

Chapter 4 Research Methodology

4.1 Introduction

This chapter presents an overview of the methodological perspective of the research. Section 4.2 describes the research design based on the research questions and theoretical models hypothesized in this study. Section 4.3 presents the research strategy of a questionnaire survey. The research strategy of structured interviews is described in Section 4.4. Section 4.5 discusses the strategy of a case study. Finally, Section 4.6 summarizes this chapter.

4.2 Research Design

The role of research design is to connect the questions to data. Design sits between the two, showing how the research questions will be connected to the data, and the tools and procedures to use in answering them. Research design must follow from the questions and fit them with data. The design is the basic plan for a piece of empirical research, and includes main ideas such as strategy, sample, and the tools and procedures to be used for collecting and analyzing empirical data (Punch, 2000). In this section, only the research strategies and general research sample are described. Other aspects such as tools and procedures used for collecting data, detailed sample determination for the questionnaire survey, the structured interviews, and the case study are presented in Sections 4.3, 4.4, and 4.5, respectively.

4.2.1 Research Strategies

For conducting empirical research, there are two methods of data collection: Qualitative and quantitative. These two methods have their strengths and weaknesses. The qualitative method permits researchers to study selected issues in depth and detail. Approaching fieldwork without being constrained by predetermined categories of analysis contributes to the depth, openness, and detail of qualitative inquiry. The quantitative method, on the other hand, requires the use of standardized instruments so that the varying perspectives and experiences of people can fit a limited number of predetermined response categories, to which numbers are assigned. The advantage of a quantitative method is that it is possible to measure the reactions of a great many people to a limited set of questions, thus facilitating comparison and statistical aggregation of the data. This gives a broad, generalizable set of findings presented succinctly and parsimoniously. By contrast, a qualitative method typically produces a wealth of detailed information about a much smaller number of people and cases. This increases understanding of the cases and situations studied but reduces generalization (Patton, 1990).

In order to avoid their respective disadvantages, one important way to strengthen a research design is to use both qualitative and quantitative methods. A number of research strategies are available for conducting social sciences: Experiments, surveys, histories, case studies, and the analysis of archival information. The kinds of research strategies adopted in a study

should be dependent on three conditions: The type of research questions, the control an investigator has over actual behavioral events, and the focus on contemporary, as opposed to historical, phenomena. However, the first and most important condition for differentiating among the various research strategies is to identify the type of research questions being asked (Yin, 1989). Based on the five research questions proposed in this study, the research strategies of a literature review, a questionnaire survey, structured interviews, and a case study were adopted in this research. The explanations for adopting such research strategies are presented in the following subsections.

Literature Review

The first and the second research questions-“What is TQM?” and “What is overall business performance within TQM?”-are descriptive in nature. According to Punch (2000), a descriptive study sets out to collect, organize, and summarize information about the matter being studied; it is concerned with making complicated things understandable. For answering these two research questions, a literature review approach was the best strategy. The literature review on all aspects of TQM helped to provide a detailed understanding of the state of TQM today in terms of its research and its application within industries. The literature review identified what the concept of TQM is. Thus the first research question, “What is TQM?”, was answered. Similarly, the literature review on all aspects of overall business performance identified what is important for measuring organizational overall business performance. Thus, the second research question, “What is overall business performance within TQM?”, was answered.

Questionnaire Survey

The third research question-“What are the effects of TQM implementation on overall business performance in Chinese manufacturing firms?”-is to examine the effects of TQM implementation on overall business performance. Based on the existing theories, two theoretical models were derived. In essence, to answer this research question is to verify a theory. According to Punch (2000), a theory verification study aims to test a theory or, more accurately, to test hypotheses derived from the existing theory. It is a common practice in social science areas that have traditionally emphasized quantitative research. Such a study starts with a theory, deduces hypotheses from it, and proceeds to test these hypotheses. Thus, a questionnaire survey was the most appropriate strategy to answer this research question. The greatest advantage of a questionnaire survey is its lower cost compared to other methods. Mail questionnaires also have sample-related advantages: Geographic coverage, larger samples, and wider coverage within a sample population. A questionnaire survey can be used only when the objective of the study is clear and not complex (Bourque and Fielder, 1995). In the area of TQM implementation, much research has been conducted using questionnaire surveys to collect information (e.g., Anderson et al., 1995; Choi and Eboch, 1998; Forza and Filippini, 1998). These researchers tested the effects of TQM implementation on overall business performance using questionnaire surveys. Generally, questionnaires were used to obtain a large database of TQM information with a low level of details. In this study, the questionnaire survey was used to obtain information about TQM implementation and overall business performance from a wide range of Chinese

manufacturing firms. Such data could be used to examine the effects of TQM implementation on these firms' overall business performance.

Structured Interviews

The fourth research question is "What kind of TQM implementation model should be developed in order to guide Chinese manufacturing firms in implementing TQM?". This question is exploratory in nature. In order to make the TQM implementation model applicable in practice, current practices of TQM implementation, successful experiences of TQM implementation, problems and difficulties of TQM implementation, and effects of TQM implementation in Chinese manufacturing firms should be studied. Thus, the dynamics of firms' TQM implementation can be obtained. In order to meet such a research requirement and answer this question, it was decided that the strategy of structured interviews would be used to obtain information on the areas identified for the research. It was obvious that structured interviews could obtain more dynamic, detailed information on TQM implementation and overall business performance from a number of firms within a relatively short time period. Such information obtained from structured interviews was used to develop the TQM implementation model and make it more robust. Generally, structured interviews can obtain more detailed information compared with questionnaire surveys; some information that cannot be obtained through questionnaire surveys can be obtained through structured interviews. In fact, in the research area of TQM implementation, some researchers used structured interviews to develop their TQM implementation frameworks (e.g., Mann, 1992). In addition, the results obtained from structured interviews could be used to explain the results obtained from the questionnaire survey findings. Furthermore, the results obtained from the structured interviews were used to give the author a better understanding of TQM implementation in Chinese manufacturing firms.

Case Study

The fifth research question is "How can this TQM implementation model be demonstrated in practice?". In fact, the model was developed on the basis of existing TQM knowledge and the structured interviews in Chinese manufacturing firms. In order to understand how to use this model in practice, a case study would be conducted in a Chinese manufacturing firm. According to Yin (1989), case studies are the preferred strategy when "how" or "why" questions are being posed. Therefore, it was suitable to conduct a case study to answer this research question. Although the case study approach has a number of drawbacks, it also has a number of unique advantages. Among the drawbacks are the lack of statistical evidence from research findings and the possibility of the research influencing the phenomenon under study. The case study strategy is, however, the only way to provide an in-depth insight into the processes going on within complex organizations. The case study method has its strength in its ability to deal with a full variety of evidence such as documents, artifacts, interviews, and observations (Yin, 1989). Through conducting a case study, the way to use this TQM implementation model could be obtained. The case study can provide practical assistance to Chinese manufacturing firms in implementing this TQM model in practice, and can also provide a better understanding of the model.

Summary

In summary, the literature review was conducted to identify what TQM is and what overall business performance is. A questionnaire survey was used to obtain data from Chinese manufacturing firms to study the effects of TQM implementation on overall business performance. Structured interviews were used for two purposes: To obtain information used for developing the TQM implementation model and to use the results of structured interviews to explain the findings from the questionnaire survey. A case study was used to provide a practical example of using this model in practice. In a word, the research strategies adopted in this study can be characterized as approaches of quantitative (a questionnaire survey) and qualitative investigations (a literature review, structured interviews, and a case study).

4.2.2 Research Sample

Manufacturing firms in Liaoning province were selected for investigation due to the province's position as one of the most important industrial centers in China, as well as for reasons of practicality and convenience perceived by the author. Several years ago, the author worked in a provincial governmental agency and had good contact with people who worked in the field of quality management in other governmental agencies. It was relatively easy for the author to obtain sufficient information to be used for this study. The details about the sample frame for conducting the questionnaire survey, structured interviews, and case study are described in Sections 4.3, 4.4, and 4.5, respectively.

4.3 Questionnaire Survey

Questionnaire Development

In the field of quality management, a number of researchers have used questionnaire surveys. These included, for example, Flynn et al. (1994), Saraph. (1989), Mann (1992), Blauw (1990), and Blauw and During (1987, 1990). All of these researchers developed their questionnaires for data collection, based on their own research purposes, thus, their questionnaires differed from each other. After the questionnaires were examined, it was determined that none fully met the requirements of this research. Therefore, it was necessary to develop a new research questionnaire. However, the questionnaires developed by these researchers did give some insights into developing the questionnaire required for this research purpose. In fact, the design of the research questionnaire was highly dependent on the concepts of theoretical constructs and the operationalization of the theoretical constructs. The major issue of designing the questionnaire was to determine measurement questions, which respondents would be asked to answer. During the process of designing a research questionnaire, the following six issues should always be kept in mind. Following these principles might ensure the successful design of the questionnaire.

- Why is this question asked?
- What is the aim of asking this question?

- Is the question of proper scope?
- Can the respondents answer adequately?
- Will the respondents answer willingly?
- Are scales clear?

It should be noted that the questionnaire survey was used to study the effects of TQM implementation on overall business performance. Therefore, the questionnaire should cover the scopes of these two areas. The items developed for measuring TQM implementation should be based on the concept of TQM and the 11 TQM implementation constructs. More importantly, item development should cover the TQM implementation practices presented in Chapter 2. The items developed for measuring overall business performance should be based on the concepts of the four constructs: Employee satisfaction, product quality, customer satisfaction, and strategic business performance. Chapter 3 discusses how to operationalize the 11 constructs of TQM implementation and the four constructs of overall business performance. In addition, question wording should be given sufficient attention when building up the measurement items:

- Is the question wording stated in terms of a shared vocabulary?
- Is the question wording precise and unambiguous?
- Are there unstated or misleading assumptions?
- Is there biased wording?

Questionnaire Modification

In this research most of the TQM literature reviewed was in English, thus the questionnaire was first developed in English. However, it was actually used for collecting information in China. Therefore, the English version had to be translated into Chinese. This translation might have biased the original design of the questionnaire. A number of quality management terms, such as benchmarking, could not be precisely translated into Chinese terms. Various measures were taken in order to minimize these potential problems. The English version was translated into Chinese by the author himself, who had previously worked in the field of quality management in China and was therefore assumed to have enough knowledge of quality management in both English and Chinese. Some English terms were translated into Chinese by providing additional explanations so that respondents could better understand them.

After translation, the Chinese version of the questionnaire was mailed to three quality managers from the Netherlands who worked in different Chinese manufacturing firms. They were asked whether: (1) The items were stated in a shared vocabulary, (2) The items were precise and unambiguous, (3) There were biased wordings, (4) They could answer these questions. They returned the questionnaires with their comments, and some alterations were made according to their suggestions. During the author's research visit to China, the Chinese version of the questionnaire was formally pre-tested on various people (i.e., governmental officials, consultants, researchers, practitioners, and quality managers). The author interviewed these people and asked them to provide feedback on ease of comprehension, clarity of the specific items, suggestions for possible change, and suggestions for additional items, etc. Their suggestions were then carefully evaluated by the author and the Chinese

version of the questionnaire was further modified. After this step, the author was confident that the questionnaire could be used for the large-scale survey. The final Chinese version of the questionnaire consisted of 79 items to measure TQM implementation and 15 items to measure overall business performance. Appendices 1 and 2 list the two instruments that the author retranslated back into English from the final Chinese version. These two instruments were used to measure TQM implementation and overall business performance, respectively. If readers request a Chinese version of the questionnaire, the author will provide it.

Contacting Relevant Persons

Between July and October 1998, the author conducted data collection in China. Before leaving for China, he had asked the Education Section of the Chinese Embassy in the Netherlands to write an introduction letter for him. The major content of that letter follows:

Zhihai Zhang is working at the Faculty of Management and Organization of the University of Groningen in the Netherlands. He is also the Chairman of the Chinese Student Association in Groningen. Currently, he is doing research in the field of TQM implementation. The major aim of the research is to study TQM implementation in Chinese manufacturing firms. Through this study, a TQM implementation model will be developed, which can provide some suggestions and methods for improving quality management and product quality in Chinese manufacturing firms. In order to make the TQM implementation model applicable and reliable, Zhihai Zhang is going to investigate quality management issues in Chinese manufacturing firms starting from July 1st 1998. On basis of this situation, it is appreciated that relevant Chinese organizations could cooperate with him.

After arriving in China, the author first interviewed a number of people who were considered potential contributors in helping to send questionnaires to manufacturing firms. These people worked at the Liaoning Provincial Economy Commission, the Liaoning Provincial Bureau for Technical Supervision, the Liaoning Provincial Statistics Bureau, the Liaoning Provincial Machinery-Building Bureau, the Liaoning Provincial Electronics Bureau, the Liaoning Provincial Chemicals Bureau, the Liaoning Provincial Quality Control Association, the Liaoning Provincial Township Enterprises Management Institute, and the Northeast Quality System Audit Center. The major aims for contacting these people were as follows:

- Discussing the possibilities of sending research questionnaires through these above mentioned organizations;
- Providing insights into modifying the questionnaire.

The author first visited the Liaoning Provincial Economy Commission to discuss the possibility of sending questionnaires to Liaoning manufacturing firms. Unfortunately, the directors of the quality management department at the commission refused the author's request due to various reasons. However, they promised that it was possible for the Liaoning Provincial Quality Control Association (the two departmental directors were in charge of the Association) to send the questionnaires. The major disadvantage to this was that the Liaoning Provincial Quality Control Association was a non-profit organization rather than a

governmental agency; if the Association sent questionnaires to firms, the response rate might be low. In order to improve the response rate, the author contacted other governmental organizations, asking them to send questionnaires. These organizations were the Liaoning Provincial Machinery-Building Bureau, the Liaoning Provincial Electronics Bureau, and the Liaoning Provincial Chemicals Bureau, in charge of administrative management for the three sectors of machinery building, electronics, and chemicals. These were also three large industrial sectors in Liaoning province. Fortunately, these three organizations agreed to help the author send questionnaires to firms in the Liaoning region.

Survey Samples

The type of samples and the number of firms were determined on the basis of meeting the information requirements for the research. In this research, all of the investigated firms were from Liaoning province, where there were more than 1,000 large or medium-sized manufacturing firms. Almost all these firms implemented TQM or, more specifically, part of TQM. Thus the samples from Liaoning Province were enough for this research purpose. Although the selected samples were limited to firms in the Liaoning region, it was assumed that the samples from Liaoning Province might represent the whole situation of manufacturing firms in China. Therefore, the research results might be generalized to all firms in China. However, strictly speaking, this generalization is limited. In this research, only Chinese manufacturing firms with annual sales revenues of more than RMB 10 million were randomly selected for investigating their TQM implementation and overall business performance. The reason for this was that such relatively large firms could have more experiences of implementing TQM, have more qualified respondents to fill in questionnaires, and take the questionnaires seriously.

The Liaoning Provincial Statistics Bureau provided the author with a firm name list. In Liaoning Province, there were 2,929 manufacturing firms with annual sales volumes of more than RMB 10 million. The data were based on the year 1997, and a sample of 900 manufacturing firms was randomly selected from the list with the help of a computer. The sample size was decided after considering the expected response rate, requirements for performing statistical analyses, and survey cost. After the 900 firms were randomly selected, they were divided into four groups according to their industrial sectors-301 for machinery building, 180 for chemicals, 97 for electronics, and 322 for other industrial sectors. The Liaoning Provincial Machinery-Building Bureau, the Liaoning Provincial Chemicals Bureau, the Liaoning Provincial Electronics Bureau, and the Liaoning Provincial Quality Control Association respectively sent 301, 180, 97, and 322 questionnaires to their targeted groups along with their respective official documents. These documents (namely, cover letters, drafted by the author), which described the aim of the questionnaire surveys, were issued by the four organizations. The questionnaires were sent by mail directly to quality management departments in these sampled manufacturing firms. Finally, 212 questionnaires were returned. The response rate was 23.6%, normal for such research. The Liaoning Provincial Machinery-Building Bureau, the Liaoning Provincial Chemicals Bureau, the Liaoning Provincial Electronics Bureau, and the Liaoning Provincial Quality Control Association received 97, 44, 21, and 50 questionnaires back, respectively; response rates were 32.23, 24.44, 21.65, and 15.53%, respectively.

Additional Issues of the Survey in China

A number of additional issues with regard to the questionnaire survey in China are presented here. In order to make it easy for firms to fill in these questionnaires, the names of the author and the Faculty of Management and Organization of the University of Groningen were not mentioned. The firms did not know the Faculty of Management and Organization of the University of Groningen conducted this research project. An official document (cover letter) was presented after the translation from Chinese into English. This document was from the Liaoning Provincial Machinery-Building Bureau, and read as follows:

In order to further strengthen quality management in provincial machinery building sector, the provincial bureau will organize relevant quality management experts to study the suggestions and measures for improving quality management and enhancing product quality. In order to accomplish this task better, please seriously fill in the quality management questionnaires according to your firm's actual situations. Please send the finished questionnaires to the Quality Management Department of the Liaoning Provincial Machinery-Building Bureau.

<i>Contact person:</i>	<i>Zhang Xiaofeng</i>
<i>Telephone:</i>	<i>(024) 23862112</i>
<i>Address:</i>	<i>No. 28, Nan Si Ma Lu, Heping District, Shenyang</i>
<i>Postcode:</i>	<i>110001</i>

The research questionnaires were sent to quality management departments in the sampled firms, not all of which had independent quality management departments. However, every firm did have a specific department that was in charge of quality management. The four organizations sending questionnaires were not entirely clear whether firms had quality management departments. Within the sampled firms, procedures for dealing with these questionnaires were different. Some registered questionnaires and presented them to their administrative departments, which then presented them to top managers in charge of quality management. If top managers agreed, they signed their names and arranged for quality management departments to answer questionnaires. Under such a situation, most quality management departments would do so. In a number of firms, quality management departments had the right to deal with such documents themselves. Whether to respond to these questionnaires was highly dependent on their perceptions about the questionnaires' importance. In these cases, it was not necessary to present the questionnaires to their respective top managers.

Before the questionnaires were sent, discussions with relevant personnel in the four organizations sending them caused the author to expect a response rate of at least 50%, especially for the questionnaires being sent by the three governmental agencies. However, in reality, the final response rate was only 23.6%, much lower than expected. There were many reasons for the low response rate. First, in 1998, China had many economic problems; for example, the whole Asian economic environment was bad due to the financial crisis in Asia. Many employees in Chinese firms were laid off and relatively fewer employees were working in firms. At the same time their working loads remained unchanged; under such a circumstance, people in charge of quality management were very busy with their daily work.

They did not have much time to fill in these questionnaires. Second, it was common for quality management departments to receive a great deal of official documents from relevant governmental agencies or various associations. How to deal with these documents was highly dependent on whether firms could obtain benefits from doing so. Of course, they could not obtain direct benefits from filling in questionnaires, and were therefore not motivated to fill them in. Third, the Chinese government was giving firms management autonomy and financial responsibility. The governmental agencies, especially provincial governmental ones could not influence firms as they could some years ago. Firms were more independent. More importantly, provincial governmental agencies did not have the right to appoint and dismiss top managers. Therefore, firms did not pay much attention to such documents issued by provincial governmental agencies. This factor would negatively affect firms' inclination to fill in questionnaires.

Although Chinese firms had more rights to make their own decisions and provincial governmental agencies did not directly intervene in their internal affairs, the Chinese provincial government still had some influential power. Therefore, at least currently in China, to conduct research like a large-scale questionnaire survey, the best way to achieve a high response rate was to send questionnaires through governmental agencies. The four high response rates in this research provide a good argument for this suggestion. The average response rate obtained through the three governmental agencies was 28.03% while that obtained through the Association was only 15.53%, exhibiting a large difference between the two groups.

Because the questionnaires were sent through four different organizations, it was impossible to maximize a good response rate by using follow-up mailing. Due to the limitation of financial budget, telephone calls were not used to improve a response rate.

A Brief Description of the Respondent Firms

Respondents

Among the 212 respondents ages ranged from 24 to 68 years old, and the average age was 42.78. The employment length of these respondents ranged from 2 to 49 years, and average employment length was 21.26 years. Among them, 135 were male and 77 female. The respondents' education level is listed in Table 4.1. The respondents had been working in their respective firms from 1 to 38 years, with an average length of 16.26. Table 4.2 lists the different departments where the respondents worked. These respondents had been working in their current jobs from 1 to 30 years, with an average length of 6.42 years. Table 4.3 lists the respondents' job titles.

Table 4.1 Respondents' Education Level

Final education	Frequency	Percentage (%)
University	81	38.2
Polytechnic college	79	37.3
Technical secondary school	37	17.5
High school	15	7.1

Table 4.2 Respondents' Departments

Departments	Frequency	Percentage (%)
Quality management department	83	39.2
Product inspection department	34	16.0
Technology department	23	10.8
Chief engineer office	14	6.6
Management department	13	6.1
Technology and quality department	12	5.7
Production department	10	4.7
Administrative office	8	3.8
Top management team	7	3.3
Quality assurance department	6	2.8
Technology supervision department	1	0.5
Quality and environment protection department	1	0.5

Table 4.3 Respondents' Job Titles

Titles	Frequency	Percentage (%)
Departmental manager	128	60.4
Quality controller	25	11.8
Managerial personnel	22	10.4
Engineer	15	7.1
Chief engineer	6	2.8
Statistician	6	2.8
Deputy general manager	6	2.8
Assistant general manager	3	1.4
Quality inspector	1	0.5

Respondent Firms

Of the 212 manufacturing firms, 82 were large-sized, 70 medium-sized, and 60 small-sized. They were from different industrial sectors. For details, please refer to Table 4.4. Table 4.5 lists the ownership of these respondent firms, and their establishment time is listed in Table 4.6. The current number of employees working in these sampled firms ranged from 75 to 26,809. On average, each firm employed 2,006 employees. Approximately, half the firms exported products to foreign countries. The annual sales of the firms ranged from RMB 10 to 3,500 million. On average, annual sales were RMB 154 million. Of the firms that responded, 70 were losing money, 18 were breaking even, and 124 were making a profit. In the 79 money-losing firms, a total of RMB 195 million had been lost. On average, each firm lost RMB 2.8 million .

Table 4.4 Industrial Sectors of Respondent Firms

Industrial Sectors	Frequency	Percentage (%)
Machinery	97	45.8
Chemical	44	20.8
Electronics	21	9.9
Building material	11	5.2
Textile	11	5.2
Light industry	10	4.7
Food industry	7	3.3
Metallurgical industry	7	3.3
Medicine industry	4	1.9

Table 4.5 Ownership of Respondent Firms

Ownership	Frequency	Percentage (%)
State-owned firm	137	64.6
Collective firm	19	9.0
Township firm	19	9.0
Joint venture	13	6.1
Others	24	11.3

Table 4.6 Establishment Time of Respondent Firms

Established year	Frequency	Percentage (%)
Before 1949	34	16.0
1950 – 1966	84	39.6
1967 – 1978	48	22.6
1979 – 1990	31	14.6
1991 – 1997	15	7.1

Data Analysis

For testing the two theoretical models hypothesized in this study, the measurement instruments should be reliable and valid. Thus, they should be evaluated for reliability and validity. In evaluating measurement instruments, reliability analysis, item analysis, and factor analysis should be conducted in order to understand whether measurement instruments were reliable and valid. The SPSS program was used in evaluation. To test the two theoretical models, structural equation modeling (LISREL) technique was used. LISREL can provide the appropriate and most efficient estimation technique for a series of separate multiple regression equations estimated simultaneously (Hair et al., 1992). There were two reasons for employing LISREL in this study. First, LISREL estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying the structural model used by the statistical program. LISREL is powerful in studying the relationships

among independent and dependent variables, even when a dependent variable becomes an independent variable in other relationships. Second, the sample size was 212 in this study, which is proposed as the critical sample size for employing LISREL analysis.

4.4 Structured Interviews

Design of Structured Interviews

The design of the structured interviews was based mainly on the research objectives, the research questions, the extensive TQM literature review, the theoretical models, guidance from the author's two promoters, input from colleagues, and previous research conducted by other researchers (e.g., Mann, 1992; Mann and Kehoe, 1994, 1995). Before the structured interviews began, their content was pre-tested with management consultants, practitioners, and academic experts. Minor alterations were made as a result of this pretest. A pilot study was conducted in a Chinese manufacturing firm in order to modify its contents, after which the interview questions were altered for the better. Seven broad categories of questions were asked during each interview: General information about respondents, organizational characteristics, overall business performance, the effects of TQM implementation on overall business performance, TQM implementation process, organizational characteristics affecting TQM implementation, and TQM implementation practices used.

Sample Determination

To conduct structured interviews, it was first necessary to decide the sample of firms, the interviewees in the firms to be interviewed, and the number of firms for interviews. The criteria for selecting interviewed firms are described as follows:

- Quality management maturity. Firms are required to have been implementing TQM for at least five years. These firms have experience with regard to TQM implementation and its effects on overall business performance. These firms may also experience the difficulties of implementing TQM.
- Organizational characteristics. A large diversity between each firm's organizational characteristics is required. This can assist in the investigation of which organizational characteristics influence the effectiveness of TQM implementation.
- Enthusiasm toward the research. If interviewees are willing to participate in the research, it is much easier to obtain much information required for the research.
- Level of seniority. Interviewees with a high level of seniority are more likely to know much more information for the research requirements.
- ISO 9000 certification. A firm with ISO 9000 certification may have more experience in how to implement the ISO 9000 standards. They may also experience the difficulties of establishing their quality management systems.

After the criteria for structured interviews were determined, the next step was to decide how many firms would be selected for structured interviews. The number of interviews was decided by considering the information required against the cost and time of conducting

structured interviews. Finally, ten structured interviews were regarded as sufficient for this study.

Access to Firms

All of the ten interviewed firms were recommended and introduced by the head of the Quality Management Department of the Liaoning Provincial Economy Commission and the director of the Northeast Quality System Audit Center (an ISO 9000 registration body). Both of these organizations had a better understanding of quality management situations in Liaoning province, as well as which kinds of firms were suitable for conducting interviews, and both had good contacts with manufacturing firms in Liaoning Province. After the author explained the research objectives in greater details, they provided many potential firms in Liaoning Province that might be suitable for conducting the interviews. On the basis of their suggestions and recommendations, ten manufacturing firms were chosen from a wide range of choices. Interviewee information such as names, job titles, telephone numbers, and addresses was provided by the two introducers. The author then made a telephone call to each interviewee and explained the aim of the interview. As a result, they all agreed to cooperate with the author and were willing to participate in this research. At the same time, appointments were made. The author naturally mentioned the names of the two introducers due to their good personal relationships with these ten interviewees, it was relatively easy to access these firms.

Process for Structured Interviews

The ten structured interviews were conducted between July and October 1998. The interview questions were given to the interviewees in advance so that they could prepare the interview. It was an effective and efficient way of obtaining sufficient information within a short time period. During the process of the interview, the interviewees were encouraged to give the major points of the quality management issues in their respective firms. In addition, all interviewees provided documents about their TQM implementation practices to the author. Thus, more insights into TQM implementation were obtained. Each interview was approximately 4-8 hours long, and in most cases was preceded or followed by firm tours. In most cases, the interviews could not be finished within one day. Sometimes, several visits were required. Relevant archival documents were also provided by these interviewees for the author's reference. All interviewees were quality managers and had worked in quality management area for a long time. Therefore, they had deep insights into TQM implementation.

Description of Interviewed Firms

The ten interviewed firms were large- or medium-sized, state-owned manufacturing firms in the machinery-building and chemical industries. The number of employees in the firms ranged from 404 to 4,300. All of them had obtained ISO 9000 certification, nine for ISO 9001 and one for ISO 9002. Approximately, they had implemented TQM for more than ten years. Therefore, they had good experience in implementing TQM. The characteristics of the interviewed firms are presented in Table 4.7.

Table 4.7 Characteristics of Interviewed Firms (Data from the end of the year 1997)

Firms	Employee number	Annual sales (RMB million)	Pre-tax profits (RMB million)	Loss-making	Fixed assets (RMB million)
C1	1,100	78	7.33	No	180
C2	1,200	100	8	No	118.95
C3	4,000	240	18.47	No	300
C4	404	15.58	1.59	No	35
C5	800	80	4.5	No	300
C6	3,350	200	10	No	260
C7	3,000	210.06	12.42	No	115.72
C8	1,560	77.41	0.19	Yes	129
C9	4,300	678.51	138.65	No	488.13
C10	3,400	180	13	No	90

Notes: These interviewed firms are state-owned.
C1-C8 are for machinery building; C9-C10 for chemicals.

4.5 Case Study

According to Yin (1989), a case study design is the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusions. Colloquially, a case study design is an action plan for getting from here to there, where "here" may be defined as the initial set of questions to be answered, and "there" is some set of conclusions (answers) about these questions. Between "here" and "there" may be found a number of major steps, including the collection and analysis of relevant data. Another way of thinking about a case design is as a "blueprint" of research, dealing with issues such as study questions, study aims, and data collection. The design of a case study is very important in overcoming the traditional criticisms of the case study method.

Case Study Questions

In this study, a TQM implementation model has been developed on the basis of existing quality management knowledge, questionnaire surveys, and structured interviews in Chinese manufacturing firms. How can this TQM implementation model be used in firms? Thus, the major aim of the case study is to provide a practical example of using this model in practice. It should be mentioned that only one firm was selected to conduct this case study and this firm was not asked to practically implement this TQM implementation model, which was used as a template with which to compare the firm's TQM implementation practices. Thus, the strengths and weaknesses of TQM implementation and overall business performance in the firm would be identified. The weak areas could be used as improvement possibilities, and based on these possibilities an improvement plan could be formulated. More importantly, this plan should be accepted by the top management in the firm; otherwise, the formulated improvement plan was nothing. Thus, three case questions should be answered through conducting this case study, which are listed as follows:

Case Question 1: What are the strengths of the firm's current TQM implementation and overall business performance?

This is a descriptive question dealing with the strengths of the firm's current TQM implementation and overall business performance, compared with the practices presented in the TQM implementation model. After the comparison, the strengths of the firm's TQM implementation could be identified.

Case Question 2: What are the weaknesses of the firm's current TQM implementation and overall business performance?

The firm's current TQM implementation practices and overall business performance were compared with the TQM implementation model. Thus, the weak areas could be identified. The weaknesses could be used by the firm as opportunities to seek improvement actions and develop an improvement plan.

Case Question 3: What kind of improvement plan can be formulated in order to improve the firm's TQM implementation?

Based on the potential improvement possibilities and the firm's current situations (e.g., resources, employees' skills, and market competition), an improvement plan would be formulated. In order to ensure this plan's practical implementation, all the improvement possibilities identified should be examined and analyzed carefully. Thus, top management was asked: Which improvement possibilities could be structurally impossible to implement at this moment? Which improvement possibilities could be ineffective? Which improvement possibilities could be implemented in the future? Which improvement possibilities could be implemented at this moment? Thus, based on identified feasible improvement possibilities, the firm's available resources, and the firm's targeted improvement areas of overall business performance, an improvement plan was developed.

Case Selection

Several factors should be considered in selecting a case. First, the case firm should have been implementing TQM for a long time. Thus, the firm would have more experience with TQM implementation. Second, the firm should implement ISO 9000 and should have ISO 9000 certification. Third, the firm should have relatively high quality management maturity. Fourth, the firm should be willing to cooperate fully (making it easier to obtain relevant information). Fifth, a Chinese manufacturing firm with fully Chinese management would be selected for conducting the case study. Finally, there were many types of manufacturing firms in terms of ownership-state-owned, collective-owned, township, joint venture, private-owned, and wholly foreign-owned, etc. Since China's state-owned firms played a major role in the country's economy, the case study would be conducted in such a firm. Details about the case firm are presented in Chapter 8.

Data Collection

In order to conduct the case study, evidence was mainly from four sources: Documents, archival records, interviews, and observations. The different data sources offered a more comprehensive insight into the subject matter than the use of only a single data source. Interviews were conducted with top managers, functional departmental managers and workshop managers, supervisors, inspectors, and operators. Appendix 6 presents a list of interviewees working in different departments (workshops) in the firm.

Case Study Process

The author conducted the case study in a machinery-building firm in Shenyang, Liaoning Province, in March 2000. First, the author presented the aim of conducting the case study to the top managers. At the same time, the top managers were asked to arrange a research coordinator to help the author to conduct the study in the firm. Second, the manager of the production department was asked to give a general introduction of the production process, production activities, organizational structure (structural chart), etc. Third, the author took a firm tour in order to understand the production activities, inventory, equipment, and working environments. Fourth, the author began to collect relevant information from relevant departments, with the help of the coordinator. This information included, for example, general history of the firm, current TQM implementation, overall business performance over the past several years, and the firm's yearly working reports. Fifth, the author made an interview plan in order to determine the interviewees, the aims of interviewing these people, and interview questions. Sixth, interviews began according to the interview plan. Interviewees were asked to provide more evidence to support their viewpoints. Seventh, after all interviews were conducted, the strengths and weaknesses of the firm's current TQM implementation and overall business performance were identified. Eighth, based on the weak parts of the firm's TQM implementation and overall business performance, an improvement plan was formulated. This improvement plan consisted of a set of improvement programs. In order to make the improvement plan more practical and applicable, a top manager in the firm was asked to be involved in its development. Finally, based on the result obtained from the firm, the author made a final case study report, which is presented in Chapter 8. The report was unbiased, honest, and fact-based.

4.6 Summary

This chapter first presented the research strategies adopted in this study: A literature review, a questionnaire survey, structured interviews, and a case study. Therefore, the research strategies adopted in this study can be characterized as the combination of qualitative and quantitative strategies. Second, the detailed processes and the methods of conducting the questionnaire survey, structured interviews, and case study were described. Finally, it must be admitted that the author's previous practical experience working in a provincial governmental agency contributed a great deal to conducting this research. If the author lacked this experience and had not had good personal contacts with many people working in the area of quality management, the author would not have successfully collected data used in this research.

