	2
	PeopleSoft	7	5
	Oracle	26	20
	PeopleSoft	14	11
	Others	32	24
Respondents company ERP Time Elapsed since Implementation at Plant (since "go-live")	Less than 1	12	9
	1 to 2	28	21
	2 to 3	48	37
	3 to 4	16	12
	4 to 5	5	4
	More than 5	22	17

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

4.7 Summary

The chapter discusses about the formulation of the proposition used in this study. After distilling the information from the literature review, research propositions were constructed to find out the relationship between IS Sophistication and Task Efficiency and Coordination Improvements, Differentiation and Task Efficiency and Coordination Improvements, ERP Customization and Task Efficiency and Coordination Improvements, ERP Time Elapsed and Task Efficiency and Coordination Improvements, Task Efficiency and Overall ERP Benefits and lastly the relationship between Coordination Improvements and Overall ERP Benefits.

The following chapter describes the characteristics of the data, preliminary results, and the multivariate analytical technique employed to test the hypotheses.