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Implementation of Activity-Based Costing in China: A Case Study of a Chinese Multinational Company

A thesis submitted in fulfilment of the requirements for the award of the degree of

Master of Accountancy

by Research

From

University of Wollongong

By

Ling Xu

School of Accounting and Finance

Declaration

I, Ling Xu, declare that this thesis, submitted in fulfilment of the requirements for the degree of Master of Accountancy by Research, in the School of Accounting and Finance, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Ling Xu

March 2012

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List of Abbreviations

AA	Activity Analysis
ABC	Activity-Based Costing
ABM	Activity-Based Management
ABCM	Activity-Based Costing Management
ACA	Activity Cost Analysis
AM	Activity Management
BoomLink	BoomLink Information Technology Co.
BPPF	Budgeting, Planning and Profit Forecasting
CAS	Chinese Accounting System
CDPPC	Chemical Device Product and Process Costing
CGRP	Central Government Restructuring Programme
Changqing-P	Changqing Petrochemical Co.
СМ	Coefficient Method
CNPC	China National Petroleum Co.
CRA	Cost Restoring and Analysing
Dalian-P	Dalian Petrochemical Co.
Daqing-P	Daqing Petrochemical Co.
Daqing-R	Daqing Refinery Co.
DNA	Did Not Answer
ERP	Enterprise Resource Planning
FMIS	Financial Management Information System
Harbin-P	Harbin Petrochemical Co.
HS	Harris Semiconductor

Jinxi-P	Jinxi Petrochemical Co.
Jinzhou-P	Jinzhou Petrochemical Co.
NVA	Non-Value-Added
OCM	Overhead Controlling and Managing
PC	Process Costing
Qingyang-R and P	Qingyang Refinery and Petrochemical Co.
RDCM	Refinery Device Coefficient Method
RHP	Ransome Hoffmann Pollard Limited
RPCA	Refinery Products Cost Accounting
SBU	Strategic Business Units
Sinopec	China Petrochemical Corporation
TQM	Total Quality Management
WIP	Work in Process
WTO	World Trade Organisation

Abstract

Activity-based costing (ABC) appears to be under-utilised in many developing countries despite its huge success in the developed world as a refined costing system that provides effective information for cost management. Previous research conducted on ABC has examined numerous issues and problems with implementation. However, the vast majority of these studies have been conducted in developed countries. Since the economic, business and political environment in these countries is vastly different to developing countries, previous research on ABC practices in developed countries provides little insight for successful implementation in developing countries. Despite the fact that an increasing number of companies in developing countries have introduced ABC into their businesses, relatively little is known about the current status of ABC in these countries due to the dearth of studies in this area. Previous studies provide little evidence on issues such as the reasons for adopting ABC in developing countries, the factors affecting successful implementation of ABC in those countries, associated problems and measures taken by companies to address those problems etc. Therefore, the main objective of this study is to conduct an in-depth analysis of a company in a developing country, the People's Republic of China, examining the above mentioned issues. This study investigates these issues through a case study of a Chinese multinational company, PetroChina, which has implemented ABC successfully in one of its four core business segments since 2004.

A qualitative approach is adopted and a case study method is applied to collect and analyse data. An analysis into eight cases covering eight branches of PetroChina in China is carried out separately. A replication approach to multiple cases studies promoted by Yin (1984) is utilised. Under this approach, a cross-case analysis across all individual cases is undertaken so that the results generated from individual cases are replicated and tested in multiple cases.

The findings of the study reveal that the main reason for implementing ABC across eight branches of PetroChina was a top-down order emanating from and enforced by headquarters due to the incessant pressure of maintaining and sustaining its profitability and competitive position in the domestic and overseas markets. The study also finds that the main objective of implementing ABC at PetroChina was to obtain more accurate costing information and many branches of PetroChina have been able to achieve this objective successfully. It is found that both technical and behavioural issues were encountered throughout ABC implementation within PetroChina, this is in contrast to the findings of Cobb et al. (1993), Cooper (1990) and Shields (1995) who provided that in developed countries, behavioural issues overwhelm technical ones. One of the major difficulties and obstacles faced by PetroChina was poor cooperation and coordination between different departments within the branches. This is one of the behavioural and organisational factors, and the result corresponds to findings in Innes and Mitchell (1991) and Major and Hopper (2005). In order to overcome these issues, branches such as Dalian-P, Daqing-R and Harbin-P have taken positive steps towards fixing the problems while Jinzhou-P and Changqing-P seemed to be experiencing trouble in finding solutions. It is noted that the conflict of interests occurred with ABC implementation in the case of Jinzhou-P and Changqing-P, and this resulted in strong resistance.

This study is limited by the fact that it is based on an analysis of a single company limiting any generalisation of the results to other companies in developing countries. However, Yin (1984) argued that with multiple case studies which involve a cross-case analysis across separate single case studies, findings can be generalised as such case studies are generalisable to theoretical propositions rather than populations. It is hoped that this study may provide some insights into the existing accounting literature on ABC practices in China while providing useful lessons for managers who are considering an adoption of the ABC system in companies in developing countries.

Acknowledgements

In completing this thesis, I would like to acknowledge the unwavering support and encouragement of a number of people.

First and foremost, I am extremely grateful to my principal supervisor, Dr. Anura De Zoysa who has been very supportive at every stage of conducting this research. I wish to express my sincere appreciation to him for guiding me through the whole process with invaluable advice and patience. Without his generous assistance and continual encouragement, this thesis could never have been completed.

I would like to express my sincere thanks to my co-supervisor, Dr. Freda Hui for her advice, guidance, encouragement and support.

I wish to express my special thanks to my mentors and friends at the School of Accounting and Finance, University of Wollongong for their support and encouragement. In particular, I wish to thank Associate Professor Robert Williams, Professor Warwick Funnel and Dr. Kathy Rudkin for their encouragement and support especially at the early stage in developing the thesis proposal.

My great gratitude and thanks are extended to a number of people in China where I completed the field work for this thesis. Specifically, I wish to thank Dr. Chunhe Wang for his enormous support during the data collection. Special thanks to all the branch accountants and managers of PetroChina who fully cooperated with this study.

I would also like to express my sincere thanks to my family friend, Mr. Louie Athanasiadis who helped immeasurably in facilitating the whole study process.

My appreciation is extended to the professional editor, Alison Haynes who provided copyediting and proofreading services, according to the guidelines laid out in the university-endorsed national guidelines.

I am highly indebted to my parents, my uncle and auntie in China for their constant love, support and encouragement.

Lastly, I am very thankful to my daughter, Ruyue Xia for her understanding, love and loyal devotion in often stressful times.

This thesis is dedicated to my late fiancé, Phil Venables who has always been my inspiration in pursuing research.

Chapter 1

Introduction

1.1 Objective of the Study

Activity-based costing (ABC) is a system that links organisational spending on resources to activities, where indirect and support expenses are accurately traced by identified cost drivers to individual products, services and customers (Atkinson et al., 2001). Since the introduction of ABC in the US in the late 1980s, companies all around the world have been able to refine their cost systems through improved overhead cost allocation based on operational activities (Carr, 1993; Kreuze and Newell, 1994; Coburn, 1997; Kaplan et al., 1997). Companies that used ABC have been able to improve cost management and accuracy by highlighting the amount of unused capacity to managers to reduce cost, to increase profitability based on a cost-effective ABC system, and to provide a management tool for better decision making (Horngren et al., 2009; Raffish, 1991; Anderson, 1995; Carr, 1993).

However, despite its huge success in developed countries as a refined costing system (Horngren et al., 2009; Anderson, 1995; Carr, 1993), ABC appears to be under utilised in many developing countries, mainly due to problems associated with its implementation (Estrin, 1994; Selto and Jasinski, 1996; Williams, 2005). The limited numbers of studies that have been conducted in developing countries examining the successfulness of ABC in these countries have revealed that there are major impediments in relation to successful implementation of ABC in developing countries owing to their vastly different business, economic and cultural environments (Kim and Han, 2003; Wessels and Shotter, 2000; Liu and Pan, 2007; Sulaiman et al., 2004). Thus, relatively little is known about the problems faced by companies in a developing country when implementing ABC.

A number of studies have been conducted in China examining the implementation of ABC. They have revealed that there are major impediments to successful ABC implementation due to complicated economic and cultural environment as well as political influence (Lin, 2001; Liu and Pan, 2007; Abdallah and Wei, 2008; Lillis, 2008; Xiong et al., 2008; Duh et al., 2009). However, due to the dearth of research in this area, relatively little is known about the specific problems and issues faced by those Chinese firms when implementing ABC in their companies. This study aims to fill this gap through an in-depth examination of the implementation process of ABC in a single manufacturing company with special emphasis on the problems associated with ABC implementation. Therefore, the main objective of this study is to identifying the problems and issues as well as the measures taken by the company to overcome the problems encountered. This study investigates these issues through a case study of a Chinese multinational company, PetroChina, which has implemented ABC successfully in one of its four core business segments since 2004.

It is well recognised that accounting methods only can be understood within the social and cultural contexts in which they take place (Bruns Jr, 1989). To facilitate this process, the following section provides a brief background of the Chinese business environment and the current status of ABC in China.

1.2 Background of the Study

1.2.1 Chinese Business Environment

China has been in economic transition converting from a planned economy based on the Soviet model to a socialist market economy by reforming and adopting opening-up policies since 1978 (Yang, 2002; Lawson et al., 2009). Many changes have taken place as a result of the emerging social market economy including the convergence between Chinese and Western accounting standards which has been in progress since 1985. The issue of the *Accounting Law and Regulations for Joint Ventures* in 1985 marked the beginning of the long process of establishing the Chinese Accounting System (CAS) (Lawson et al., 2009). Among those changes, the largest corporate structural reform, the Central Government Restructuring Programme (CGRP) has been carried out since 1998 in order to streamline and transform government functions and allow enterprises to enjoy full power in production and management (Lin, 2006; Duh et al., 2009).

In order to better react to the surging market challenge and economical reforms, Western business management techniques including modern management accounting methods such as standard costing, capital budgeting, just-in-time inventory system, balanced scorecard and ABC have been widely adopted and implemented by Chinese firms, especially after joining the World Trade Organisation (WTO) in 2001 (Xiong et al., 2008; Wang et al., 2005; Islam and Kantor, 2005). It is understood that the more competitive the global market is, the more important these management accounting techniques will be particularly in the Chinese manufacturing sectors. Among the above mentioned methods, ABC has been of interest to many Chinese accounting academics and professionals.

1.2.2 Introduction of ABC in China

Given the popularity of ABC in the west, a number of researchers have focused on some basic concepts of ABC such as what it is and how it works as well as how to identify multiple cost drivers. These issues have been the subject of theoretical debates among the Chinese management accounting academics since the late 1990s (Hu, 2001; Lin, 2001; Pan and Zhou, 2002; Wang, 2002; Xiong et al., 2008). Through these studies the concepts of ABC and its applications have received a widespread coverage in Chinese management accounting textbooks.

The increased attention paid to the practical implication of ABC has resulted in many Chinese companies being interested in implementing it in their organisation to improve cost management and thereby to increase the profitability and competitiveness of their business operations (Xiong et al., 2008; Islam and Kantor, 2005; Liu and Pan, 2007; Lawson et al., 2009). PetroChina was one of the leading companies in China that introduced ABC in 2004 with the aim of achieving better cost management.

1.3 Research Questions

As indicated previously, relatively little is known about the current state of ABC practises in Chinese companies and the problems faced by such companies in their effort to implement ABC successfully. Therefore, this study is designed to carry out an in-depth analysis of ABC implementation in Chinese companies with special references to particular problems that Chinese manufacturing companies encounter when implementing the ABC system. This study aims to achieve this objective through a case study of the Chinese multinational company, PetroChina, which has been using ABC since 2004.

The specific research questions that this study attempts to examine are:

- What are the objectives of implementing the ABC system in PetroChina?
- To what extent has PetroChina been able to achieve those objectives?
- What are the problems encountered by PetroChina in implementing ABC?
- What measures have been taken by PetroChina to solve those problems?
- How has PetroChina addressed issues in relation to resistance to change and conflicts arising with ABC implementation?

By finding answers to the above research questions through an in-depth examination of the ABC implementation process of PetroChina, this study aims to provide insights on ABC implementation to other manufacturing companies who wish to implement ABC in their business operations while contributing to fill the existing gap in ABC literature in developing countries.

1.4 Research Design

Since the major objective of this study is to examine the ABC implementation issues encountered by Chinese companies, a constructive and valid understanding of how human actions, experiences, and beliefs are significant to ABC implementation within the Chinese context must be gained. Thus, a thorough investigation into ABC implementation in Chinese companies must be carried out so that a holistic view and knowledge of the ABC implications within the Chinese context can be captured and developed in depth. Such a task cannot be explained by analysing numerical data. Therefore, a qualitative research approach is appropriate and was selected to conduct this study.

It is found with the rising adoption of ABC in China, problems and issues relating to implementation of ABC encountered by those Chinese companies persist. However, little investigation has been carried out into how and why problems occur and what solutions are available to address the issues under the Chinese context. Therefore, a detailed investigation into the issues would help understand how the underlying issues have been dealt with within cultural and social settings in China. Given the nature and objectives of the study, a case study approach is considered suitable. Therefore, through the theoretical lens provided by Yin (1984) for case study research, the main issues of this study are examined using the empirical data obtained from the case of PetroChina. The data collected for this study is from a number of sources. The key source was interviews with PetroChina employees. This data was supplemented by direct observations made by the researcher at the research site. A secondary source of data such as company annual reports, relevant internal publications, and the company website was also used for collecting relevant data. Data collection methods comprised examination of organisational documents and archives, and direct observations as well as formal and informal interviews using an open-ended questionnaire. In addition to conducting formal and informal interviews, relevant personnel within the company were contacted by telephone and email.

Analysis of data was carried out following guidelines provided by Yin (1984) for using the replication approach to multiple cases studies. Accordingly, an analysis of eight individual cases was undertaken at eight branches of PetroChina. Individual cases consist of a chronicle of their perspective in an attempt to pursue answers to the research questions posed. During the analysis of individual cases, convergent evidence was sought in an effort to discover the facts and to reach conclusions. The conclusions drawn from each case are replicated and then compared to other cases. This is followed by a cross-case analysis conducted across all individual cases in order to check and test the applicability of the findings of individual cases within the context of the multiple cases. Through this replication process, the study attempts to achieve external validity and as a result the findings derived from this study are likely to be robust.

1.5 Contributions of the Study

This study is designed to examine the ABC implementation process of PetroChina with special references to the problems and issues encountered while implementing ABC. As such, this study expects to identify factors affecting successful implementation of ABC in a large organisation together with the issues and problems faced by such an organisation during the implementation process.

A goal of this case study is to provide useful insights into ABC practices in China and useful lessons for managers considering adopting an ABC system.

Another goal is that the outcomes derived from this case study should contribute towards filling the knowledge gap in the accounting literature on ABC implementation issues in developing countries by providing a detailed account of ABC practices of one of the major companies in a developing country, China.

1.6 Limitations of the Study

Since this study utilises a case study approach, an inherent weaknesses of such an approach are present in this study as well. One of the major criticisms of using a case study approach is the question of whether it is appropriate to generalise results for a larger population of companies from analysis carried out to provide answers to specific research questions concerning a single company. As noted by Neuman (2006), numerous cases need to be analysed in order to generalise the results. Therefore, the results of this study cannot be generalised to a large population. However, Yin (1984) argued through multiple case studies that involve a cross-case analysis across separate single case studies under a rich theoretical framework, propositions made by the findings of the study can be generalised although such findings cannot be generalised to the population.

Interviews conducted at the research site were mainly with managers and accountants of PertroChina. Given the fact that most of the information they provided was about a company's internal operations, the extent of information they provided was limited by what they were allowed to reveal. However, this limitation is partially overcome through confirmation of some facts through direct observations made by the researcher at the research site and through information obtained from other sources including company annual reports, relevant internal publications, the company website etc.

1.7 Structure of the Thesis

This thesis consists of six chapters--Chapter 1: introduction, Chapter 2: literature review, Chapter 3: research design and data, Chapter 4: analysis of individual cases, Chapter 5: cross-case analysis, and Chapter 6: conclusions. A brief introduction to these chapters is given below:

Chapter 1 presents an introduction to the study. It states the research objectives and background of the study. This is followed by the research questions being investigated throughout the study and a brief introduction to the research design. The chapter also presents the contributions and limitations of the study together with the structure of the thesis.

Chapter 2 reviews the wide-ranging literature on ABC implementation studies across countries, both developed and developing, with a special view to studies in China. Through this literature review the theoretical background and context of this study is presented. This chapter highlights the gaps in the literature on ABC implementation, showing the need for investigating ABC implementation issues and problems encountered inside large Chinese organisations.

Chapter 3 discusses the research design starting with a detailed explanation on why a qualitative approach is favoured over quantitative one to conduct this study. It also highlights why the case study method is more appropriate to investigate ABC implementation issues in China within its social and cultural context. A description of the case study of PetroChina and the data collected is also presented in this chapter. Chapter 4 provides an analysis of eight individual cases involving eight branches of PetroChina. For each case, it presents the following: objectives of implementing ABC; outcomes arisen and difficulties encountered during the ABC implementation; critical factors engaged in implementing of ABC within PetroChina.

Chapter 5 provides a cross-case analysis by comparing all aspects investigated in individual cases. This chapter generalises the empirical results derived from this research to the theoretical propositions through the replication approach.

Chapter 6 provides a summary of findings of this study and the conclusions drawn. It provides the answers to all of the research questions being posed in the study. Research limitations are also presented in this chapter together with directions for future research.

Chapter 2

Literature Review

2.1 Introduction

Research on ABC implementation can be traced back to the late 1980s. The focus of some early studies was how to identify cost drivers and associated activities in order to design a cost-effective ABC system (Carr, 1993; Kreuze and Newell, 1994; Coburn, 1997; Kaplan et al., 1997; Atkinson et al., 2001). Previous research has shown that companies with a cost-effective ABC system have benefitted in terms of reducing cost, increasing profitability and improving cost management and accuracy by successful ABC implementation, and as a result, improved decision making leading to a better outcome for the company (Raffish, 1991; Carr, 1993; Anderson, 1995; Horngren et al., 2009).

However, since ABC represents a major change in the way a company manages costs, it naturally is associated with many difficulties and problems especially with its implementation process. These problems are severe when there is a vast diversity intrinsic to business, economic and cultural environments as observed in developing countries (Wessels and Shotter, 2000; Kim and Han, 2003; Sulaiman et al., 2004; Williams, 2005; Liu and Pan, 2007). A number of research projects conducted in both developed and developing countries have examined the ABC implementation process and associated problems from various theoretical perspectives. Some of the major research conducted in this area is reviewed below.

2.2 ABC in Developed Countries

It is well known that ABC has been successfully implemented as a refined costing system in developed countries since it was first introduced in the US in the late 1980s (Horngren et al., 2009; Anderson, 1995; Carr, 1993). Despite the huge benefits and value derived from implementing ABC, a variety of problems and issues in association with ABC implementation also occurred. A number of associated studies in developed countries that addressed the issues and factors involved with ABC implementation from either a negative or positive, or even a political perspective are represented below:

From the negative standpoint, Spicer (1990) argued that little evidence showed either profits or performance measures have been improved by adopting an ABC system in some western firms. Therefore, a challenging question is how to ensure that a shift of the costing system from conventional to activist like ABC is successful, especially when other organisational changes are made simultaneously.

Similarly, Gietzmann (1991) conducted a case study into an initial implementation of ABC in Ransome Hoffmann Pollard Limited (RHP) in Britain. He found there was little evidence of either increase of profits or true measurement of cost appearing by adopting ABC in RHP. However, a major benefit of implementing ABC has been a rise in mutual understanding between the sales and accounting personnel and factory staff in how effective the costing system was in terms of managing tradeoffs. This had an impact on organisational change and a change of 'company culture' according to Gietzmann (1991, p199).

On the other hand, from a positive perspective, Innes and Mitchell (1991) applied ideographic theory focusing on early factor studies by conducting a case study of ABC implementation in a UK-based company. They identified some factors leading to successful ABC implementation including: strong support from top management; constant supply of adequate resources; achievable objectives for ABC implementation; a participative manner between the different departments in data congregating; and complete involvement of all staff. Meanwhile, they also indicated difficulties and obstacles encountered during ABC implementation. A critical difficulty was the increase of potential conflicts due to a fact that those responsible for implementing ABC did not realise the need for good communication and cooperation between different departments when introducing a new system. As a result, the conflicts among the relevant departments were believed to impair the success of ABC implementation in the company. However, they were unable to explain in any depth what caused the conflicts.

Meanwhile, by applying the same theory in a case study into occurrence of organisational and behavioural consequences during ABC implementation, Bhimani and Pigott (1992) argued that implementation of ABC in a company caused a shift in the power base between the authority and organisation. As a result, unintended organisational and behavioural consequences occurred. These consequences brought out an array of changes when adopting new costing approaches like ABC, and they were far overweighted the changes itself and its impact on the structural context of the organisation. However, this study left many unanswered questions such as, what has caused a shift in the power base? How to deal with these organisational and behavioural consequences when they occur during ABC implementation?

Perhaps some of the answers may be found in Anderson's (1995) exploratory case study, where she identified behavioural and contextual factors as part of the success factors to influence ABC implementation in General Motors Corporation from 1986 to 1993. Her extended factors study in terms of searching for influential factors which had impact on cost management system change could be well understood through empirically investigating those factors. This study has provided the first clinical account of ABC implementation at a hierarchal level.

Similar to Anderson's (1995) research, by using an exploratory survey method, Shields (1995) provided empirical evidence based on a survey of 143 firms through the lens of theoretical models developed by Shields and Young (1989) and Argyris and Kaplan (1994). This study has contributed to promoting successful implementation of ABC by identifying a set of variables that are highly related. Several behavioural and organisational variables were investigated and proved to be associated with the success or failure of ABC implementation, especially: top management support; link to competitive strategies; link to performance evaluation and compensation; training; ownership by non-accountants; and adequate resources. Shields (1995) argued that the outcome of ABC implementation depended on how well it could match its preferred objectives in relation to powerful alliance of every employee especially top management which was regarded as crucial for successful ABC implementation. This is because it was top management that held the power of providing or denying financial and technical resources needed for ABC implementation, and of directing the implementation in a political way. Most importantly, combining these behavioural and organisational variables creates a powerful package through which a strong message will be sent to every employee that ABC implementation is so important that it determines the success of the organisation and individual. As a result of that, resistance to change will be reduced. Empirical results derived from this study strongly supported and enriched empirical evidence provided by other studies conducted by Innes and Mitchell (1991), Bhimani and Pigott (1992).

One of the few empirical studies conducted by Gosselin (1997) intensely examined an effect of strategic and organisational structure on the implementation of Activity Management (AM) approaches by employing a survey methodology within a sample of Strategic Business Units (SBU) in 161 Canadian manufacturing firms. In this research, Gosselin (1997) classified AM into three basic categories, namely, Activity Analysis (AA), Activity Cost Analysis (ACA) and ABC. Thus, AM was considered as 'an innovation with multiple levels' of AA, ACA and ABC according to Gosselin (1997, p106). Using organisational innovation theory, two models, the dual-core and ambidextrous model were developed and tested. The findings suggested that the organisational structure did play an important role in selecting the type of AM approaches especially at the last level of AM-ABC with several contextual factors including centralisation, formalisation and differentiation being taken into account. It turned out to be the more centralised and formal the organisations are, the more likely they are to implement ABC. This exploratory study was believed to be one of the first empirical studies to provide insight into the association between the behaviour of organisations and ABC implementation.

In contrast to the study of Shields (1995) and Gosselin (1997), Malmi (1997) argued that the interest of organisational stakeholders should be taken into account when identifying factors that influence successful ABC implementation based on factors studies in the contemporary ABC implementation literature. According to Malmi (1997), it was likely that divergent interests would result in conflicts occurring between different parties and departments within the organisation regardless of the nature of ABC implementation. Most importantly, he argued that regardless of outcomes, ABC implementation only satisfied the intention of senior management. His case studies proved this by revealing that any strategic projects including ABC seemed to be a temporary attraction to those who held decision-making power. He also addressed the need for searching for harmony between ABC implementation and the prevailing cost system in order to understand resistance to change by various parties throughout the ABC implementation process. He concluded that resistance to change cannot be

removed or resolved by employing implementation-based strategies including full participant involvement. Therefore, more empirical studies that explain and explore problems and failures as well as resistance to change occurring during ABC implementation are called for by Malmi (1997, p461). The study conducted by Malmi (1997) was a good supplement to the studies carried out by Innes and Mitchell (1991), Bhimani and Pigott (1992) in addressing those questions left unanswered.

An empirical investigation into issues relating to the adoption of ABC was carried out by Nguyen and Brooks (1997) based on a mail questionnaire sent to 350 Australian manufacturing companies. Results from 120 respondent companies indicated that cost control was regarded as the most important objective of the ABC adoption followed by improved accuracy for decision making. Further, they found that large firms operating with greater production complexity within a highly competitive environment are more likely to implement ABC.

Friedman and Lyne (1997)'s exploratory study which had the objective to investigate the operational and organisational consequences in relation to implementing activity-based techniques including ABC covered a wide-range of issues. This research predicted a promising future for ABC to be effective in the medium term. Findings indicated that one of the positive outcomes of implementing ABC was the significantly improved relations between management accountants and operational managers. Thus, a 'bean-counter' image of management accountants that operational managers held dramatically declined as a result of a wide-range of valuable ABC data being provided by the management accountants. They argued that the position of management accountants within an organisation would be secured in the medium term as the value of ABC was more useful to top managers than operational managers given the lack of top management involvement in the long run in ABC implementation. In addition, another empirical study carried out by Chong and Cable (2002) on implementation of the ABC system in an Australian oil and gas company indicated that the most important objectives for the implementation were focused on three factors, namely more effective cost management, better cost control and more accurate costing information. It was proved that these objectives had been achieved through implementation of ABC. A number of factors, including full management support, a well organised project team and efficient information flow linking users and preparers together, were claimed to be contributable to successful implementation of ABC within the company. However, a lack of understanding of the ABC methodology was revealed as an impediment to achieve success in its implementation. Therefore, they urged companies to recognise the need for highly motivated and fully committed staff to ensure successful and sustainable implementation of ABC. Their findings were consistent with Innes and Mitchell (1991), Shields (1995) and Nguyen and Brooks (1997).

Furthermore, Major and Hopper (2005) raised technical and contextual issues in relation to accuracy and relevance with the ABC system when conducting a case study in a Portuguese telecommunications company. By applying a theoretical triangulation combining labour process theory, factors analysis and process-based approaches, they examined the practical problems, difficulties and behavioural issues associated with ABC implementation. They addressed an observable status regarding ABC implementation problems that the company faced when the power and conflict of interests rested in organisations. They explained resistance to implementing ABC as being due to a lack of training and poor communication between different departments within the organisation. They also found that among those factors identified as relating to the implementation success, top management support throughout implementation

held the key to enable ABC being accepted by employees, and to make ABC work effectively. This was consistent with Shields (1995). One of their findings indicated that ABC implementation could turn into a political process when parties involved held divergent interests, which was consistent with Malmi (1997).

From the political perspective, Collier (2006) identified ABC implementation as a political process by citing social problems that have arisen during the process due to an inextricability between the politicisation of accounting and politicisation of policing. In fact, Collier's (2006) focus on the politicisation of ABC implementation provided some insights into the causes of conflicts between managers within an organisation when implementing ABC, offering explanations absent from Innes and Mitchell's (1991) study. Collier's study also provided some answers to the questions left unanswered in Bhimani and Pigott's (1992) study. In summary, Collier (2006) argued that the involvement of stakeholders in the ABC implementation process is driven more by political motives than technical or economical reasons.

A further study into the politics behind implementation was conducted by Englund and Gerdin (2008). These researchers focused on power, conflicts and politics and shed light on unresolved questions mentioned earlier. They argued that ABC implementation is not a neutral process but is a political one where conflict of interests does exist and might be expressed hierarchically within organisations. This addresses the concern unaddressed by Innes and Mitchell (1991). It is assumed that different parties have different purposes for getting involved and that they act in their own interest during ABC implementation. Therefore, a shift in the power base occurs when the power base standing for those organisational stakeholders is threatened by organisational and behavioural consequences. As a result, a political ABC implementation will change power relations among those organisational stakeholders in order to solve the organisational and behavioural consequences, and to regain balance of the power base for all parties involved. Their research fully resolves the questions left unanswered by Bhimani and Pigott (1992).

The review of the above studies conducted in developed countries on a variety of issues in relation to ABC implementation reveals that the process of implementing ABC is not a mere accounting experience but is heavily influenced by various economic, cultural and political factors. The influence of these issues is expected to be more intense when implementing ABC in developing countries since their business, economic and social environmental factors are vastly different to those in developed countries where ABC systems have been successfully implemented with minor implementation issues. In the next section, the major studies examining ABC implementation in developing countries will be reviewed.

2.3 ABC in Developing Countries

A review of the existing literature on ABC practices shows that the popularity of ABC as a tool of cost management in developing countries is very much below its popularity in companies in the developed world. Lack of awareness and expertise of ABC in developing countries may have had bearing on this outcome. However, any specific conclusion as to why ABC is not considered as an effective cost management tool in many developing countries cannot be drawn with certainty as the number of studies that have examined ABC implementation issues in developing countries is limited. The main studies to have examined the status of ABC implementation in developing countries include: Brewer (1998), Mwita (2000), Wessels and Shotter (2000), Joshi (2001), Luther and Longden (2001), Waters et al. (2001), Kim and Han (2003), Roztocki and Weistroffer (2004), Sulaiman et al. (2004), Chongruksut and

Brooks (2005), Williams (2005), Liu and Pan (2007), Jamaliah and Sulaiman (2008). Their findings are briefly discussed below.

Brewer (1998) examined the relationship between national culture and an ABC success by conducting a case study of Harris Semiconductor (HS)'s two plants located in Malaysia and the United States. They found that the top-down implementation approach which HS applied in its Malaysia plant played an important role in contributing to successful ABC implementation under its national culture, whereas it was not a case in its US plant. Therefore, the cross-culture difference did have impact on successful ABC implementation. However, the question of whether this cross-culture difference would affect ABC failure remained.

Through a review of some of the concepts and literature of the performance management framework built up in developed countries, Mwita (2000) argued that a motivation for the performance management model should be promoted to modify the behaviour of job-holders, which can be done by employing an ABC model of behaviour change. Mwita (2000) urged developing countries to adopt this model as an efficient tool to overcome a drawback occurring in the over-centralised decision making style typical of its public service. On the other hand, the model can be well evaluated from an economic, managerial, social and behavioural perspective within its organisational context.

The study conducted by Wessels and Shotter (2000) examined the problems of ABC implementation in companies located in South Africa. This study identified insufficient training for users and managers as a major impediment for implementing ABC in South Africa. However, in terms of organisational or cultural influences, the study found no association between organisational behaviour or culture and the problems faced by these companies during the ABC implementation process.

Another South African study conducted by Luther and Longden (2001) with a focus on benefits of adopting management accounting techniques including ABC by the companies in South Africa seemed to be more significant than those studies carried out in the UK. Their findings indicated that factors causing management accounting techniques such as ABC and ABM change in South Africa differ from those in the UK for reasons of structural change and volatility in transitional economies like South Africa. Thus, this study showed that management accounting techniques and changes can only be understood within the political, cultural and economic context (Hopper et al., 2009).

A case study conducted by Joshi (2001) indicated a very low adoption rate of ABC in India. In fact most Indian companies heavily relied on traditional management accounting techniques due to culture diversity and confusion in adapting contemporary management accounting practices including ABC. He concluded that some of the reasons could be attributable to Indian's long term orientation and conservative management style.

Waters et al. (2001) conducted a study applying ABC in a nongovernment and non-profit health care provider in Peru from mid-1997 to the end of 1998. Their results indicated that it was practical and useful to apply ABC in a developing country like Peru. They demonstrated the ABC model set up by clearly showing managers potential targets or areas in cost and spending, which could be efficiently improved by implementing ABC. Benefits of the application of ABC included successful measurement of the effectiveness of the quality improvement programmes implemented all the way through an ABC analysis.

In South Korea, Kim and Han (2003) pointed out two major trouble areas in relation to ABC implementation, namely optimisation of cost-drivers and estimation of

cost relationships. They found that efficiency and effectiveness of costing systems were impaired as a result of the lack of accuracy in selecting appropriate cost drivers and in estimating cost relationships. Although a hybrid model was suggested to be set up for fixing the problems, the model was not tested using real-world data.

Similarly, by using a fictional company, Roztocki and Weistroffer (2004) illustrated a framework by integrating a value chain model into ABC with the aim of evaluating IT investments in emerging economies. Information derived by the integration was claimed to be beneficial for managers in emerging economies to make better decisions, and to achieve cost effectiveness when making an evaluation of the proposed IT investments.

Sulaiman et al. (2004) conducted a comparative study on ABC implementation based on survey data collected in four Asian countries: Singapore, Malaysia, India and China. The results derived indicated that only 13 per cent of the sample companies in Singapore were using ABC to identify activities that drive cost. In Malaysia, they found that 28 per cent of the respondents used ABC to allocate overheads. In India, the results showed that 20 per cent of 60 surveyed companies had adopted ABC. In the case of China, only three per cent of sampled companies excluding foreign venture firms have used ABC. Although the study did not carry out an in-depth analysis, it posed two good questions that might be beneficial for future research. The two questions were: (1) what are the obstacles to ABC implementation in Asian firms? (2) Is cultural diversity a predominant factor in the success of ABC implementation?

Additionally, Chongruksut and Brooks (2005) conducted a survey in Thailand providing empirical evidence on ABC implementation by Thai firms. Their results indicated a relatively high rate of ABC adoption of 35 per cent overall which they considered exceptional in developing countries. They also found that firms with high product and service complexity were likely to adopt ABC due to increasing competition and growing costs. According to their results, benefits derived from ABC implementation included: more accurate product costs; improved cost control; better performance measurement; increasing profitability; and growing competitive capability. They proved that an essential and key factor leading to successful ABC implementation was top management support, which is consistent with studies conducted by Innes and Mitchell (1991), Shields (1995), Major and Hopper (2005). However, in contrast to much of the current ABC literature, they found that most problems encountered by Thai implementers were attributable to technical issues rather than behavioural ones. These authors attributed this to reasons within the context of the Thai culture.

Jamaliah and Sulaiman (2008) also conducted an in-depth case study on ABC implementation with a focus on addressing benefits derived from and problems occurring with implementation in two companies in Malaysia. The results indicated that managerial factors rather than technical aspects contribute to successful ABC implementation. The managerial factors were: top management support; simplifying the ABC implementation process; sourcing suitable ABC software; full involvement and commitment by all affected employees. Their findings are consistent with the empirical evidence provided in Shields's (1995) study.

In addition to the above studies on ABC practices in developing countries, there were a number of prior studies examining various aspects of ABC implementation in China. These studies are reviewed in the next section.

2.4 ABC in China

Previous management accounting literature suggests that the introduction of ABC in Chinese companies occurred in the late 1990s. During the period, a number of studies have been carried out focusing on some basic concepts of ABC in terms of what
it is, how it works, and how to identify multiple cost drivers through theoretical debates among Chinese management accounting academics (Hu, 2001; Lin, 2001; Pan and Zhou, 2002; Wang, 2002; Xiong et al., 2008). However, there have been only a few studies that have attempted to examine ABC practices in Chinese companies. These few studies highlighted some of the problems encountered by Chinese companies with ABC implementation and suggested that these problems hinder the progress and widespread use of ABC in China (Chen et al., 2001; Hu, 2001; Lin, 2001; Pan and Zhou, 2002; Wang, 2002; Chen and Wang, 2007; Liu and Pan, 2007; Tan et al., 2007; Abdallah and Wei, 2008; Wang et al., 2010; Xiong et al., 2008). The nature of these studies and their findings are briefly described below.

Based on the successful experiences with ABC learnt from Western countries, Hu (2001) presented a theoretical framework in relation to how an ABC system could be applied in Chinese companies. He tried to link the design of the ABC system to Activity-Based Management (ABM) in Chinese organisations. However, this research remained at a theoretical level only.

Similarly, Pan and Zhou (2002) theoretically reviewed the ABC system in the context of a new social market economy, and identified some technical difficulties and problems encountered by Chinese companies who have made efforts to implement ABC.

Practically, Lin (2001) carried out an investigation into how some concepts of an ABC system can be applied in the Chinese Railway, a state-owned company. He pointed out some technical difficulties in identifying multiple cost drivers used to allocate overhead expenses to products and services provided by the company. This research was believed to be a pilot study on ABC concepts being adopted by one of the biggest Chinese state-owned companies.

In a wake of an increasing popular application of ABC in China, Wang (2002) notably pointed out five misunderstandings when adopting ABC. These misunderstandings were: first of all, ABC was suitable for any kind of businesses to implement; secondly, benefits derived from implementing ABC always outweighed the associated implementation costs; thirdly, the main purpose of implementing ABC was to accurately compute cost; fourthly, the ABC team should be made up of accountants only; lastly, ABC was regarded as a better substitute for the traditional costing system. Wang (2002) argued that an ABC implementation would not succeed if any of the above misunderstandings existed. In general, this research provided some reasonable insights into how to implement ABC successfully taking relevant factors into account within the context of organisations in China. This research concluded that there is still a long way to go for Chinese companies to implement and run the ABC system successfully.

A pilot survey study conducted by Chen et al. (2001) with the purpose of investigating the problems encountered with and benefits derived from implementing ABC by companies based in Hong Kong revealed a low adoption rate of ABC. In their survey, of those reported respondents, 11 per cent were adopting ABC while five per cent were considering adopting it. They argued that the concepts of ABC were made up of many cost pools and cost drivers based on the traditional cost accounting system within the context of Hong Kong. It is well known that Hong Kong has been a part of China officially since the British Government handed it over to the Chinese Government in 1997. Thus, they suggested that the complexity of ownership structure resting within companies in Hong Kong may have contributed to the low adoption rate of ABC. Despite the rare application of ABC in Hong Kong, those that implemented ABC had derived benefits as expected and were satisfied in terms of obtaining better

accuracy of product cost data. However, problems such as difficulties in collecting data, modifying the ABC system, and integrating ABC into the existing accounting system seemed to be challenging. They found that there were a couple of factors responsible for the low adoption rate of ABC including lack of support from top management and satisfaction with the current traditional cost accounting systems. These findings were in line with studies conducted by Innes and Mitchell (1991), Shields (1995), Major and Hopper (2005).

Other research carried out by Tan et al. (2007) setting up a series of metric measurement models in relation to ABC and ABM with the aim of evaluating dynamic enterprise process performance was practically supported by a proposed methodology. The proposed methodology developed by conducting this research was to contain seven characters including time, quality, service, cost, speed, efficiency and importance as a criteria, and these characters were accompanied by six types of process flows discovered within the manufacturing sector namely activity, product, resource, cost, cash and profit flow. This research sets up a good example of a complicated and multifunctional application of ABC within the Chinese manufacturing industry. However, this research stayed at a theoretical level without investigating a real-world situation.

A study conducted by Chen and Wang (2007) proposed a generic activitydictionary-based method and this method has been implemented in a computer assembling company to alleviate the shortcomings derived from an initial application of ABC in product costing within the context of mass customisation in China. According to their research, the shortcomings or drawbacks hindering implementation of ABC were found to involve difficulties in identifying activities and associated cost drivers as well as the consumption of related resource pools. The generic activity-dictionary-based method was believed to be a solution based on several fundamental assumptions regarding the product family and production process under a situation of mass customisation in China. Since it is not possible to generalise the results of this study, its implications are limited.

A pilot case study carried out by Liu and Pan (2007) is perhaps the most comprehensively review conducted on ABC practices in China. Using applied action research framework, they conducted the pilot case study of ABC implementation in a single Chinese manufacturing company, Xu Ji, for the period of 2001-2005. Their findings indicated that top management support was a predominant success factor in ABC implementation under the corporate culture of 'top-down' innovations. In the meantime, they identified some issues such as resistance to change and issues relating to the organisational structure, and found these issues were not prevalent but might affect future success. This study has made a historical contribution to the Chinese ABC literature as an examination of the very first successful ABC implementation within the Chinese organisational context.

A survey study conducted by Xiong et al. (2008) investigated ABC applications of Chinese manufacturing firms using responses from 133 respondents. Their findings indicated that few Chinese manufacturing firms have formally adopted a complete ABC system. However, some ABC concepts such as applying multiple cost drivers to allocate manufacturing overheads and period expenses into product and service costs have been widely adopted by Chinese firms. Meanwhile, approaches into how to effectively adopt these ABC concepts were gaining a high level of popularity in the Chinese manufacturing sector. They suggested that Chinese firms should seriously take their circumstances into account when adopting such ABC concepts in order to avoid a failure by simply copying ABC from western firms. Abdallah and Wei (2008) carried out an investigation into the factors that led to a failure of ABC implementation in the Bank of China, one of the biggest financial institutions in China. This study has contributed to the existing knowledge on ABC practices in China from an opposite perspective: Why did ABC fail? According to their findings, there were six factors/obstacles blocking ABC implementation. These factors were: lack of clear business purpose; lack of education/training in ABC; a poor ABC model; lack of participants; resistance to change; and few outsources available. Some of the factors such as making adequate training and resources available throughout ABC implementation were also identified by Shields (1995).

A field research conducted by Wang et al. (2010) into a Chinese oil well cementing company, which investigated finding appropriate cost drivers for fuel overhead costs by adopting an ABC system. Their empirical results indicated that the accuracy of fuel cost allocation among individual oil wells was improved by applying the product of distance and weight as the cost drivers under the ABC system. This study was claimed to be the first to reveal the best choice in selecting cost drivers by accessing and testing a real Chinese company's data. Thus, it made a contribution to the Chinese ABC literature with a rigorous, empirical and fundamental test setting and data analysis. However, the analysis of this study was limited to technical aspects of ABC implementation.

2.5 Summary of the Chapter

The literature indicates that ABC researchers in developed countries tended to re-identify and reinvestigate issues such as resistance to change and conflict of interests, which remained unresolved due to their political nature while such issues remain unidentified in developing countries including China. By reviewing the ABC implementation literature in developing countries including China, it's found that none of the reviewed studies have been able to examine a number of major issues, which proved to be a cause of potential problems when implementing ABC in a business environment and a cultural setting similar to those in China. For example, issues, such as resistance to change by employees and conflict of interests not only from a technical but also behavioural and managerial perspective when implementing ABC in a company, have not been discussed deeply in any of the above research.

As suggested by Englund and Gerdin (2008), the ABC implementation literature could be greatly benefitted by highlighting issues in relation to power and underlying conflict of interests within a company. By doing so, unexpected and contradictory results derived from an 'inherently political' implementation of ABC can be well understood as stated by Englund and Gerdin (2008, p155). However, such research issues remain untouched in developing countries including China.

The literature also points out that there is still a long way to go for researchers to work out solutions to the issues. Unfortunately, research conducted on Chinese ABC practices has not yet revealed the behavioural and managerial context of ABC implementation in any company. Thus, this study attempts to fill the gaps in the literature on the ABC implementation issues through an in-depth analysis of ABC practices within a major manufacturing company in China. The research design and data used to identify and empirically examine the ABC implementation issues in a Chinese manufacturing company is presented in the next chapter.

Chapter 3

Research Design and Data

3.1 Introduction

ABC applications in developed and developing counties as well as in China were reviewed in the previous chapter with a view to identifying research gaps in the literature in relation to studies on ABC implementation in developing countries in general and in China in particular.

As outlined in the literature review section, relatively little is known about the current status of ABC practises in Chinese companies and the problems they face in their effort to implement ABC successfully. Therefore, this study is designed to carry out an in-depth analysis of ABC implementation in Chinese companies with special references to specific problems that Chinese manufacturing companies encounter when implementing the ABC system. The purpose of this chapter is to develop a research design to examine the underlying issues relating to implementing ABC in Chinese companies and to describe the data collection and analysis.

As mentioned previously, the major objective of this study is to examine ABC implementation in Chinese companies with a view to identifying the problems and issues as well as the measures taken by the company to overcome the problems encountered. As shown in the literature review, researchers have used either a quantitative or qualitative approach in examining underlying issues. Given the nature of the issues examined in this study, a qualitative approach is considered to be more appropriate than a quantitative one. The selection of a qualitative approach for this study will be justified in the following sections, together with a detailed discussion on the case study method applied in this study. This is followed by a description of the data used in the study as well as the data collection process.

3.2 Research Design

According to Yin (1984, p28), a research design 'is the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusions'. Such a logical sequence can be either inductive or deductive. Mostly, qualitative research follows an inductive process whereas research associated with deductive process is concerned with empirical studies where a large amount of data is analysed by applying quantitative techniques. Depending on the nature of the research, if a particular theory is to be tested and findings need to be generalised to a population, then it requires a deductive process leading to a quantitative approach. By contrast, where little information will be available to gain a deep understanding of what people think or feel about issues emerging within a certain context, an inductive process plays an important role bringing about a qualitative approach. To sum up, research strategies and methods contribute to a research approach that tends to be either qualitative or quantitative (Creswell, 2003).

3.2.1 Selection of the Research Method

There have been a variety of research strategies available in social science including experiments, survey research, correlation, content analysis, ethnography, phenomenology, grounded theory studies and case studies etc, and these strategies can be grouped under either quantitative or qualitative approach (Creswell, 2003; Yin, 1984). Basically, quantitative research is a collection approach employing strategies such as experiments, survey research, correlation and content analysis to inquire into an issue or theory, whereas qualitative research seeks to build knowledge so as to enrich a researcher's understanding into a social or cultural phenomenon through a selection of the qualitative research design strategies including ethnography, phenomenology grounded theory studies and case studies etc.

According to Creswell (2003, p18)

'A quantitative approach is one in which the investigator primarily uses post positivist claims for developing knowledge (i.e. cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories).'

Given the fact that the research in social science has been dominated by the quantitative approach since the late 19th century (Creswell, 2003), the matured and advanced approach has been boosted by its undebatable advantages across many scientific fields and disciplines. Being deductive, the quantitative approach is based on measuring events and performing statistical analysis by formulating scientific hypotheses which are free from the researcher's own values and biases (Frankfort-Nachmias and Nachmias, 1992). Major strengths of the quantitative approach include the following:

- Stating a research problem in a designed and controlled manner (Frankfort-Nachmias and Nachmias, 1992);
- Objective and comprehensive conclusions can be reached after precisely setting up and testing hypotheses (Carr, 1994);
- Achieving a high level of validity and reliability in data analysis attributable to controlled variables (Balsley, 1970; Carr, 1994);
- Results gained are likely to be unbiased and generalisable (Carr, 1994).

Despite these strengths of quantitative research, it also has weaknesses, some

of which are highlighted as follows:

- In order to gain a level of control, research is usually carried out away from a real world over which the researcher has little control, which probably results in unnatural outcomes (Carr, 1994);
- Results are limited in terms of a large amount of numerical images rather than detailed narrative analysis (Carr, 1994);
- Failure to gain a deep understanding and to conduct a thorough investigation into a contemporary phenomenon within its social and cultural context due to little participation in a real-life context (Carr, 1994; Yin, 1984);
- Time-consuming and can be difficult for non-statistical researchers (Carr, 1994).

To avoid these disadvantages, a qualitative approach is favoured by those researchers who wish to investigate real problems in a real world where little control can be exercised. Moreover, conducting qualitative research can lead to developing knowledge and an in-depth understanding of issues derived from complex and contextual data, the validity of which is not easily justified by carrying out quantitative research otherwise (Carr, 1994; Fossey et al., 2002).

Fossey et al. (2002) argued that under a post positivist theoretical position, an assumption that truth or an objective reality is present independent of those seeking inquiry within its context is questionable as the world is socially constructed. Therefore, in order to gain an in-depth understanding of human involvement within its social and cultural context, qualitative research must be undertaken. As per Creswell (2003, p18):

'A qualitative approach is one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives (i.e. the multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern).'

As opposed to measuring objective facts in a controlled environment under quantitative research, a qualitative approach seeks to construct social meanings of human experiences within their social and cultural context under a natural environment where the researcher has little or no control over the situation.

Central to qualitative research as indicated by Miles and Huberman (1994) is that a qualitative approach is designed to capture a systemic and constructive picture of human actions and experiences as well as a belief in the objective world within a historical and social context. This allows a researcher to gain insights based on his or her understanding by putting themselves inside the context. Therefore, qualitative research is believed to best suit studies which require an in-depth exploration or investigation into a contemporary phenomenon involving human actions and beliefs within social and cultural contexts (Fossey et al., 2002). It is extremely useful in describing and understanding the social phenomenon of human actions and experiences which would be too complex to be understood by analysing numerical data or conducting a hypothesis test (Carr, 1994). Some of the strengths of conducting qualitative research are listed below:

- Gaining a constructive and valid understanding of a contemporary phenomenon within its social and cultural context that cannot be explained by analysing numerical data or conducting a hypothesis test (Carr, 1994);
- Designed to achieve a holistic view of the phenomenon under exploration and investigation, and aimed at discovering knowledge rather than testing (Miles and Huberman, 1994);
- Little standardised or flexible ways in collecting and analysing data, practical for studying a limited number of cases in-depth and conduct cross-case analysis (Miles and Huberman, 1994);
- Multiple interpretations available in analysing data, for example, the researcher is allowed to interpret and analyse data in his or her own words into a rich and detailed phenomenon which is embedded within its social and cultural context (Miles and Huberman, 1994);
- External validity will be greatly enhanced as the research is conducted in a natural setting (Carr, 1994).

Despite many positive aspects of qualitative research, some weaknesses of

conducting qualitative research continue to be criticized as following:

- It is difficult to make quantitative predictions, and to test hypotheses on a large population (Carr, 1994);
- It has been argued that findings are not able to generalised to a large population (Carr, 1994; Yin, 1984);
- Subjectivity could occur if the researcher becomes overwhelmed or puzzled by the data collected (Carr, 1994);
- Time-consuming in terms of collecting and analysing experiential data (Carr, 1994).

Carr (1994) argued that the debate over which approach is superior is unnecessary as it will limit the research outcome by solely relying on either quantitative or qualitative approach to answer the research questions. Rather, depending on the nature and purpose of the study, one of them or both should be considered as a methodology.

The major objective of this study is to examine ABC implementation in Chinese companies with a view to identifying the problems and issues as well as the measures taken by the company to overcome the problems encountered. Therefore, an inquiry is needed into how human actions, experiences, and beliefs will effect on ABC implementation within the Chinese context. Given that the researcher has no control over such a natural setting, a thorough investigation into ABC implementation in Chinese companies must be undertaken in order to obtain and develop in-depth knowledge of the ABC implications within the context of China. Thus, a qualitative research approach is more appropriate than a quantitative one to conduct this study.

As stated previously, major types of qualitative research are made up of ethnography, phenomenology, grounded theory and case study research. A brief description of these four types qualitative research is given below.

Ethnography focuses on describing the culture of a group of people, and the focus might be an entire culture broadly referring to shared values, beliefs, attitudes, practices and language of a group of people, and how these various parts shape the culture as a whole (Evelyn, 1987). The purpose of applying the ethnographic approach is to learn from rather than to investigate members of a group of people, and to understand how they shape and present their world views (Evelyn, 1987). This requires researchers to take a large amount of time and to participate or immerse themselves into the research field in order to fully understand the culture. The time-consuming process in conducting such research possibly results in an everlasting study. Given the current study aims to investigate the problems and issues encountered when implementing ABC in Chinese companies within its social and cultural context, the effect of culture is considered as background to the study but not an entire research goal. Thus, this approach will not be employed to carry out the current study.

Another approach, phenomenology is concerned with how individuals experience a phenomenon and how they interpret their experiences based on

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consciousness (Giorgi, 1997). According to Giorgi (1997), phenomenology had an impact on the 20th century philosophy and has been used mainly in disciplines such as psychology and sociology, thus, phenomenology is considered as both a philosophical and qualitative method. As this approach aims to seek meanings freely constructed and imagined by individuals based on their inner feelings and subjective experiences (Giorgi, 1997), it is not suitable for a study with the aim of objectively investigating problems and issues relating to ABC implementation in Chinese companies.

In common to phenomenology that seeks to understand a phenomenon in a subjective way by focusing on human experiences, grounded theory developed in the 1960s, and aimed to explain social processes by inductively identifying a social situation being investigated (Baker et al., 1992). However, the former is more concerned with explaining a psychological phenomenon by concentrating on participants involved only, while the latter is more focused on understanding and investigating social processes based on a wider range of data involved (Baker et al., 1992).

From the perspective of grounded theory, the researcher or investigator is fully involved in the data collecting and analysing process simultaneously and from the beginning to the end. Any previous or current experiences and knowledge derived from him or her and other people involved become parts of the data (Baker et al., 1992). Therefore, the theory developed from the research is grounded or rooted in the data (Corbin and Strauss, 1990; Minnis, 1985). When following grounded theory Corbin and Strauss (1990) urge the researcher or investigator to develop and group the concepts pertaining to the researched phenomenon, and to bring the situation under control. In this study, the researcher conducted an investigation into the issues and problems encountered with ABC implementation in Chinese companies, over which the researcher had no control at all, therefore, grounded theory is not considered suitable to conduct this study. Furthermore, under grounded theory, one cannot confirm whether the theory grounded in the data is proven true (Minnis, 1985). As a result, validity seems to be barely constructed by employing grounded theory in this study.

In order to gain an in-depth understanding of a contemporary phenomenon within its cultural and social context, an inquiry of why the phenomenon occurred and how it progressed within its context needs to be made. This will lead to a detailed discovery into the phenomenon and its context. To make such an inquiry and discovery in reality, where the researcher has no control over the phenomenon being investigated or hypotheses formulation within the context of the research, it is essential that some field work be conducted by the researcher. Consequently, a case study approach seems to be suitable to fulfil the task (Yin, 1984).

With the rising applications of ABC in China, problems and issues relating to the implementation of ABC encountered by those companies in China continue to emerge. Little investigation has been carried out into how and why the problems occurred and what solutions are available to address the issues in the Chinese context. Therefore, a detailed examination into such issues is necessary and needs to be undertaken in order to gain an in-depth understanding of ABC applications within their cultural and social context. In particular, the relationship between different issues and their context is unclear, and little control can be exercised in order to carry out such an examination. Hence, a case study approach is appropriate for this study. Details regarding the case study method are discussed in the next section.

3.2.2 The Case Study Method

It is widely recognized that accounting methods and processes can neither be fully understood nor make sense without considering the organisational context in which they take place since they are shaped and affected by a number of organisational

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and behaviour factors (Bruns Jr, 1989). We keep improving accounting methods and processes with the aim of better solving problems encountered by organisations and society. But in order to fulfil this task, the knowledge about how accounting actually works inside an organisation must be gained (Bruns Jr, 1989). Questions need to be addressed such as: would the same accounting method which has been proven effective in terms of real life solving problems in developed countries work the same way in the developing world? Would the same accounting technique which is well developed in western counties be shaped or affected by the similar organisational and behaviour factors in organisations in eastern countries? To answer these questions, field studies or case study research is required.

According to Yin (1984), a case study is defined as an empirical inquiry made by investigating a contemporary phenomenon within its real-life context where the borders between the phenomenon and context remain unclear. Differentiated from other research strategies such as experimental research and surveys with hypotheses being developed and tested, case study research attempts to gain a better and deeper understanding of a contemporary phenomenon by addressing questions such as "how?", "why?", "what?" and "what else?" in a real life situation within its context over which the investigator has little or no control (Yin, 1984). Thus, case study research has distinct advantages over other research strategies when the above questions can be investigated deeply, and solutions attained. Furthermore, case study research is valuable when it comes to describing how a particular phenomenon runs within its context, and it owns a 'unique strength in its ability to deal with a full variety of evidence--documents, artefacts, interviews and observations' as stated by Yin (1984, p20). Moreover, Yin (1984) argued that by applying case study research, researchers would be able to better understand and explain the phenomenon of interest within its context taking organisational and behavioural factors into account rather than focusing on technical issues only.

However, one could argue that outcomes derived from case study research have little basis for generalisation. To defend such a criticism, Yin (1984, p39) stated that:

'Critics typically state that single cases offer a poor basis for generalizing. However, such critics are implicitly contrasting the situation to survey research, in which a "sample" (if selected correctly) readily generalizes to a large universe. This analogy to samples and universes is incorrect when dealing with case studies. This is because survey research relies on statistical generalization, whereas case studies (as with experiments) rely on analytical generalization. In analytical generalization the investigator is striving to generalize a particular set of results to some broader theory.'

Yin (1984) further argued that by replicating process and logic for multiple case studies, which involves cross-case analysis of separate single case studies based on a rich theoretical framework, a study's findings can be generalised as case studies are generalisable to theoretical propositions rather than populations.

In the case of this study, a study strategy applying multiple cases and cross-case is used to make the findings applicable and generalised. With some social and casual links arising in a real life situation and they are too complex to be understood by applying other research methodologies such as survey or experiment. However, they will be well explained under a methodology of case studies (Yin, 1994). It was argued that validity, generalisability and reliability of the findings can be facilitated by applying a cross-case analysis (Miles and Huberman, 1994) through replication process (Yin, 1994).

Four tests have been developed and summarised by Yin (1984) providing strong evidence to demonstrate the application and emphasis of case study research in terms of validity, generalisability and reliability presented in the table below:

Table 3-1 Case Study Tactics

Tests	Explanation	Case study tactic	Phase of research
Construct	Establishing correct	Use multiple sources of evidence	Data collection
validity	operational measures for the	Establish chain of evidence	Data collection
	concepts being studied	Have key informants review draft case study report	Composition
Internal validity	Establishing a casual	Do pattern-matching	Data analysis
	relationship as distinguished	Do explanation-building	Data analysis
	from spurious relationships	Do time-series analysis	Data analysis
External	Establishing the domain to	Use replication logic in multiple-	Research
validity	which a study's findings can be generalised	case studies	design
Reliability	Demonstrating that the	Use case study protocol	Data collection
	operations of a study such as the data collection	Develop case study data base	Data collection
	procedures can be repeated with the same results		
Source: Yin 198	84, p36 and Kidder 1981,	p7-8.	

According to Yin (1994), case study research can be explanatory, descriptive and exploratory depending on certain research purposes. He also pointed out that internal validity is mainly concerned with explanatory studies and is inapplicable in descriptive and exploratory studies due to its nature of establishing casualty. However, inferences can be made through pattern-matching, explanation-building and time-series analysis during the data analysis procedure to emphasise internal validity. While construct validity can be developed via the use of multiple sources of evidence such as interviews, direct observations and documentation, and the ability of establishing chain of evidence makes it possible to use replication logic while conducting cross-case analysis. Thus, 'analytical generalization' can be achieved, so can be external validity enhanced as indicated by Yin (1994, p39). Consequently, reliability of the case will be addressed by replicating and developing a case study data set with the purpose of minimising errors and bias. Four tests set up by Yin (1984) are relevant to develop a quality research design for this case study research. Given the nature of this research, detailed and comparative descriptions have been provided by conducting eight individual cases and a functional cross-case analysis based on the use of multiple sources of evidence including interviews, direct observations and documentation. Some problems and issues regarding ABC implementation are discussed and investigated through analysing individual cases and across cases. The study draws heavily on descriptive case study research. Yin (1984, p25) stated that case studies have at least four applications:

- To *explain* the casual links in real-life interventions that are too complex for survey or experimental strategies;
- To *describe* the real-life context in which an intervention has occurred;
- An evaluation can benefit, again in a *descriptive* mode from an illustrative case study;
- To *explore* those situations in which the intervention being evaluated has no clear, single set of outcomes.

Further, Yin (1984, p97) indicated that:

'A descriptive case study is usually considered less demanding than an explanatory one. Little theory is said to be needed, casual links do not have to be made, and analysis is minimal. The case-study investigator is simply supposed to be free to "tell it like it is"... However, even under theses conditions, the relevant evidence needs to be cited.'

Therefore, it is critical for an investigator to clearly identify evidence within the whole research theme, and collect relevant evidence in a way free from bias. Most importantly, the investigator should be able to investigate the evidence deeply and carefully, and link the evidence together as well as set up and maintain a chain of evidence in order to construct validity of the study.

Through the theoretical lens of Yin's (1984) case study research, the main issues of this study are examined using a single oil processing company in China as a case. The company chosen for this purpose is PetroChina which is known to have

implemented ABC successfully in their operations. Some background information about this company is provided below.

3.3 The Case: PetroChina

PetroChina was created in 1999 as a joint stock company under the Chinese Company Law as a result of part of the CGRP conducted between its initial parent company, China National Petroleum Co. (CNPC), one of the largest state-owned enterprises formed in 1949, and China Petrochemical Corporation known as Sinopec formed in 1998. Both companies have been listed on the Fortune Global 500 companies (Nolan and Zhang, 2002).

The initially registered capital comprised 160 billion stated owned shares with par value of RMB 1.00 (US\$0.12) per share was transferred by CNPC in exchange for the assets and liabilities. Four core business segments were formed after an injection of most of CNPC's assets and liabilities following PetroChina's establishment in 1999. These were Exploration and Production (to explore and produce crude oil and natural gas), Refining and Marketing (to refine, store, transport and market crude oil and its associated petroleum products), Chemicals and Marketing (to produce and sell petrochemical products) and Natural Gas and Pipelines (to transmit, sell and market natural gas). Apart from this, a newly added segment of Overseas Business was successfully installed as a result of having expanded their oil and gas business in Indonesia since 2002.

PetroChina was successfully listed on the New York and Hong Kong Stock Exchanges in April 2000 with a total capital of US\$2.89 billion being raised through the Initial Public Offering (IPO). CNPC initially held 88.21 per cent of total equity of PetroChina (Nolan and Zhang, 2002). Soon after the IPO, PetroChina became the sixth largest listed oil company in the world. By 2007, 4 billion A-shares were listed on the Shanghai Stock Exchange through its IPO and 86.29 per cent were held by its parent, CNPC. The purpose of issuing A-shares, according to PetroChina Interim Report 2007, was to facilitate its ongoing and strategic business development by establishing a new financing platform, and to further improve its shareholders' interest and share structure as well as the company's sustained competitive strength. As a result of its ongoing achievements, PetroChina was ranked 30 on The Global 2000 in 2008¹.

As a flagship of Chinese public listed companies, PetroChina has to react to market conditions in an effective and timely manner in order to enhance its selfcontrollability and flexibility as well as long-term sustainable growth. On the one hand, the company has been facing pressure from tough competition worldwide and from investors to reduce costs, increase profitability and to improve cost accuracy due to inaccurate cost information generated by the traditional costing system which has been used since being listed (Abdallah and Wei, 2008). On the other hand, rapid development requires better management tools and effective costing systems to gain competitive advantage. Thus, the company started implementing ABC in one of its four core business segments, Refining and Marketing since 2004, and the system is still ongoing. In the next section, details on how to design a case are discussed.

3.4 PetroChina: The Case Design

Yin (1984, p28) clearly defined the research design as 'the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusions.' As to case studies, Yin (1984, p29) indicated that five components of a research design are particularly important: (1) A study's questions; (2) Its propositions, if any; (3) Its unit(s) of analysis; (4) The logic linking the data to the propositions; and

¹¹ Note: Unless specially mentioned, all the financial and non-financial figures appeared in this part are from various annual and interim reports of PetroChina, which are available at <u>www.petrochina.com.cn</u>

(5) The criteria for interpreting the findings. These guiding principles as they apply to this study are addressed below.

3.4.1 Research Questions

As indicated by Yin (1984) the case study strategy is most likely to address 'what?', 'how?' and 'why?' questions, so the initial task in carrying out a case study is to clarify the research questions. The specific research questions that this study examines are:

- What are the objectives of implementing the ABC system in PetroChina?
- To what extent has PetroChina been able to achieve those objectives?
- What are the problems encountered by PetroChina in implementing ABC?
- What measures have been taken by PetroChina to solve those problems?
- How has PetroChina addressed issues in relation to resistance to change and conflicts arising with ABC implementation?

By answering to the above research questions through an in-depth examination of the ABC implementation process of PetroChina, this study aims to provide insights on ABC implementation which may be applicable to other manufacturing companies who wish to implement ABC in their business operations. It also contributes to filling in the gaps in ABC literature for developing countries. After this initial task, the second component according to Yin (1984) is to state study propositions, if any.

3.4.2 Study Propositions

Study propositions reflect the theoretical issues that should be investigated within the scope of the study oriented by a theoretical framework (Yin 1984). To have propositions drawn from literature being included in a case study is helpful to ensure the researcher's capability of staying within the scope of the study and to increase the chances of finalising the project, however, propositions may not be present in each case study depending on the nature of the study (Baxter and Jack, 2008; Yin, 1984).

The literature review undertaken in Chapter 2 assists in developing the theoretical framework for this study. The issues and problems associated with ABC implementation will be examined within the Chinese context and compared to the literature. The previous literature is a good guide to specify the case and unit(s) of analysis (Yin, 1984).

3.4.3 Unit(s) of Analysis

Unit(s) of analysis, in fact, according to Yin (1984) and Miles and Huberman (1994) is the case which is a contemporary phenomenon taking place in a bounded social and cultural context. To be able to specify the relevant unit(s) of analysis is principally important in terms of applying case material to a broader body of knowledge and maintaining the focus of research (Smith et al., 1988).

Under this study, unit(s) of analysis primarily is related to the type of organisation (one of the largest Chinese oil companies, PetroChina) where the case study research applied in as individuals (branches of PetroChina) or integral organisation (cross targeted branches of PetroChina). Consequently, eight branches of PetroChina in which the ABC system has been implemented were selected as individual cases, and an analysis of the individual cases based on a variety of data collected at the research sites is carried out, along with a cross-case analysis across all the individual cases.

The last two components, the logic linking of data to the propositions, and the criteria for interpreting the findings, stand for the steps taken during the data analysis in case study research (Yin, 1984).

3.4.4 Linking Data to the Propositions and Criteria for Interpreting the Findings

Linking data to the propositions is concerned with how the data analysis is carried out in a way that is related to the theoretical propositions represented by a developed research framework (Yin, 1984). Yin (1984) indicated that there are a number of ways to carry out the data analysis under case study research, but none of them will definitely achieve the data analysis outcome expected on this type of case study. However, replication logic must be followed if multiple case studies are carried out. For whichever method is engaged in the data analysis, the researcher must ensure that the data is converged and analysed in an attempt to answer the research questions and to understand the case as a whole (Baxter and Jack, 2008).

In this study, the replication approach to multiple case studies promoted by Yin (1984) is utilised. First of all, an analysis of eight individual cases is carried out, and each individual case consists of a whole story from their perspective in an attempt to answer the research questions. In every single case, convergent evidence is sought towards the truth and a conclusion, and the conclusions drawn by each case are replicated and compared to other cases. Secondly, a cross-case analysis across all individual cases is undertaken so that the results generated form the individual cases are replicated and tested in multiple cases. Thus, external validity is achieved through the replication logic and the findings derived from the replication process are likely to be robust.

Although Yin (1984) indicated that there is no specific way of setting the criteria for interpreting robust findings, criteria for interpreting the findings should be developed under a well organised research framework explicit and free from bias. In other words, validity of evidence should be constructed through establishing and maintaining a chain of evidence. Yin (1984) identified a variety of sources of evidence gathered in case studies including interviews, direct observations, documents and archival records, and they are obtained through data collection. Under this study, data was collected from eight branches of PetroChina, and based on the data, separate single case studies as well as a cross-case analysis are carried out in order to strengthen the results of this study and to make the findings of the study applicable and valid as well as generalised.

Yin (1984) indicated that a unique strength of case study research lies in the fact that it can well sort out a wide-range of evidence including interviews and observations. Thus, a major source of data collection will be made up of interviews conducted and direct observations carried out by the researcher at the research sites within PetroChina. Details on data collection will be provided in the following section.

3.5 Data

The data required for this study has a number of sources. The key source was interviews with the employees of PetroChina. This was supplemented by direct observations made by the researcher at the research sites. A secondary source of data included company annual reports, relevant internal publications and the company website. Data collection methods comprised of examination of organisational documents and archives, and direct observations as well as formal and informal interviews using an open-ended questionnaire.

The open-ended questionnaire was originally designed and written in English. To ensure a smooth process in carrying out the interviews with the employees of PetroChina at all levels, an English questionnaire was translated into Chinese by the researcher due to the fact that the official language being used in China is Chinese. However, the translated copy was reviewed by a Chinese scholar who has conducted his post-doctoral research in business management for a number of years in English in one of the European countries. Thus, it is certain that there is no significant deviation in terms of language difference between the English and Chinese questionnaires. At the end of the interview process, the reviewed and finalised version in Chinese was translated back into English, and the process has been carefully modified and supervised by the Chinese scholar with expertise in English and management. Therefore, a double check translation procedure between English and Chinese has been carefully and strictly carried out to ensure consistent and qualified research data.

In addition to conducting formal and informal interviews, relevant personnel within the company have been contacted over the telephone and by email. As branches and segments of PetroChina are located almost in every town or city across China, the targeted group of people involved in the interviews were mainly focused on the ABC team members within their branch including management and petrochemical budgeters, cost and financial accountants, a statistician, a financial auditor and system manager as well as Head and Vice-Head of Accounting Department. These people were located in different branches where ABC has been implemented within the organisation.

The researcher travelled to PetroChina's eight branches located in seven cities across from the northeast to northwest in China, and conducted interviews and direct observations for three months. In total, 24 interviews were carried out, and each interview lasted for approximately two hours.

Meanwhile, these branches were assured that any information collected on site was strictly for a research purpose only, and confidentiality would not be breached. 24 interviewees who have been interviewed were either current or previous ABC team members in their branch, and their role in ABC implementation was cost or financial accounting with their education background mainly in the accounting and finance disciplines. Details on information regarding interviewees are attached in Appendix 1. The overall research process is depicted in the following chart:

Figure 3.1 Research Design



3.6 Summary of the Chapter

The purpose of this chapter is to develop a research design in order to examine the underlying issues relating to implementing ABC in Chinese companies, and to explain how the data was collected.

The major objective of this study is to examine ABC implementation in Chinese companies with a view to identifying the problems and issues as well as the measures taken by the company to overcome the problems encountered. Therefore, a constructive and valid understanding of how human actions, experiences and beliefs will have an effect on ABC implementation within the Chinese context must be gained. Thus, a thorough investigation into ABC implementation in Chinese companies must be carried out in order to obtain a holistic view and develop knowledge of ABC implications within the Chinese context in depth. This cannot be explained by analysing numerical data only. Therefore, a qualitative research approach is appropriate to conduct this study.

With the rising applications of ABC in China, problems and issues relating to implementation of ABC encountered by those companies in China continue to emerge. Little investigation has been carried out into how and why these problems occurred and what solutions are available to address the issues in the Chinese context. Therefore, a detailed examination into the issues needs to be undertaken in order to gain an in-depth understanding into the issues within its cultural and social context. In particular, issues have been occurring within a context where the relationship between them remains unclear, and over which the researcher has little or no control. Hence, a case study approach is suitable and used to collect and analyse the data.

Through the theoretical lens of Yin's (1984) case study research, the main issues of this study are examined using a single oil processing company in China as a case.

The company chosen for this purpose is PetroChina which is known to have implemented ABC successfully in their operations.

Yin (1984) defined five components that are important to a case study design. They are a study's questions; its propositions, if any; its unit(s) of analysis; the logic linking the data to the propositions; and the criteria for interpreting the findings. The research questions examined in this study are:

- What are the objectives of implementing the ABC system in PetroChina and to what extent has PetroChina been able to achieve those objectives?
- What are the problems encountered by PetroChina in implementing ABC and what measures have been taken by PetroChina to solve those problems?
- How has PetroChina addressed issues in relation to resistance to change and conflicts arising with ABC implementation?

In this study, the replication approach to multiple case studies promoted by Yin (1984) is utilised. An analysis of eight individual cases is carried out, and each individual case consists of a whole story from their perspective in an attempt to answer the research questions. During the analysis in every single case, convergent evidence was sought towards the truth and a conclusion, and the conclusions drawn by each case are replicated and compared to other cases. Subsequently, a cross-case analysis across all individual cases is undertaken so that the results generated from individual cases are replicated and tested in multiple cases. Thus, external validity is achieved through the replication logic and the findings derived from the replication process are likely to be robust.

According to Yin (1984), validity of evidence should be constructed through establishing and maintaining a chain of evidence. Yin (1984) identified a variety of sources of evidence gathered in case studies including interviews, direct observations, documents and archival records, and they are obtained through data collection.

The data required for this study has a number of sources. The key source was interviews with the employees of PetroChina. This was supplemented by direct observations made by the researcher at the research site. A secondary source of data included company annual reports, relevant internal publications and the company website. Data collection methods comprised examination of organisational documents, archives and direct observations as well as formal and informal interviews using an open-ended questionnaire. In addition to conducting formal and informal interviews, relevant personnel within the company have been contacted over the telephone and by email.

Based on the data collected broadly, separate single case studies and a cross-case analysis are carried out in order to strengthen the results of this study and to make the findings of the study applicable and valid as well as generalised. An analysis of individual cases is described in Chapter 4. This is followed by a cross-case analysis across all cases in Chapter 5.

Chapter 4

Analysis of Individual Cases

4.1 Introduction

PetroChina was created in 1999 as a joint stock company under Chinese Company Law. Four core business segments were formed following its establishment, they were: Exploration and Production (exploration and production of crude oil and natural gas); Refining and Marketing (refining, storage, transportation and marketing of crude oil and its associated petroleum products); Chemicals and Marketing (production and sale of petrochemical products); Natural Gas and Pipelines (transmission and sale of natural gas).

Since PetroChina's successful listing on the New York and Hong Kong as well as Shanghai Stock Exchanges in April 2000 and November 2007 respectively, the company has been facing pressure from tough competition worldwide, and from investors to increase profitability and to improve cost accuracy due to inaccurate cost information generated by the traditional costing systems.

Among the traditional costing systems, Financial Management Information System (FMIS) was the dominating system within PetroChina. It first appeared as FMIS5.0 before 2001, and was then updated to FMIS6.0 between 2001 and 2007.

In August 2006, a specialized team within PetroChina was formed to design and update the current costing system, FMIS6.0 to FMIS7.0. The team has researched all financial data generated from more than 90 subsidiaries where the team members exchanged views with IT managers, engineers and accountants. A year later, over 45000 standard information codes and more than 200,000 customer information codes were created, and an updated FMIS7.0 has been produced. This was a milestone for PetroChina which became the first multinational in the nation, to be able to account, integrate and share financial and accounting information among all subsidiaries across the country in one general costing system. FMIS7.0 has enabled the head office to better oversight and control of basic costing and financial processes running across all PetroChina's subsidiaries. In general, FMIS7.0 is still functioning based on process costing.

From the headquarters' perspective, FMIS7.0 has been an efficient financial and costing system to monitor financial performance and to take control over all the branches as a whole. However, from the branches' perspective, FMIS7.0 has not been able to effectively account, reflect and control or manage the costs occurring on raw materials, Work in Process (WIP) and all kinds of final products. Details on its ineffectiveness will be followed in the analysis of individual cases.

On the other hand, rapid development requires better management tools and effective costing systems to gain a competitive advantage. A transparent and effectual costing system was desperately needed in order to investigate what was really happening to the cost of raw materials, WIP and final products, and to further take control over these costs. Thus, the company started implementing ABC in one of its four core business segments, Refining and Marketing from 2004 with technical support provided by BoomLink Information Technology Co. (BoomLink).

According to Dr. Wang, founder and CEO of BoomLink, the company was established under the support of PetroChina's parent company, CNPC as a contractor in 1999, and committed to providing expert technical support and has specialized in implementing ABC among the majority of branches of PetroChina. It is located in Zhongguancun which is well known as China's Silicon Valley in Beijing. Staff members within BoomLink were made up of a group of experts who have gained Postdoctoral, Doctors and Masters as well as Bachelors degrees from the top universities in China and overseas. They have expertise in management, business and finance as well as computer science with over 10 years experience in implementing and collaborating Enterprise Information Systems within the Chinese oil industry.

Dr. Wang indicated that BoomLink has designed and developed an Activity-Based Costing Management (ABCM) module based on ABC theory, which follows production flow and is integrated with the carry-over method in computing, analysing and controlling costs of raw materials, WIP, diversified final products and joint products for PetroChina's branches.

He also stated that the training programmes initiated by headquarters, and designed and organised by staff from BoomLink regarding how to install and run the ABCM module have been provided to the ABC implementation team members in branches since 2004. Each team member has been regularly trained on ABC theory and associated practices for an average of three times per year under the headquarters' initiative to the end of 2007.

It has become apparent that significant outcomes in terms of transparency of cost components as well as effectiveness and timeliness on cost analysis and control has been achieved since the ABCM module was put on trial in December 2002. By the end of 2009, there were about 24 branches of PetroChina who had implemented and run the ABCM module with ongoing technical assistance from BoomLink according to Dr. Wang.

Dr. Wang accompanied the researcher to eight out of 24 branches located in seven cities across China's northeast to northwest where the ABCM has been implemented under technical support from BoomLink for three months to the end of 2009. During the three months period, 24 staff across eight branches were interviewed

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and offered their valuable views on the objectives of implementing ABC, outcomes derived from the implementation, difficulties and obstacles encountered throughout implementation, and those critical factors which might have an impact on successful implementation within their branch. The findings of the examination of each of the eight branches of PetroChina are described in the following sections.

4.2 Analysis of Case A

Jinxi Petrochemical Co. (Jinxi-P) is one of the branches of PetroChina, located in the north-eastern Liaoning Province, residing in a coastal city named Huludao (meaning, an island of zucchini as the shape of the city looks like a zucchini when viewing from the air). The city is located at Bohai Bay where there are ample reserves of natural gas and oil. Jinxi-P has boosted the local economy through providing employment opportunities to the local community and a processing capacity of more than six million tonnes annually of crude oil. Containing over 50 production units, the plant's production of gas, liquid petroleum gas, light naphtha and vacuum gas oil (to name but few) is provided by Jinxi-P to other refineries of PetroChina and to the external market.

Established in 1999 as a subsidiary of PetroChina , Jinxi-P has a costing system that has heavily relied on the traditional costing system represented by the FMIS7.0. Under the FMIS7.0, cost of WIP was estimated based on the planned data, and then formed part of the cost of final products. Thus, the influence of international and national fluctuation of crude oil was unable to be reflected on either the WIP cost or final products cost. Most importantly, the amount of raw material and WIP consumed by final products was unknown.

In order to obtain the 'real' cost of final products and to investigate a 'black box', (WIP) cost, which is an unknown, a 'new' costing system, ABC was introduced through the headquarters' initiative to the majority of its branches including Jinxi-P in 2004.

4.2.1 Objectives

An announcement made by headquarters regarding implementing ABC in the segment of Refining and Marketing in 2004 was the impetus for Jinxi-P to experience ABC. It is known that a gradual reduction of crude oil reserves since 2001 in Bohai Bay Oil and Gas Region has led to Jinxi-P decrementing its product capacity and thus profitability. As one of the measures to revitalise the company, it took steps to improve its product cost computation and control product cost with a view to improving profitability. The ABC costing system was in the forefront of these developments. Regarding the objectives of ABC, two employees of Jinxi-P, Mr. Jiao and Ms. Yang stated that ABC was expected to increase the accuracy of product cost calculations and control the cost.

Mr. Jiao, who works in the Cost Management Unit as a cost accountant, and became involved in the ABC system implementation after 2007, without being able to be trained at all during the process, commented:

'I supposed that the objective of implementing ABC is to develop and improve the current costing systems towards a more efficient and effective outcome in cost control.'

While Ms. Yang, a former ABC team member who has left the team recently after being promoted to a new role in the Capital Management Unit stated:

'The main objective of implementing ABC is simple. We just want to get our product cost right.'

Since most of the employees who had been involved in an early stage of implementation have moved to other branches due to a frequent rotation of employees in the company, the researcher was not able to interview those who were directly involved in the early stage of ABC implementation.

4.2.2 Outcomes

ABC implementation started with installing ABC software designed and monitored by BoomLink. With ongoing technical support from BoomLink, Jinxi-P has been able to distinguish cost of WIP and final products out of activity cost pools. Cost accountants have been able to analyse and compare the cost to the planned data.

Mr. Jiao noted:

'For the very first time, cost accountants were so happy to be able to investigate the 'black box' that has existed among various WIP products for so many years!'

By comparing the traditional costs to the ABC cost data, the importance of cost management has been promoted by the cost accountants who have further ensured the accuracy of accumulating cost from product lines to individual products. By doing so, cost accountants have become aware of the importance of recognizing all relevant activities throughout ABC implementation. Mr. Jiao indicated:

'To improve cost management, we must understand what makes up the total product cost which we cannot make sense of under the traditional costing system. ABC tells us a very different story about how product cost is calculated based on all relevant activities. Therefore, it is very important for every one to have knowledge of all kinds of activities happening in the business that may have an impact on product cost.'

However, Jinxi-P did not only experience positive outcomes with ABC implementation but also some difficulties and obstacles.

4.2.3 Major Difficulties and Obstacles

Jinxi-P is one of the old branches of PetroChina. In order to keep pace with new technology, business and eco-environmental development sustainability, the branch has

been recruiting fresh graduates from China's top universities recently.

There have been a number of new employees getting involved in the ABC implementation since the ABC software was installed in 2004. It is good to recruit new blood into the ABC team as these people bring new ideas and skills into the business. However, a frequent rotation of the ABC team members has been a negative influence on efficiency and effectiveness.

With regards to the problem, Mr. Jiao and Ms. Yang raised their concern as follows:

'A rotation of the ABC team members including team leaders should not be taking place as often as it is now as it takes a long time for new members to settle themselves into a comfortable situation during implementation, and because of the frequent rotation, none of us has been able to be fully trained to satisfy our role.'

Because of the frequent rotation of the ABC team members, a lack of full understanding of ABC theory with ongoing training became a common issue. Supply of basic information required by ABC from relevant departments including Production and

Planning has become degraded since it commenced.

Apart from that, problems relating to technical factors have become a major

concern as identified by Ms. Yang below:

'We are still unfamiliar on how to run the (ABC) system well and expert consultation (IT support) is needed. Currently, system integration needs to be improved as it is very slow to input data.'

With issues emerging throughout ABC implementation, it is practical to identify

factors that may have an impact on ABC implementation in Jinxi-P.

4.2.4 Critical Factors

The following factors that may impact on successful ABC implementation were

raised by the interviewees:
'First of all, we desperately need financial and technical support from headquarters in order to keep ABC working on the right track. Adequate resource supply is critical during the implementation process.'

'Secondly, we need to be consistently trained given the relatively regular rotation of the ABC team numbers. Ongoing training to some extent is a key to a successful implementation of any programmes including ABC.'

'If the above issues can be resolved, then, with a full understanding of ABC theory and practice, given improved accuracy of statistical information and qualified IT skills, we will be able to clearly identify associated activities and cost drivers, thus contributing to a better quality ABC system.'

To sum up, factors including top management support, adequate resource supply and ongoing training are critical to achieve successful ABC implementation Jinxi-P.

4.2.5 Summary of Analysis of Case A

The experiences of employees at Jinxi-P showed that ABC can better reflect product cost compared to the traditional costing systems. Costs calculated under ABC were found to have measured WIP inventory more accurately and thereby contributed to more accurate inventory values. Based on cost information provided by ABC, a comparative cost analysis and evaluation has become easy and transparent, making such analysis more meaningful for accountants and managers in terms of understanding what is really happening in the business. This provides opportunities for them to improve their cost management practices.

The main objective of introducing ABC at this site was to obtain more accurate product costs and thereby improved costing system and cost control. Jinxi-P seems to have achieved the objective of ensuring accuracy of accumulating cost from product lines to individual products based on a general understanding of ABC theory and real product costs gained. The insights provided by ABC on matters relating to cost management and improvement have been seen as a major outcome of implementing ABC. However, Jinxi-P has encountered difficulties and obstacles during ABC implementation. The issues such as a frequent rotation of ABC team members and the lack of training as well as limited understanding of ABC theory and practice have impacted on achieving desired results. Along with technical issues and insufficient supply of basic information required by ABC from relevant departments like Production and Planning made it harder to maintain ABC running smoothly in the branch. Overall, the experiences of the interviewees show that implementation of ABC at this branch has been successful in terms of achieving its set objectives. The keys to further success were identified as: first, the financial and technical support from headquarters along with adequate resource for the execution of the plan; second, ongoing training is essential.

4.3 Analysis of Case B

Jinzhou Petrochemical Co. (Jinzhou-P) is another branch of PetroChina located in north-eastern Liaoning Province, about 50 kilometres north of Jinxi-P. There are about 70 diverse oil refinery devices in Jinzhou-P contributing to a crude oil processing capacity of seven million tonnes per year. The primary products of Jinzhou-P are gasoline and diesel oil. As a producer and distributor of petrochemicals, the company sells its products domestically and world wide across the Asia Pacific region, the US and some European countries.

Owing to an ongoing sharp fluctuation in oil prices around the world and surging crude oil costs in recent years, it has been very difficult for Jinzhou-P to make a profit according to a senior executive (who did not wish to be identified). In order to survive in the long run, it is imperative for Jinzhou-P to find a solution for its business and more than 5000 employees. Since the product prices are uncontrollable, the company has turned its focus on cost.

4.3.1 The Current Costing Systems

Similar to Jinxi-P, since Jinzhou-P was formed as part of PetroChina in 1999, the costing systems have been rooted in the traditional costing systems. Basically, the traditional costing systems are made up of the FMIS, Refinery Device Coefficient Method (RDCM), Chemical Device Product and Process Costing (CDPPC). Overall, FMIS7.0 is representative of the current costing systems.

It is known that FMIS 7.0 is an efficient and effective costing system for the head office to monitor and control its subsidiaries. However, from Jinzhou-P's point of view, it cannot help the branch make cost savings and a profit due to a lack of transparency and reliability on cost components, especially when WIP costs were still estimated on planned data. The planned data used is obtained by one of the traditional costing methods, the RDCM, which has been widely used in branches of PetroChina. Under this method, one factor is selected according to a proportionate production device and then is fixed to allocate costs into WIP and final products. The factor therefore is called a coefficient.

Having provided feedback on operating FMIS7.0 to the head office and witnessed the benefits generated from implementing ABC in other branches, Jinzhou-P was able to start implementing ABC in 2005 following the top-down order from headquarters.

4.3.2 Major Difficulties and Obstacles

Since Jinzhou-P's purpose of implementing ABC is trying to turnaround the company's profitability, it was mainly cost accountants who were held responsible for installing and running the ABC system while using other costing methods at the same time. Because they did not realize how vital good cooperation and coordination between departments is to make ABC work effectively, this resulted in a conflict between the Planning and Accounting departments.

During a visit to Jinzhou-P, two cost accountants who have been well trained for implementing ABC were interviewed. One of them, Ms Wang addressed her concern over poor cooperation between the Accounting and Planning departments in sourcing and sharing data on ABC:

'The main difficulty is how to balance material used in working processes in order to prepare for the product costing process, and the Planning Department should be accountable to solve the problem. Instead, we have to manually source statistical data coming from the Planning Department and make efforts to communicate and coordinate with them on data's reliability and timeliness. This has been a very time consuming and exhausting process to go through everyday'.

Meanwhile, she pointed out a possible solution as follows:

'We need to turn the current costing systems into a simplified and efficient one in an effort to create an ABC environment ready to make ABC work. In order to achieve this, strong support from top leaders and headquarters is desperately in need'.

Similar concern was raised by another cost accountant, Mr. Meng who has been

working in the Accounting Department for more than eight years:

'ABC is an immature accounting tool in terms of how difficult it is to maintain and update the system given poor cooperation between different departments when delivering and analysing data. It (data analyses) was too difficult to perform by the Accounting Department only, without strong support from top leaders at headquarters'.

Having experienced how difficult it is to implement ABC within Jinzhou-P, cost

accountants alleged that strong support from top leaders at headquarters is critical to

lead ABC to a success.

4.3.3 Critical Factors

Apart from the strong support needed from headquarters, other factors such as cooperation and coordination between different departments and improved accuracy of statistical data are also critical to achieve success. Moreover, these factors seem to be

interrelated according to the cost accountant, Ms Wang:

'If strong and ongoing support from top leaders at headquarters is available, good cooperation and coordination between different departments especially the Planning and Accounting will develop over time. As a result, improved accuracy of statistical information will eventually be achieved. All in all, as a cost accountant from the leading department in implementing ABC, I urgently call for sustainable and ongoing support from headquarters'.

By taking the above critical factors into consideration, according to the cost

accountants, the objective of implementing ABC will be achieved.

4.3.4 Objectives

Having discussed the issues involved in implementing ABC with those

dedicated and experienced cost accountants, the objectives of implementing ABC were,

according to another cost accountant, Ms Zhou:

'To account costs objectively and fairly as they occur and to discover and eliminate Non-Value-Added (NVA) activities throughout implementation of ABC'.

Meanwhile, the cost accountant, Mr. Meng added his view as follows:

'The goal of implementing ABC should also focus on how to discover deficiencies in costing management and to improve the current level'.

However, Ms Wang expressed her negative viewpoint as follows:

'By implementing ABC, an efficient and accurate costing analysis should be achieved. Unfortunately, we only use ABC to produce and provide numbers to headquarters without other functional use after a huge amount of effort has been expended since we started implementing it in 2005.'

A concluding remark below by the Head of Accounting Department, Ms Shen

(who has a master degree with a major in accounting, her master thesis was about how

to make ABC work in the context of the Chinese oil industry):

'The goal of implementing ABC should be to improve cost accounting of each device so as to provide real product costs and to ensure authenticity of performance evaluating. This could help decision-makers to make better decisions on how to reduce cost efficiently and effectively. We are striving to reach this objective.'

Different views on the objectives of ABC implementation given by individual

interviewees posed a very interesting question to the researcher: Is ABC successful in

Jinzhou-P?

4.3.5 Is ABC Successful?

Ms Wang commented:

'ABC implementation is not successful in our branch. Currently, we only use ABC to provide numerical information to headquarters without applying it to costing management. One of the lessons would be to recognize that it is real costs not planned costs which should play a role in applying ABC.'

However, Ms Zhou offered her answer to the question in a different way:

'ABC is going well in our branch. However, issues such as how to improve the system and how essential it was for better communication between departments, emerged during implementation. We are working hard on dealing with these issues, and hopefully we can find solutions soon to make ABC worthwhile.'

A very circular and cautious comment was given by Mr. Meng as follows:

'We have successfully applied advanced cost management theory like ABC to practice. But it needs to be improved in order to achieve a successful ABC system in reality.'

When asked the same question, Ms. Shen made no comment.

Some useful lessons learnt by those implementers have shed light on the future

of ABC implementation in Jinzhou-P.

4.3.6 Looking Ahead

Ms Wang clearly offered her suggestions below:

'First of all, strong support is urgently needed from top leaders; secondly, an ABC environment needs to be created by changing the current costing systems; thirdly, the Planning not Accounting Department should be leading in implementing ABC in order that related departments are coordinated and cooperate. By doing so, an organized and integrated ABC system can be achieved.'

Similar comments made by Mr. Meng as follows:

'ABC should be directly led and implemented by headquarters. Meanwhile, strong support is needed from top leaders all the way down. Otherwise, it is too difficult to be carried out just by branches.'

These suggestions raised a very strong voice for urgent support from top leaders

at headquarters to keep ABC running at the targeted branches.

While Ms Zhou was very confident in the future of ABC and expressed her

interest in an ambitious way:

'I think that we should focus on how to perfectly combine FMIS7.0, ABC and ERP together in the future.'

At the time when the researcher was collecting data on ABC, Jinzhou-P was about to start implementing another project, Enterprise Resource Planning (ERP) which will be led by the Accounting Department according to another top-down order issued by headquarters.

4.3.7 Summary of Analysis of Case B

Owing to the heavy loaded and mixed costing systems including FMIS7.0, RDCM, CDPPC, ABC and upcoming ERP, Jinzhou-P's experience with implementing ABC was not straightforward. ABC was implemented and led by the Accounting Department (consisting of mainly cost accountants).

Difficulties and obstacles were encountered while implementing ABC due to a conflict emerging between the Planning and Accounting departments as a result of poor cooperation and coordination between the departments. According to the interviewees,

no solution could be found to solve the conflict without sustained and strong support from top leaders at headquarters, a factor which has been considered as essential in leading to successful ABC implementation in Jinzhou-P. In addition, the cost accountants also realized that the ABC system was too difficult to maintain and update.

If strong and ongoing support is available from headquarters, good cooperation and coordination between the Planning and Accounting departments could be developed in time. This will lead to improved accuracy of statistical information required by ABC. Thus, the objectives of implementing ABC can be achieved.

Based on Jinzhou-P's experience with implementing ABC, the objectives of implementing ABC can be summarised as follows: to account cost accurately, to improve cost management by eliminating NVA activities, to provide real product costs and improve performance evaluating, thus making better decisions on how to reduce cost effectively.

It seems that there is still a long way to go for Jinzhou-P to achieve success. It is also worth noting that the role of leadership should be clearly set when implementing a new system.

4.4 Analysis of Case C

Dalian Petrochemical Co. (Dalian-P) is located in the historic coastal city of Dalian, the second largest city of Liaoning Province which has been used as a port by the British, Japanese and Russian occupying powers from 1858 to the mid twentieth century. Nowadays, Dalian-P is the largest petroleum port in China and is playing an important role in international trade.

With competitive advantages in its location and the city's heritage, Dalian-P is believed to be the biggest refinery of PetroChina based on its crude oil processing capacity of 20.5 million tons annually. There are a total of 60 refinery and chemical units running to produce more than 200 diversified products including gasoline, diesel, kerosene, lubricating oil, paraffin, benzene, and polypropylene etc. These high quality petroleum products qualified by the National Emissions Standard III are shipped and exported through the port across the country and to the world creating large profits for the company. According to a newsletter posted on PetroChina's website, in the first half of 2010, Dalian-P's revenues on refinery products increased by 74 per cent to RMB 40.7 billion (\$5.7 billion) contributing to a profit at RMB 850 million (\$119.9 million) before tax.

Different from other branches' experience with ABC implementation, Dalian-P was chosen by headquarters as a trial company to implement ABC in 2001. According to Mr. Qu, the Head of Cost Unit for the Accounting Department (he has attended up to 30 ABC training sessions and seminars):

'We have carefully discussed and evaluated feasibility of ABC implementation about 10 times prior to its application. As required by the head office, FMIS7.0 has been used as a benchmarked costing system through all of the branches since it was introduced and updated. FMIS7.0 use is wide spread in almost each area of cost accounting including cost analysis, cost control and cost budget. For the purpose of centralised management from the head office's point of view, FMIS7.0 is an efficient cost management tool. However, from the individual branch's point of view, FMIS7.0 cannot provide us with actual costs occurring on WIP, thus, it does not reflect exact costs consumed by final products.'

The problem in relation to FMIS7.0 seems to be a common issue, also noted in previous cases. ABC was considered as an appropriate solution, and a thorough application commenced in 2003 following the successful trial.

4.4.1 Objectives

As the trial company, Dalian-P has played a vital role in leading other PetroChina branches to a smoother adoption of ABC. The objectives of implementing ABC, according to Mr. Yang (Assistant Accountant) were: 'Our objectives for implementing ABC, first of all, is to be able to accurately account real product costs, which is based on the unit cost of utilities including water, electricity and other supplies is fairly allocated and accounted; secondly, an understandable comparison on device operating cost should be made between different equipment. So far, we have been doing very well in achieving these objectives.'

As said by Ms. Zhan (Accountant):

'It is to strengthen costing management given that an integrated statistical system is provided and an accurate coefficient exists'.

Mr. Qu added:

'A perfect costing management should be based on ABC information provided by allocating multiple activities and cost drivers instead of current coefficient when accounting cost on refinery products. If this can be achieved, cost control and management can be further improved by researching activities and cost drivers deeply.

Nine years later, ABC has worked extremely well in the branch and has brought

with it huge benefits.

4.4.2 Outcomes

Dalian-P was well prepared for ABC implementation since it provided frequent training programmes to the ABC team members during the whole period. Mr. Qu was trained on various aspects of ABC application about 30 times which was the highest amount of training provided to an individual in PetroChina. Through these training programmes, the ABC team members were able to improve their understanding on how to broadly apply advanced cost management theory and technology especially ABC. An insight into the importance of cost management has gained by obtaining real product costs and ensuring the accuracy of accumulating costs from product lines to individual products. Theoretically, the training facilitated the ABC team members to identify multiple cost drivers and accurately allocate indirect costs into individual products. It showed that a finely tuned costing management and control system has been achieved by expanding the previous 20 activities into currently more than 50 activities, which better reflects product costs in detail, thus further improves cost analysis and control. For the very first time, cost accountants have confidence in clearly 'seeing' real product costs through the ABC system.

The ABC system also has become an assistant tool in decision making and planning as a result of the positive outcomes it delivered in computing and accumulating more accurate product costs. However, difficulties and obstacles have also been encountered.

4.4.3 Major Difficulties and Obstacles

Although the ABC team members have been trained frequently through the implementation, it was not an easy task for them to discover and allocate multiple cost drivers due to the complications of the oil refinery process. For instance, during the oil producing process, it is impossible to allocate individual cost drivers to corresponding product expenditure as the costs occurring during this period are mixed expenses which could be consumed by diversified WIP or final products.

Research was carried out and eventually they realized that one factor, the coefficient which has been commonly used as one of the costing methods in computing product costs among almost all the refineries, could be applied as an appropriate cost driver to allocate common costs or overheads during the oil refining process. It showed that the coefficient has been a reasonable representative as a cost driver to allocate relevant costs and expenses occurring during the oil processing period since 2001. Thus, a bottleneck of discovering and allocating the major cost driver has been broken during the trail of ABC implementation in Dalian-P prior to the top-down order issued by headquarters in 2004.

However, presently another issue is that the coefficient is the only representative of major cost drivers, but it is not effective in allocating all relevant product costs, which emerged at the late stage of implementation, and the ABC team members are still striving for a solution.

In addition, other technical issues such as system maintenance and how to substantially improve the accuracy of statistical information, along with behavioural issues for example, a lack of good cooperation and coordination between the Accounting and Planning departments remained critical.

With regards to the system maintenance, Mr. Qu commented:

'The ABC system only integrates numerical data while other systems keep updating, and this creates trouble when trying to do a proper job since data integration should be kept in sync between different systems'.

Meanwhile, the lack of good cooperation and coordination between the Accounting and Planning Department resulted in an inefficient statistical system when transforming the basic information required by ABC.

Mr. Qu noted:

'Good cooperation and coordination between the Planning and Accounting departments is critical in order to substantially improve the accuracy of statistical information provided by the Planning Department, which strongly maintains and supports the ABC system running persistently.'

Some of these issues were considered as major critical factors that may have an

impact on successful implementation.

4.4.4 Critical Factors

As indicated by Mr. Qu, good cooperation and coordination between the Planning and Accounting Department held the key to successful implementation. Meanwhile, with an efficient link between these two departments, the accuracy of statistical information could be further improved which will facilitate the ABC system working effectively.

Apart from that, factors such as ongoing support from headquarters and updated training were also critical to the success. Interestingly, only in Dalian-P, an analysis of activities and cost drivers was considered as the most important part of ABC implementation, and thus one of the critical factors.

4.4.5 Looking Forward

Ms Zhan stated:

'ABC has played an important role in costing management. However, a positive outcome of implementing ABC is too hard to achieve due to the inaccuracy of basic information that supports the ABC system'.

Meanwhile, she also offered her opinion on how ABC could run better in the future:

'Strong support from top leaders and management as well as adequate input of human resources are urgently in need in order to maintain the ABC system moving forward.'

Compared to Ms. Zhan's apprehensive attitude, Mr. Qu was rather positive about the

success:

'I should say, it is successful as the costing information provided by the ABC system is richer and more objective than other costing systems, which strongly supports better decision-making on production management.'

With regards to lessons learnt from implementation, he added:

'However, some lessons we learnt are: we should focus on activities and cost drivers analysis which is considered as the most important part of ABC implementation; we should be aware that ABC has an advantage in planning and decision making compared to cost accounting.'

Looking forward, he made a suggestion below:

'A perfect statistical system needs to be built up, based on which, we will be able to apply ABC well'.

As a leading branch in implementing ABC, Dalian-P has put an extreme amount of effort into examining, trialling and adjusting the system throughout every stage of implementation. The Dalian-P's ABC implementation is used as a role model for other branches on how to implement the system successfully. The Dalian-P's implementation of ABC has been successfully running for nine years in the branch and is likely to be improved in the future.

4.4.6 Summary of Analysis of Case C

It took nine years for Dalian-P to apply ABC since it was put on a trail by the head office in 2001. Dalian-P was well prepared and equipped through a number of evaluations made on feasibility of ABC implementation and a great amount of theoretical and practical training programmes. An insight into solid and advanced cost management theories has been gained. An improved cost analysis and control system has been achieved by discovering more than 50 activities and by researching associated cost drivers continuously. Transparency on cost components was obtained, and as a result, the ABC system has become a very helpful tool in production decision-making and planning.

However, difficulties and obstacles were also encountered. Major issues remain critical such as: how to technically identify the relevant activities and associated cost drivers at different stages of production owing to the complications of the Chinese oil production process; how to maintain the ABC system; how to develop good cooperation and coordination between the Planning and Accounting departments; how to improve the accuracy of statistical information which greatly supports the ABC system operating.

Among these obstacles, factors regarded as critical in leading to successful implementation of ABC were: technical identification of relevant activities and

associated cost drivers; good cooperation and coordination between the Accounting and Planning departments (which could result in improved accuracy of statistical information provided by the Planning Department); ongoing support from headquarters and updated training.

One of the objectives of ABC implementation has been achieved according to Mr. Yang, which was to accurately account product costs, and based on which, an understandable and reasonable comparison on costs between different devices can be made. Mr. Qu added that cost information provided by the ABC system was more transparent and objective than the other costing systems, contributing to a better cost analysis and control system. Therefore, ABC was successfully implemented in Dalian-P.

Further research on relevant activities and associated cost drivers is recommended by the interviewees in terms of maintaining the cost control and management system. This will in turn help plan and make better decisions on production management. Meanwhile, to build up a perfect statistical system providing more accurate statistical information to support the ABC system, with strong and ongoing support from top leaders and management being available, ABC success should be preserved in the long run.

4.5 Analysis of Case D

Daqing Petrochemical Co. (Daqing-P) is located in Daqing City, an oil city of Heilongjiang province in northeast China. The oil city was founded in 1959 as a result of a ground-breaking discovery of the largest oilfield in China, the Daqing oilfield, which unfolded the history of Chinese oil self-reliance. The Daqing Oilfield contained about 2.2 billion tons of crude oil when production started in 1960, and the current reserves remain around 500 million tons which makes the field the number four most productive oilfield in the world.

With the supply of crude oil constantly from the Daqing Oilfield, Daqing-P processes 6.5 million tons of crude oil annually. There are more than eight production plants and 127 production units operating in the company and producing a wide range of oil products, chemicals and fertilizers including gasoline, diesel, lubricants, paraffin, jet fuel, ethylene, polyethylene, synthetic ammonia and urea etc.

With a large number of diversified products being produced, the job of accounting costs of these products was not simple for the Accounting Department given that the costing systems are totally mixed. Similar to other branches, FMIS7.0 has been the dominating costing method since 2005, along with the method of coefficient and process costing. Real product costs were too difficult to obtain based on the mixed costing systems.

As stated previously, use of the ABC system was ordered by the head office to be fully implemented in the division of Refining and Marketing in 2004. Soon after that, it has been thoroughly applied in almost each petrochemical and refinery branch. Daqing-P commenced the system in 2005. Led by the Accounting Department, the ABC team was formed by the cost accountants, management budgeter, statistician and petrochemical budgeter along with the IT support from BoomLink.

With the hope that ABC can play a positive role in reflecting real product costs as it has performed well in Dalian-P and other branches, the ABC team has put their focus on improving cost control and management.

4.5.1 Objectives

ABC was regarded as a necessity for cost control as indicated by 75 per cent of interviewees within the ABC team. Three out of four interviewees held that the

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accuracy of accumulating costs and calculating profit can be well developed by implementing ABC. Also three-quarters of interviewees believed that ABC would be a good catalyst in improving cost management by understanding real product costs, and in strengthening performance evaluation by understanding cost flow.

One of the interviewees, who has been working as a management budgeter for more than eight years, and did not wish to be identified, offered his view as follows:

'The objective is to accurately account costs and eliminate NVA activities through implementation of ABC.'

Ms Wang, who was the only statistician among all those interviewed (although she has worked as a management budgeter in the Accounting Department for more than three years), added her view:

'The objective is to accurately account costs and to generally report production efficiency in order to provide useful and timely information for better decision making. To achieve this goal, we must ensure that accounting base is accountable, relevant statistic information is accurate, and financial accounting reports are accurate and timely.'

As one of the ABC team key members, Mr. Wei has been working as a petrochemical budgeter within the Accounting Department for about five years, and his role was involved in providing petrochemical budgets in relation to associated ratios analysis. From a broad perspective, he commented:

'First of all, we should consistently learn and accept new ideas on costing management, and continually improve the accuracy of cost accounting; secondly, cost accounting should be thoroughly improved by deeply analysing cost drivers and having a professional knowledge on product lines; finally, ABC implementation should be broadly applied by developing and strengthening cooperation and coordination between relevant departments.'

In general, ABC implementation aimed to effectively improve cost control and management with extensive research into areas such as cost drivers, associated product lines, and developing cooperation and coordination between departments involved.

4.5.2 Outcomes

A number of training programmes have been provided either by headquarters or

the branch to ABC team members since the Spring of 2004. All of the four interviewees

had been trained on ABC theory and associated practices at least three times prior to its

implementation.

The anonymous management budgeter indicated that,

'Through those training programmes, ABC theory has been rooted in our mind, and allowed us to apply it by successfully separating diversified devices during oil production via process costing, which made it a reality in accounting real product costs. ABC really made a difference for us to realize that we can obtain the true product costs by understanding and getting information delivered by ABC.'

Ms Wang explained her change of role as an outcome of implementing ABC

within the branch.

'I worked as a statistician outside the Accounting Department until we started implementing ABC in 2005. I suppose that my statistics background and work experience would be beneficial to the implementation. I was required to join the Accounting Department since the ABC team was formed, and have been a member since then.'

With regards to the impact on cost control and management, she continually

commented:

'ABC really made a difference in accounting costs as it reflects real product costs, guides device flow, and determines materials and expense allocation methods. Thus, cost control and management became possible, and has been greatly improved under ABC through understanding device and cost flow. As a result, performance evaluation has been strengthened.'

Despite the positive outcomes brought in, some difficulties and obstacles were encountered.

4.5.3 Major Difficulties and Obstacles

Issues such as lack of full support for providing basic information required by

ABC and poor cooperation between different departments emerged. The management

budgeter pointed out:

'The major difficulty is that we have to manually source statistical data to support the basic information required by ABC due to inaccurate information provided by the Planning Department. This has been a very time consuming and inefficient process to go through.'

The same issue was also indicated by Ms. Wang below:

'We have difficulties in balancing statistical data, in coordinating with the Planning Department, and in producing relevant accounting reports which are informative, resulting from the use of ABC in our branch. I suppose that ongoing IT support and consideration from headquarters are urgently needed to fix these problems.'

The IT support from BoomLink was available when the ABC team was formed in 2005. However, these IT support members regularly travelled to other branches across the country where they helped implementing ABC around that time. With regards to the support from the head office, it seems that this has been a common issue emerging throughout ABC implementation in every branch visited. Solutions to these problems are still to be discovered.

Mr. Wei pointed a way out below:

'First of all, we need to work out how to balance and refine relevant materials, and to make relevant activities, costing goals and drivers clearly linked; secondly, we need to put more effort along with much needed support from head office into developing better cooperation and coordination between the Planning and Accounting departments than is currently occurring.' The above issues remain critical in determining the future of ABC implementation in Daqing-P.

4.5.4 Critical Factors

Factors including ongoing support from headquarters, ongoing training, cooperation and coordination between different departments, improved accuracy of statistical information, well identified associated activities and cost drivers, are critical during ABC implementation in the branch for its long term success.

As a common issue, ongoing support from headquarters has been urgently called for by all of the interviewees from each branch visited, and it has been seen as an essential factor that could directly result in success or failure. Three-quarters of interviewees in Daqing-P made an urgent call for ongoing support from the head office.

Although training programmes on ABC theory and associated practices have been made available for the ABC team members, and each of them has been trained on average three times either in or outside the branch since Spring 2004. The factor of ongoing training was considered as essential by 75 per cent of interviewees in leading to a successful implementation of ABC.

All interviewees expressed their concern over cooperation and coordination between different departments, and believed that improved cooperation and coordination between the departments involved is a pathway to success.

Lastly, improved accuracy of statistical information and well identified associated activities and cost drivers were also regarded as significant by three-quarters of interviewees.

4.5.5 Summary of Analysis of Case D

Built on the biggest oilfield in China, Daqing-P has made a fair contribution in terms of producing a wide-range of diversified products, providing a reasonable annual processing capacity of crude oil, and accounting and managing costs under the comprehensive costing systems. ABC was implemented with a heavy focus on improving cost management and control by the dedicated ABC team following the top-down order issued by the head office in 2004.

The objectives of implementing ABC, from a theoretical perspective, should be focused on research into ABC theories and cost drivers analysis in order to be effective in managing costs. Therefore, ongoing support and training provided by headquarters were fundamental to achieve this objective. From a practical perspective, professional knowledge on production processes and lines should be gained by the ABC team members. Finally, how to build a strong relationship among the relevant departments involved in ABC implementation is the key to success. A mutual understanding between these departments should be reached in order to achieve the objectives.

Through a number of solid training programmes conducted at both headquarters and branch level, the ABC team, consisting of the cost accountants, management budgeter, statistician, petrochemical budgeter and IT support from BoomLink, has gained a valuable impression on how ABC can make a difference in accounting for true costs. Moreover, through their theoretical and practical experience with ABC, they also witnessed an improved cost control and management as well as a strengthened performance evaluation system.

However, some obstacles emerged, specifically, difficulties in sourcing and balancing statistical data provided by the Planning Department due to poor cooperation and coordination between the Accounting and Planning departments. In addition, lack of ongoing support and training from headquarters significantly held the implementers back. Solutions to thoroughly overcoming these issues were still being researched.

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It showed that these issues along with the well identified associated activities and cost drivers were the main factors affecting ABC implementation. Among them, ongoing support from headquarters has been seen as essential and urgently called for by three-quarters of the interviewees. 75 per cent of interviewees regarded ongoing training, improved accuracy of statistical information, and identifying associated activities and cost drivers as significant in determining the future of ABC implementation. All interviewees held that ABC cannot be smoothly implemented without good cooperation and coordination between the departments involved.

The way to implement ABC in Daqing-P seems to be full of difficulties moving forward. However, with ongoing support from headquarters and effective cooperation and coordination building up between related departments, those obstacles and difficulties should be able to be overcome, making the future of their ABC implementation brighter.

4.6 Analysis of Case E

Daqing Refinery Co. (Daqing-R) is located about 30 kilometres west of Daqing-P in Daqing city. Joined PetroChina in October 2000, Daing-R is a combination of two production areas, Maanshan and Linyuan which cover about 20 km² area of oil and gas. The prime location made this young company vibrant and ambitious with an annual processing capacity of crude oil up to eight million tons and production of gas being more than half million tons annually.

Consisting of 32 sets of production units, Daqing-R produces a wide range of diversified petrochemical products, 38 in total, distributed under 100 plus different brands. Some popular products including heavy and light diesel oil, chemical light oil, high standard and unleaded gasoline series, aviation kerosene, crude scale paraffin wax, propylene, acrylonitrile and acetonitrile etc are manufactured by superior production equipment imported from America, France, German, England and Italy, which placed the company in a strong position when facing tough competition both domestically and internationally. This company is capable of offering high grade petrochemical products of the finest quality to both national and international customers.

Because of the diversity of its products and gas production of over half a million tons annually, it has been vital for the company's top managers to make the right decisions on pricing and costing. However, costing information generated by the current costing systems, consisting of FMIS7.0, coefficient method and process costing, was distorted due to the lack of flexibility in tracing the production and cost flow. Especially under the coefficient method, the coefficient factor used for allocating costs from upstream to downstream of the products during production processes was always fixed no matter how many activities and activity chains were involved. The cost accountants were struggling to produce and analyse information on cost and price until the initiative of implementing ABC among majority branches of PetroChina was launched by the head office in 2004. Immediately, the ABC team was formed, and it was made up of cost accountants and budgeters from the Accounting Department as well as managers from the Production Department.

4.6.1 Objectives

A high level of confidence in cost control and management has been gained after the ABC team members were trained on average four times through the training programmes provided by headquarters and the branch since 2004. The objectives of pursuing a sustainable ABC system were initiated.

An unidentified accountant from the new department, Budgeting commented:

'To accurately analyse each device's cost, and to provide useful and precise information for better decision-making should be the objectives of the ABC implementation.'

Another unidentified cost accountant who had been working in this role for more than

seven years, and is currently assigned to the Budgeting department commented:

'The objectives of implementing ABC should be: firstly, to understand the association in producing and transforming data from production processes to financial and cost accounting; secondly, to cooperate and coordinate efficiently between the departments involved.'

The leader of ABC team, Ms Chen, who was originally from the Production

Department, at present, is employed as Vice-Head of the Accounting Department. She

stated that:

'The objectives should be to precisely reflect activities and final product costs, to provide an efficient tool for decision-making, and to achieve maximum value and great benefits.'

She further commented that:

'In order to achieve these objectives, technically, we must adjust product lines, making sure that the ABC data generated based on that is as accurate as it could be through close cooperation with the Production and Planning departments. Non-technical factors in ABC implementation like trust must be built up between the Production, Planning, Accounting and Budgeting departments based on a mutual understanding gained through cooperation, which will strengthen cooperation in return. Thus, with ongoing support from top leaders from headquarters and the branch, the objectives of ABC implementation will be achieved eventually.'

Ms Chen was convinced that she has learnt so much from ABC implementation,

which in turn offered her a huge opportunity in pursuing a new career. She expressed her strong belief during the interview that ABC can do a good job of accounting,

analysing, as well as controlling, planning and managing cost.

4.6.2 Outcomes

There have been positive outcomes arising from implementing ABC in Daqing-

R. Ms Chen proudly commented:

'ABC becomes a kind of common language connecting all relevant departments including Production, Planning and Accounting together,

which never happened before! I would not have been in the position where I am now as Vice-Head of the Accounting without getting myself involved totally into ABC implementation. At the very beginning, I knew that ABC would work in terms of letting us discover the real cost of the products, getting costs controlled and managed as well as allowing accurate forward planning. I still can remember the moment when I walked into the head office in our branch, and asked the president to please support us on the new exciting project-ABC, and we will surprise you with a great outcome!'

She continued sharing her experience with ABC as follows:

'We did surprise the leader and the whole branch by being ranked in the top three refineries of PetroChina in terms of profitability as a result of our ABC implementation. Also I was lucky to be promoted to the current position based on the great achievement that our team has completed through implementing ABC in our branch.'

With a great attitude and enthusiasm towards ABC implementation, she added:

'As encouraged by the great performance demonstrated by ABC implementation, with support from the top leader in our branch, we formed the new department-Budgeting, not only involved computing but also planning and managing cost through applying ABC. So far, there are about 20 full-time staff members in the department working tirelessly and making great efforts by setting up a number of models in running the system effectively.'

The cost accountant made the following comments regarding outcomes:

'We have been regularly trained on ABC theories and associated practices by headquarters and the branch four times since we started implementation. As a cost accountant, I have been trained more than five times so far since 2004. Greater awareness in realising the importance of cost management and understanding of real product costs has been promoted through these training programmes. Most importantly, a number of models including: the Refinery Products Cost Accounting (RPCA); Cost Restoring and Analysing (CRA); Budgeting, Planning and Profit Forecasting (BPPF); and Overhead Controlling and Managing (OCM) have been able to be set up based on the ABC information provided by the system. This has greatly improved cost control and management in our branch.'

Meanwhile, the unidentified accountant added his views below:

'I am new to the department and still learning about ABC. What I have learnt through the ABC implementation is those models such as the CRA, OCM and BPPF set up based on the ABC information are working very well in terms of analysing, controlling and planning cost. This has been greatly helping our leaders in making better decisions on productivity, profitability and business future.'

During the visit to the branch, the majority of staff members from the new department-Budgeting had a short meeting with the researcher. Impressively, they were very enthusiastic about their current roles, and satisfied with what they have achieved in implementing ABC. Confidence and inspiration gained through ABC implementation via the interviews at this branch did not emerge from interviews conducted in other branches. While positive outcomes were delivered, difficulties and obstacles were encountered.

4.6.3 Major Difficulties and Obstacles

Major difficulties have emerged such as lack of strong and ongoing support from top leaders, inaccuracy in ABC data sourcing and balancing, and the lack of effective communication and coordination between relevant departments.

Ms Chen addressed her concern over one of the issues as follows:

'Our branch's top leader was fully supportive when implementation started. Unfortunately, he left for a new role in another branch during the process, and it seemed to be too difficult for us to keep ABC going since then. This has been a very serious issue for my team to carry ABC forward as a result of frequent rotations occurring in branch's leaders. Not every new leader was interested and informed as the previous one in what we have been doing and achieving. Therefore, the lack of strong and ongoing support from top leaders is the top concern which will disadvantage the long-term effect of projects including ABC.'

In searching for a solution to the issue, Ms Chen offered her view below:

'I suppose that an ABC environment should be created in which every one including the top leader of branch and staff members needs to be well informed and educated on ABC theories and information. Thus, ABC implementation will be fully understood by each staff in our branch. Overall, ABC is not a single job that has to be done by the Accounting Department but a common interest to get every one involved. If this can be done, then the negative influence of frequent rotations of branch's top leaders on ABC implementation would be minimised.'

Meanwhile, she pointed out another issue as follows:

'Apart from that, a major technical issue we were struggling to deal with is the inaccuracy of ABC data generated from repeatable production processes when sourcing and balancing the data. These production processes occur when raw materials, WIP and some finished products have to be reproduced and reprocessed due to a nature of our petrochemical and refinery production. As these processes are unavoidable, a negative impact of reoccurring data on the accuracy of ABC information when following activities and cost drivers occurred in our branch.'

The issue was addressed by two other interviewees as well. Because of the occurrence of the issue, the ABC team realised that product lines actually were a major factor in activity chains, which directly impacted on the ABC data. They have been working closely with the Production Department in order to adjust product lines with the aim of improving the quality of the ABC data. Notably, this issue seemed to be a common one as it has occurred in other branches where ABC was implemented. However, none of them has been able to diagnose the cause of the issue except for Daqing-R.

Through cooperation with the Production and other departments, the ABC team acknowledged how important good cooperation, coordination and communication could contribute to smooth ABC implementation. Ms Chen commented:

'To ensure ABC implementation is carried out smoothly, good cooperation, coordination and communication definitely needs to be built up between the Accounting, Production, Budgeting and Planning departments as well as others. A mutual understanding and views on how to better cooperate and coordinate between the departments in generating and transferring the ABC data should be regularly exchanged. Any conflict arising due to failure to do this could be extremely detrimental to successful ABC implementation.'

Having taken these issues seriously and striving for solutions to the problems, the ABC team gained some valuable understanding in recognizing a number of critical factors affecting the success.

4.6.4 Critical Factors

These critical factors were: strong and ongoing support from headquarters; improved accuracy of statistical information; cooperation and coordination between different departments; and training.

The majority of interviewees consistently urged for strong and ongoing support from top leaders from headquarters and the branch, and considered it as the most significant factor.

It is essential to ensure the statistical information required by the ABC data is as accurate as possible in order to ensure a successful ABC implementation as indicated in the previous cases. Impressively, the ABC team in Daqing-R has discovered a causeeffect relation between product lines and the ABC data, and this issue is being researched by the Accounting, Production and Budgeting departments in order to fix the problem technically.

To improve the accuracy of statistical information provided by the Production and Planning departments will rely on good cooperation and coordination between these departments. The interviewees regarded this factor as having a long-term impact on ABC implementation.

Although most of the ABC team members have been trained at least four times in preparation for ABC implementation, the factor of training was still viewed as critical.

Daqing-R was the only PetroChina site where the researcher discovered that those involved in ABC implementation were quite confident and satisfied with the outcomes derived from their implementation. This inspired the researcher to explore the

story behind this confidence.

4.6.5 A Successful Story

The cost accountant from the Budgeting Department proudly expressed himself:

'Throughout ABC implementation, we are able to fully understand how well production goes, what is going on in the production processes, and how accurate the costing data could be. What we have learnt from implementing ABC is far beyond our expectations. I suppose that ABC implementation in our branch is successful.'

The accountant from the same department added:

'Our ABC implementation is exceptional so far. Cost on each device and product can be fully reflected in detail. From my point of view, ABC implementation is a successful story in our branch.'

As Vice-Head of the Accounting Department, and the initiator of the Budgeting

Department, and the ABC team leader, Ms Chen acknowledged ABC implementation

positively in a neutral way below:

'I think that ABC is successfully implemented in our branch based on what we have achieved. However, it has not been applied broadly due to lack of full support from top leaders at the level of headquarters and our branch, and lack of good cooperation, coordination and communication between the ABC team and the various departments.'

Through the interviews with Ms Chen and her dedicated team members, a message reflecting strong confidence and inner belief in successfully implementing ABC was delivered, which made the task of collecting data on this research enriching and remarkable.

At the time of conducting interviews at the branch, it was required by headquarters to install an ERP system, and extremely strong resistance was occurring in transferring the ABC system into ERP. One of the reasons appeared to be a conflict of leadership arising between the Accounting and IT departments. It was worth noting that this issue did not appear throughout the ABC implementation in Daqing-R.

4.6.6 Summary of Analysis of Case E

Daqing-R was apparently one of the outstanding refineries with its diversified productivity and excellent contribution to PetroChina's bottom line. It was ranked in the top three refineries of PetroChina after a successful ABC implementation. The initiative for implementing ABC was directed by PetroChina's headquarters and facilitated in Daqing-R by their senior management who formed the ABC team made up of cost accountants, budgeters and production managers. Through a number of training programmes provided by headquarters and the branch, the team has developed a strong faith that ABC can improve cost control and management as well as performance evaluation.

Objectives of implementing ABC were to accurately analyse activities and product costs by applying ABC through good cooperation, coordination and communication between related departments, and to make ABC an effective tool for decision-making on production, profitability and business future.

Positive outcomes derived from ABC implementation have benefitted the branch with a top three ranking in profitability among all refineries of PetroChina. ABC also developed new career opportunities for individuals like the team leader, Ms Chen who was promoted as Vice-Head of Accounting Department based on her commitment and contribution to leading her team, and forming a new department-Budgeting. With about 20 full-time staff members working enthusiastically and confidently in the department under her leadership, they have successfully extended the ABC system into a number of multifunctional costing control and management models including the RPCA, CRA, BPPF, and OCM. Cost control and management in conjunction with cost analysis and planning were greatly improved, which resulted in higher productivity and profitability. This ensured better decision-making on the business's performance and future.

However, difficulties and obstacles were also encountered. Among them, lack of strong and ongoing support from top managers, was commented on by all of the interviewees. They continually urged for strong and ongoing support from top leaders across all levels, and regarded it as a significant factor to successful ABC implementation.

In addition, a technical issue, the inaccuracy of ABC data was a major concern. Extraordinarily, a cause-effect relation between product lines that may cause the issue has been diagnosed by the dedicated ABC team members, and effort was made to fix it through close cooperation between the Accounting, Budgeting, Production, and Planning departments.

Through cooperation between the departments involved, a non-technical issue occurred, which is lack of good cooperation, coordination and communication between these departments. A mutual trust built up between the Accounting, Production, Budgeting and Planning departments may ease the issue. Both the technical and non-technical issues along with the factor of training were considered as critical to the success.

Overall, Daqing-R has successfully implemented ABC based on its achievements.

4.7 Analysis of Case F

Harbin Petrochemical Co. (Harbin-P) is located in Harbin, the capital of the Heilongjiang Province in Northeast China. It was originally built in 1976 prior to joining PetroChina in 1999. Harbin-P was a medium-size refinery heavily relied on its supply of crude oil being transferred by a pipeline stretching 183 kilometres from the Daqing Oil Field into Harbin. The pipeline was regarded as a 'lifeline' in Harbin-P owing to its unique function.

Based on this external supply of crude oil, Harbin-P was able to deliver approximately five million tons of crude oil to its processing lines annually. With 14 well equipped production devices operating 24 hours a day, six different products marketed as 16 different brands were produced and offered to the domestic and international markets. The wide-range of oil products and chemicals produced are: gasoline, diesel oil, lubricants, paraffin, ethylene, polyethylene and other chemicals.

Because these products were heavily processed following strict production lines, their costs were accounted based on the traditional process costing prior to ABC implementation in 2005. With technical assistance and IT support from BoomLink, ABC implementation led by the Accounting Department commenced in 2005. It was a rocky road for those accountants who put in a huge effort in setting up the system, and in obtaining and gathering relevant information from the Production and Planning departments. Through an interview with the Vice-Head of Accounting, Mr. Li, the following difficulties and obstacles encountered during ABC implementation were reviewed.

4.7.1 Major Difficulties and Obstacles

Mr. Li, who has been in charge of budgeting and financial analysis as the Vice-Head of Accounting for about five years, and was the only interviewee at the site as a result of a heavy workload in the department, had a lot to offer regarding difficulties and obstacles faced during ABC implementation:

'It was a very difficult time for us as accountants to set up the ABC system although technical assistance was available from BoomLink at the beginning of implementation. We were required to lead implementation in the branch by headquarters. However, neither the branch executives nor other departments including Production and Planning were cooperative and coordinated in sharing and transferring relevant information due to limited understanding of ABC and its applications. It seemed that only we, accountants from the Accounting Department were involved and responsible for the implementation, there was nothing to do for staff from the other departments! This had been frustrating and time-consuming for us to get through in the early stage of implementation.'

Mr. Li vividly recalled the troubled time in the early stage of ABC implementation when one of the major issues of poor cooperation and coordination between the departments was first encountered in Harbin-P. It took his team about one year to overcome the issue and improve the whole situation:

'With a number of training programmes on ABC being offered by headquarters since 2004, a positive outcome was arising in terms of transparency and accuracy when accounting and accumulating cost of products. Regular comparisons and analysis made on product costs between the ABC system and traditional processing costing were able to be delivered by our accountants. As a result, our branch leaders started to understand and accept ideas of ABC. Meanwhile, people from the Production and Planning departments noticed that there was a huge difference in costing data produced by two systems, and realized that the basic costing data created and transferred by them was not the true cost at all through our work and communication with them. Eventually, a year after we first implemented ABC in our branch, the situation has been improved in terms of developing better cooperation and coordination between the Accounting, Production and Planning departments.'

Having gone through a tough time during the early stage of ABC implementation, Mr. Li and his team realized how important it was to have a well equipped and qualified ABC team formed by members from all relevant departments not only Accounting but also Production and Planning, which can implement ABC smoothly with full support from headquarters and the branch executives.

However, a lack of full and ongoing support from the board of directors and

executives at all levels within PetroChina was another concern addressed by Mr. Li:

'On behalf of my department and team, we desperately call for full and ongoing support from the board of directors and executives from headquarters and the branch. Attention is needed from these people who can make decisions on providing relevant training programmes, technical assistance and follow-up supervision throughout the whole process of implementing ABC. Without this kind of support along the way, we obviously cannot carry the ABC system forward, not to mention achieve the objective of implementation.'

Mr. Li extended his concern about the major difficulties they had encountered to

the problem of how to maintain the process of ABC implementation so as to achieve its

objective.

4.7.2 Objective

Having put great effort in to acknowledging and overcoming those obstacles,

Mr. Li and his team set up a reasonable objective for ABC implementation:

'At this stage, the objective of implementing ABC in our branch should be to clearly understand real cost of each product and to eliminate NVA activities so that a better cost control and management can be achieved.'

To ensure the objective was achieved, he also offered some guidelines below:

'In order to achieve the objective, first of all, full and ongoing support from executives at all levels within PetroChina is definitely needed, and top leaders' capability of accepting new ideas needs to be developed; secondly, a well equipped and qualified ABC team needs to be formed by members from relevant departments including Accounting, Production and Planning, through which better cooperation, coordination and communication between the departments will be built up and maintained; lastly, more accurate statistical information regarding associated activities and costs needs to be delivered and transferred through developed cooperation between the departments. By doing so, cost control and management in our branch can be well improved.'

In order to achieve the objective, Mr. Li and his team sacrificed their time on weekends and holidays, and worked on solving issues. Four years since the commencement of ABC implementation, Mr. Li was proud of some achievements and valuable lessons learnt by his team within the branch.

4.7.3 Achievements and Lessons

Having set up the objective and encountered difficulties and obstacles, Mr. Li and his team spent a great amount of time in persuading and communicating with branch leaders and staff from the Production and Planning departments with the aim of developing an understanding and awareness of the transparency and accuracy in costing that the ABC system could deliver. The outcome turned out to be very pleasing as commented by Mr. Li:

'We made continuing efforts in informing both our branch leaders and staff from the Production and Planning departments about the transparency and accuracy in costing that ABC can achieve by regularly demonstrating comparisons and analysis made on costs between ABC and process costing. Eventually, our branch leaders started accepting and understanding new ideas of ABC. Meanwhile, staff from the Production and Planning departments convinced that previous costing data based on information supplied by them was not true, and acknowledged that ABC was more accurate and transparent in doing such a job compared to the process costing. Thus, a mutual understanding of ABC and its applications has been developed, so has better cooperation and coordination between the Accounting, Production and Planning departments.'

Based on improved cooperation and coordination between these departments, the accuracy and transparency of costing data delivered by the ABC system has been greatly improved according to Mr. Li. Surprisingly, his team also developed a new financial forecasting model based on ABC theory in an Excel format, taking costs of raw materials and WIP into consideration. The model can promptly account and accumulate monthly costs at any time with a rounding error of less than one per cent by flexibly adjusting the volume of raw materials and WIP. This was a great achievement made by the team given the tough time they went through.

Highly encouraged by the achievements looking back with a clear mind, some lessons learnt by the team were addressed by Mr. Li:

'We have learnt some lessons throughout ABC implementation in our branch. Firstly, a mutual understanding across the top and bottom level of management, accounting, planning and production is essential in obtaining full support, and in building up good cooperation and coordination between those departments involved; secondly, a well equipped and qualified ABC team made up of members from relevant departments is a premise to successful implementation; lastly, accurate statistical information on basic activities is necessary to be transferred and used for creating the ABC data.'

These valuable lessons accounted for not only achieving a positive outcome through implementing ABC but also could be applied to other projects such as an ERP which was currently being implemented within Harbin-P.

4.7.4 ABC vs. ERP

By the time the researcher started the data collection trip in Northeast China, the majority of the branches of PetroChina were undertaking an ERP system which aimed to strengthen and facilitate the current financial and costing systems including FMIS7.0 and ABC following another initiative launched by headquarters.

Harbin-P was underway in implementing ERP. It seemed that similar problems were occurring in the new system with a probability of weakening ABC implementation since all the financial and costing systems were installed and run by the same team made up of limited members from the Accounting Department.

Mr. Li was deeply concerned about the potential problems that could arise in the future as he explained below:

'Currently, an ERP system is being implemented in our branch following another top-down order issued by headquarters early this year. We are very concerned about the following issues: first of all, how to technically apply and integrate ABC into the ERP system without depreciating the positive outcomes delivered by ABC implementation? Secondly, how to form well equipped and qualified ABC and ERP teams made up of members from relevant departments not only just Accounting? Lastly, how to develop and strengthen the way in collecting and accounting basic data on ABC without having a clash with the new ERP system?'

These issues probably were just a few that needed addressing as the new system-ERP was launched. It would be amazing if they could take up the challenge, fix up the issues, and maintain all the financial and costing systems including FMIS7.0, ABC and ERP functioning smoothly and independently in the future.
4.7.5 Summary of Analysis of Case F

As a medium-size refinery, Harbin-P heavily relied on the 183 km pipeline between the Daqing Oil Field and its base transferring and supplying crude oil to maintain its production and function. Following strict production lines, products were produced based on their process. Cost of all types of products was traditionally accounted through process costing until the initiative of implementing ABC was launched by headquarters in 2004. Led individually by the Accounting Department, those accountants with technical assistance from BoomLink commenced ABC implementation in 2005.

Because of a lack of understanding and acceptance of ABC and its applications by branch executives and relevant departments other than Accounting, one of the major difficulties and obstacles, poor cooperation and coordination between the departments especially Accounting, Production and Planning, was encountered in the early stage of ABC implementation. It took the ABC team about a year to improve the situation by demonstrating the difference between ABC and process costing in terms of the transparency and accuracy of costing data that the two systems delivered. Throughout the process, the ABC team also realized it was essential to form a well equipped and qualified ABC team made up of members from relevant departments including Accounting, Production and Planning, with full and ongoing support from the board of directors and executives at all levels. This kind of support was urgently needed during ABC implementation.

The objective of implementing ABC was to clearly improve cost control and management. Through the continuing efforts made by the team in informing branch leaders and staff from the Production and Planning departments about ABC, better cooperation and coordination between the Accounting, Production and Planning departments has been developed based on a mutual understanding of ABC and its applications. Amazingly, the team also developed a new financial forecasting model which can predict profit based on more accurate costing information delivered by ABC within one per cent of rounding error. Cost control and management has been greatly improved since ABC implementation commenced. Thus, the objective was achieved.

Despite positive outcomes arising, some important lessons were also learnt by the team. It could have made ABC go smoothly by setting up a well equipped and qualified ABC team consisting of members from relevant departments besides Accounting based on good cooperation and coordination between these departments, with full and ongoing support from senior executives at all levels.

These valuable lessons not only applied to ABC implementation but also to other projects such as an ERP system which was being implemented in Harbin-P following another recent initiative launched by headquarters. The challenges faced that were worth noting are how to technically apply and integrate all the systems without weakening or undermining each other, and how to build up a well equipped and qualified team to fulfil the task.

4.8 Analysis of Case G

Changqing Petrochemical Co. (Changqing-P) is located in Xianyang, a city in Shanxi Province in China's northwest. It was originally built in 1990 and commenced operation in 1992 prior to joining PetroChina in 1999. With capital of about seven billion Yuan (\$980 million) being injected into the branch, 30 trillion Yuan (\$4.2 trillion) of fixed assets were installed through a couple of technical upgrades, and 20 trillion Yuan (\$2.8 trillion) of GDP was contributed to the Chinese economy yearly.

Changqing-P can process five million tonnes of crude oil annually through 11 production units, and a 1.2 million tonnes production of the hydro cracking unit which is claimed to be the largest in China's west. The wide-range of quality products such as

high grade standard and unleaded gasoline series, light diesel oil, gas and jet fuel are manufactured by total 1000 workers. The jet fuel produced is supplied to Xi'an-Xianyang International Airport, the largest airport in China's northwest, via a pipeline stretching about 14 kilometres between the airport and Changqing-P plant.

Traditionally, the cost of products was calculated based on the planned WIP cost data, and the cost information derived in the traditional way could not reflect or reveal the true cost of all products. Thus, an efficient way of measuring cost in an objective and neutral manner was in sought until the initiative of implementing ABC was launched in 2004.

With the aim of reflecting and revealing the true cost of all kinds of products, ABC was implemented by the Department of Accounting in 2005 following the topdown order issued by headquarters. At that time, the coefficient method was used under the process costing together with FMIS7.0 they formed the financial accounting and costing systems in Changqing-P.

4.8.1 Objective

With a heavy workload being imposed on the Department of Accounting, there were only ten accountants including cost and financial accountants responsible for running the financial and costing systems consisting of FMIS7.0, process costing, ABC and the upcoming ERP system. Great effort was expended by those dedicated accountants in order to be able to measure production costs accurately, thus improving cost control by implementing ABC.

A few accountants attended a number of training programmes on ABC and relevant seminars organised by headquarters. They were convinced that cost control and management can be improved by understanding cost flow through the ABC data. According to Mr. Bai, who has been working in the Department of Accounting for more than eight years preparing and producing financial reports, and was coordinating the

ABC system after being trained three times, stated:

'The objective of implementing ABC in our branch at this stage should be able to analyse, control and manage cost objectively and thoroughly.'

A similar view was offered by Mr. Yang whose role was accounting cost, budgeting

and was trained on ABC twice:

'The objective of implementing ABC in our branch should be to focus on how to strengthen managing and analysing cost structure under ABC in order to clearly control and manage costs. To achieve the objectives, full and ongoing support from executives of the branch and headquarters is essential.'

The implementation project showed that an understanding was gained on how to apply advanced cost management theory and technology such as ABC through the training programmes. This was one of the outcomes deriving from ABC implementation in Changqing-P.

4.8.2 Outcomes

Apart from gaining an understanding on how to apply ABC through the training programmes, the implementers were capable of identifying a number of multiple cost drivers in order to allocate indirect costs accurately into individual products. According

to Mr. Yang, outcomes arising from ABC implementation were:

'More detailed, broadened and accurate information on costing all types of products deriving from ABC was able to be accessed for the very first time in our branch. Awareness of the importance of cost management was promoted through comparing the costing information delivered by ABC and other costing methods. By implementing ABC, we were able to make a comparison in cost restoring and to carry out variance analysis between different products and devices. Thus, cost control and management was improved, which has a positive impact on performance evaluation.' While cost control and management was improved by implementing ABC, difficulties and obstacles were encountered which dramatically weakened performance and confidence.

4.8.3 Major Difficulties and Obstacles

Major difficulties and obstacles faced by the implementers were: a poor input of human resources; lack of full support in obtaining basic production information from different departments which is required by ABC; lack of ongoing technical support and training; and poor cooperation between different departments within the branch.

Mr. Yang expressed his concerns as follows:

'Lack of input of human resources in the Department of Accounting, incomplete statistical information provided by the Planning Department due to poor cooperation between the two departments, and lack of training and ongoing technical support have significantly held us back in progressing ABC implementation further.'

Mr. Bai, was extremely concerned about the status of ABC implementation:

'Currently, outcomes deriving from the ABC system are recognized neither by the branch leaders nor co-workers from other departments such as Production and Planning. People from these two departments strongly resisted getting involved and cooperating throughout ABC implementation. This was too difficult for us to overcome without strong and ongoing support from top leaders at all levels.'

These difficulties and obstacles obstructed the effectiveness of the implementation of ABC in Changqing-P, and were likely to have a long-term negative influence.

4.8.4 Critical Factors

A number of critical factors that might have a significant impact on ABC implementation were worth addressing.

Firstly, full and ongoing support of top leaders from the branch and headquarters was critically needed, along with access to sufficient training. Secondly, good

cooperation and coordination between the Accounting, Planning and Production departments was essential. Thirdly, the accuracy of statistical information provided by the Planning Department should be improved, which will completely support the basic information required by ABC. Lastly, the relationship between associated activities and cost drivers, which are some of the essential components of an ABC implementation, should have been investigated initially.

The above factors were raised by the interviewees in Changqing-P as critical to progress ABC further. However, it seemed to be extremely difficult for Changqing-P to succeed compared to other branches where ABC was implemented. The following arguments would highlight some reasons behind this conclusion.

4.8.5 A Negative Story

Unfortunately, neither of the interviewees would claim a success in ABC

implementation in Changqing-P. Mr. Yang commented:

'We should have had the whole process clearly defined in terms of making available accurate statistical information and the associated accounting methods ready before implementing ABC. Unfortunately, it did not happen in our branch.'

Compared to Mr. Yang's implied attitude, Mr. Bai frankly argued:

'No, I do not think that we have successfully implemented ABC in our branch. One of the main lessons would be people from the Department of Production should have gotten themselves fully involved during implementation. Perhaps, ABC should be implemented by the Department of Production instead of Accounting!'

A conflict of leadership between the Accounting and Production departments appeared throughout the ABC implementation in Changqing-P, and it did not seem to have been resolved yet.

Mr. Bai further argued:

'Outcome-oriented ABC implementation seems to be an issue for the Department of Accounting. No matter how much profit was achieved, it would not make any difference when evaluating performance either from the perspective of branch or individual. In other words, to achieve maximum profit is not an incentive.'

Every business has its own problems. However, in order to keep the business a going concern and moving forward, some problems damaging the organisation's ideology or culture like the ones above should be addressed as soon as possible. There was no doubt that ABC implementation should be linked to a certain level of performance evaluation through setting up appropriate incentives to encourage those implementers to effectively get the job done.

4.8.6 Summary of Analysis of Case G

Changqing-P is a young petrochemical company, proud of its contributions to PetroChina and the Chinese economy. There are 1000 workers in total working on site which include ten accountants responsible for running a mixture of financial and costing systems containing FMIS7.0, process costing, ABC and the upcoming ERP. In order to disclose the true cost of all types of products, following the top-down order issued by headquarters in 2004, ABC was implemented by the Department of Accounting in 2005.

The objective of implementing ABC was to achieve better cost control and management. An understanding of how to apply ABC was gained through a number of training programmes organised by headquarters. The importance of cost management was acknowledged through accessing more detailed, broadened and accurate cost information delivered by ABC. It became possible to make a comparison on the cost information delivered by ABC and other costing systems. As a result, variance analysis between different products and devices provided data, which resulted in improved cost control and management. However, some difficulties and obstacles were encountered which heavily hit the implementers' confidence, and critically had an adverse impact on ABC implementation. One of them was a lack of appropriate human resources in the Department of Accounting. The heavy workload imposed on the under resourced accountants needed to be addressed by executives from the branch and headquarters. Therefore, full and ongoing support along with sufficient training were desperately called for and regarded as the most critical factor impacting on ABC implementation by the interviewees. Another obstacle was poor cooperation and coordination between the Accounting, Planning and Production departments due to a conflict between these departments. As a result, strong resistance by those involved was an ongoing issue. This was seen as a significant concern by the interviewees. Because of the existing poor cooperation and coordination between those departments involved, incomplete and inaccurate statistical information was provided to support the ABC data, which critically had an adverse impact on the quality of ABC data delivered.

Changqing-P's experience in implementing ABC highlighted a fact that the conflict of leadership in leading ABC implementation resulted in strong resistance by those involved, which was a primary reason for the detrimental cooperation and coordination between the Accounting, Planning and Production departments. Meanwhile, without considering setting up incentives to encourage the ABC implementers in relation to their performance evaluation, the future of their ABC implementation seems to be uncertain.

4.9 Analysis of Case H

Qingyang Refinery and Petrochemicals Co. (Qingyang-R and P) is located in Qingyang in eastern Gansu province of China's northwest, which was considered to be one of the poorest provinces in China in terms of its annual GDP contribution despite recent growth in its economy. Qingyang's economy has been heavily reliant on processing and exploration of petroleum and natural gas since the Yumen Oil Field, the first oil field discovered along the Ancient Silk Road in 1939, along with the foundation of Qingyang-R and P in 1971 prior to joining PetroChina in 1999.

Qingyang-R and P is capable of processing one and half million tonnes of crude oil annually. With a dozen refinery devices being operated by 1500 dedicated staff members, and 1.544 trillion Yuan (\$216 billion) of fixed assets, Qingyang-R and P produced a wide-range of refinery and petrochemical products consisting of gasoline, diesel, gas, MTBE, paraffin, paraffin wax, and other petrochemicals.

As one of the oldest refineries of PetroChina, Qingyang-R and P was very keen to improve its profitability and decision-making strategies on product prices and costs. Similar to other branches, the financial and costing systems in Qingyang-R and P were made up of FMIS7.0, process costing, and coefficient method prior to ABC implementation. A cost effective plan was developed to effectively reduce cost and increase profit when the initiative of implementing ABC was launched by headquarters in 2004. ABC implementation was led by the Department of Accounting, and commenced in 2005 followed by a number of training programmes delivered by headquarters. With the hope that the cost effective plan could be achieved through implementing ABC, those implementers who were trained on ABC averagely three times were highly motivated.

4.9.1 Objectives

The implementers, consisting of financial and cost accountants, a financial auditor, budgeter and system manager, urgently wanted to investigate cost relationships between crude oil processing and the WIP and final products that were manufactured. Because the traditional costing methods failed to accurately record and control cost before, during and after these processes. They believed that cost can be clearly controlled and managed by understanding real product cost, and the accuracy of process accounting cost can be improved. Consecutively, relevant information gained on devices cost can be transferred back to the Department of Production, which would guide decision making on production. The objectives of ABC implementation in association with the cost effective plan were described as follows.

A system manager who has been trained on ABC twice, and preferred to remain unidentified commented:

'The objective of implementing ABC in our branch should be to accurately accumulate and account products cost and effectively reduce the costs.'

A similar view was offered by a financial auditor who has been working in the current role for more than eight years, and was trained on ABC twice, and preferred to also be unidentified:

'The objective of implementing ABC should be to improve cost accounting, management and effectiveness as well as to achieve maximum profit.'

A financial accountant who has been trained three times on ABC, and preferred to be anonymous made this comment:

'It would be a perfect implementation of ABC if we can accurately account and make a timely comparison on costs of each activity when the activity transpires!'

More broad and challenging views regarding decisions making and how to achieve the objectives were addressed by other two interviewees. Mr. Du who had been in charge of accounting sales, fees, taxes, materials, costs since he started working in 1997, and currently was a budgeter, and was trained in ABC four times, commented: 'From my point of view, the objectives of implementing ABC should be: to accurately produce timely analysis reports based on information provided by the ABC system; to design and develop an analysis and evaluation model which can help make decisions on production, cost effectiveness, and performance evaluation. The way to achieve these objectives depends on the level of support we obtain from headquarters and our branch.'

Similar views were addressed by an anonymous cost accountant who has been trained

more than five times on ABC:

'The objectives of implementing ABC should be: to reflect the current manufacturing status; to strive for the enterprise's interest; to provide information for decision making in a timely and effective manner. They can only be achieved through cooperation and coordination between the Manufacturing and Accounting departments as well as all the way through strong and ongoing support from top leaders from headquarters.'

It showed that the investigation into what was happening in costs was successful

as the real product cost were discovered and clearly understood by those implementers

as demonstrated by all of the interviewees. This was just one of the positive outcomes

derived from their ABC implementation.

4.9.2 Outcomes

Meanwhile, the importance of cost control and management was recognized by

those implementers through the training programmes on ABC provided by headquarters

and the branch, and through the subsequent practices in ABC implementation.

The financial auditor made the following comments on how they benefitted from

ABC implementation:

'At the first stage of implementing ABC, by attending those training programmes, we got to know that ABC is a very functional and constructive tool in terms of controlling and managing cost effectively. At the following stage, the ideas and theory on ABC have been deeply rooted in our minds and carried out through our actions, eventually we made it possible to efficiently produce more accurate and prompt costing reports than before.'

Notably, Mr. Du indicated that the value of the ABC implementation in Qingyang-R and P has been extended from delivering an accounting function to better decision making which resulted from better communication on product cost information sharing between the Accounting and Production departments. This was extraordinary compared to the previous cases.

However, difficulties and obstacles were encountered during the ABC implementation, despite the positive outcomes experienced.

4.9.3 Major Difficulties and Obstacles

Major difficulties and obstacles were: lack of a deeper understanding of ABC as a result of the absence of follow-up training programmes; lack of good cooperation between different departments which caused trouble in the data collection process; lack of processes for supplying all information required by ABC; and lack of strong and ongoing support from top leaders from headquarters.

Because of the absence of follow-up training programmes, it was difficult for those implementers to have the ABC system updated. This was indicated by Mr. Du:

'Due to a limited understanding of the ABC system as a result of lack of further training, and owing to instability in the way the ABC data was gathered, the ABC system has become very difficult and inconvenient to keep updated recently.'

Meanwhile, difficulty, delay and inaccuracy occurred during the ABC data collection process, which was caused by under developed cooperation between different departments. This was implied by two unidentified interviewees, the system manager and financial accountant. Also, lack of processes for supplying basic information required by ABC, due to a nature of refinery processes was indicated by Mr. Du:

'Due to continuity in oil refinery processes, the level of accuracy in cost reallocation depends on the rationality of a technical coefficient of a single device. Therefore, if the technical coefficient chosen was not rational, then inaccurate information on cost would have been transferred to generate incorrect ABC data which might be misleading.'

Lastly, strong and ongoing support from top leaders from headquarters was a major concern of Mr. Du:

'Due to a constraint on system management, the future of the ABC system is uncertain and the system seems to be discouraged by top leaders from headquarters. It will be too difficult to run ABC smoothly without ongoing technical support and guidance from headquarters!'

These difficulties and obstacles were considered as critical to have had an impact on the ABC implementation.

4.9.4 Critical Factors

Factors that remained critical were: strong and ongoing support from headquarters; training; relevant IT skills; cooperation and coordination between different departments; improved accuracy of statistical information; clearly identifiable associated activities and cost drivers.

All interviewees considered strong and ongoing support from headquarters and sufficient training as a major hurdle for a successful ABC implementation. Meanwhile, 80 per cent of the interviewees regarded cooperation and coordination between different departments and obtaining accurate statistical information as significant. In addition, 80 per cent of those interviewed held relevant IT skills and identifiable associated activities and cost drivers as fundamental in progressing ABC forward.

Having been highly motivated by and having benefitted from implementing ABC, with difficulties and obstacles being faced along the way, was ABC implementation successful in Qingyang-R and P?

4.9.5 Successful or Unsuccessful?

Comments made on whether ABC implementation was successful or not were

very diverse. Answers to the question reflecting attitudes of the interviewees were

positive, negative, or even neutral. Mr. Du commented in a very positive way:

'I think that we have successfully implemented ABC as it is innovative. It has pushed the traditional costing methods forward, and further extended from an accounting function into better decision-making in our branch. ABC has made a practical contribution to cost effectiveness and to improve value-added activities.'

Compared to Mr. Du's positive comments, remarks given by the system

manager, financial accountant and financial auditor were rather negative. The system

manager said:

'No, we did not successfully implement ABC in our branch. Lessons are: there is not a related promotion system being linked to outcomes derived from cost control and management under ABC; and lack of support from top leaders from headquarters.'

The financial accountant also commented in a negative way:

'No, I do not think that ABC implementation in our branch was successful. To apply ABC in our branch is just like reallocating costs using another method.'

The financial auditor went on with the same attitude and explained in detail below:

'We started implementing ABC as required by headquarters in 2006. But it did not seem to work as well as we hoped for. Usually, we input data obtained from the financial costing system into ABC, and then produce costing reports on devices and products. Thus, to account for, control and manage cost, which is not based on information provided by ABC.'

Interestingly, the cost accountant took a neutral position commented:

'As far as I am concerned, ABC implementation is partially successful in our branch in terms of being educated on ideas and theory of ABC. However, more research needs to be undertaken to fix problems and to apply ABC efficiently.' Perhaps, to argue whether ABC implementation was successful or unsuccessful was not as important as to learn some valuable lessons which would help guide those implementers to carry their work forward.

4.9.6 Summary of Analysis of Case H

Qingyang-R and P was the last branch to be visited during the data collection process. It was very impressive to witness that the staff, including the branch leader were dedicated and committed to their jobs and careers. They all have spent at least six months working on site where a new plant was about to be commissioned without spending regular time with their family for periods of over a month. With such dedication, they focused on developing strategies to promote profitability and decisionmaking in relation to product prices and costs. The cost effective plan was set into motion in conjunction with the ABC implementation with the aim of improving cost control and management. The implementers, consisting of the system manager, financial auditor, financial and cost accountants as well as a budgeter, researched what was happening in production processes in order to discover the real product component costs, due to the failure of traditional costing methods in accurately recording and controlling costs.

The implementers set out the objectives of implementing ABC in relation to achieving the cost effective plan at the early stage of implementation, and developed them with a focus on promoting better decision-making at the late stage. In fact, the investigation progressed well with a discovery of the real product cost. Moreover, the investigators realised the importance of cost control and management through training programmes and practices. As a result, more accurate and prompt costing reports were able to be produced efficiently. It showed that the value of ABC implementation has been seen as not only delivering an accounting function but also as contributing to better decision-making through better inter-department communication of product cost flowing between the Accounting and Production departments.

However, difficulties and obstacles were encountered, including: lack of strong and ongoing support and sufficient training; lack of good cooperation and coordination between different departments; and lack of supply of accurate and basic information required by ABC.

Referring to these difficulties, all interviewees expressed their deep concern over the lack of strong and ongoing support as well as sufficient follow-up training programmes provided by headquarters, and considered such support as the key to a successful ABC implementation. Although better inter-department communication in relation to delivering product cost information between the Production and Accounting departments was developed through the implementation, issues such as delay and inaccuracy when the ABC data was delivered still occurred caused by lack of good cooperation and coordination between relevant departments. Eighty per cent of the interviewees indicated that the requirement to improve cooperation and coordination between associated departments and to obtain more accurate statistical information remained significant. Meanwhile, 80 per cent of the interviewees held that there was a need to further develop technical and relevant IT skills in order to supply accurate and basic information required by ABC with being able to better identify associated activities and cost drivers, would play an important part in carrying ABC forward.

4.10 Summary of the Chapter

In this chapter, each case is analysed individually based on the data obtained mainly through interviews with the ABC team members and observations made by the researcher through visiting each branch on site. A range of subject matters, including objectives of implementing ABC, outcomes derived from implementation, difficulties and obstacles encountered throughout, and critical factors which might have had an impact on a successful implementation, were discussed in depth with individuals involved along with detailed observations. The results of this analysis are summarised below.

In Case A, following a top-down order from the head office to implement ABC, Jinxi-P has achieved the objective of ensuring accuracy of accumulating cost from product lines to individual products based on a general understanding of ABC theory and real product costs was realized. ABC can better reflect real product costs than the traditional costing system, and costs calculated under ABC revealed what the component WIP costs were made up of, and therefore contributed to relatively real costs of WIP and final product. Based on cost information provided by ABC, a comparative cost analysis and evaluation has become transparent and more meaningful for accountants and managers to understand what is going on inside the business, thus to further improve cost management. The insights provided by ABC on matters relating to cost management and improvement have been seen as a major outcome arising from the implementation of ABC.

However, difficulties and obstacles were encountered during ABC implementation in Jinxi-P. Apart from technical issues, behavioural and managerial issues such as a frequent rotation of the ABC team members, the lack of training with limited understanding of ABC theory and practice, insufficient supply of basic information required by ABC from relevant departments including Production and Planning have weakened positive outcomes delivered by the ABC implementation. Critical factors impacted on successful implementation of ABC have been identified by the interviewees as follows: first of all, the financial and technical support from

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headquarters along with adequate resource supply is urgently in need; secondly, ongoing training is a key to the success.

In Case B, ABC implementation was led by the Accounting Department consisting of mainly cost accountants following the top-down order issued by the head office. Difficulties and obstacles were encountered while implementing ABC due to a conflict emerging between the Planning and Accounting departments as a result of poor cooperation and coordination between the two. Interviewees from the branch stated that no solution could be found to solve the conflict unless sustained and strong support from top leaders at headquarters is available. The support was considered as an essential factor in leading to successful ABC implementation in Jinzhou-P. It is also very important to clearly ascertain the role of leadership when implementing a new system. Perhaps, these are the lessons learnt from Jinzhou-P's experience with their ABC implementation.

With Case C, as a trail ABC implementation branch in PetroChina, Dalian-P was well prepared and equipped through well resourced theoretical and practical training. These training programmes facilitated those implementers to gain an insight into solid and advanced cost management theories. An improved cost analysis and control system was obtained through discovering more than 50 activities and researching the associated cost drivers constantly. Thus, one of the objectives, to accurately account for product costs in making a reasonable comparison of costs between different devices has been achieved. Transparency on cost components was obtained, and as a result, the ABC system has become a very helpful tool in production, decision making and planning. Therefore, ABC was successfully implemented in Dalian-P.

However, difficulties were also encountered. Major issues emerged such as: constantly identifying relevant technical activities and associated cost drivers; maintaining the ABC system; developing cooperation and coordination between the Planning and Accounting departments; and improving the accuracy of statistical information. Among these obstacles, factors are regarded as critical in leading to a success including: a technical identification of relevant activities and associated cost drivers; cooperation and coordination between the Accounting and Planning departments; ongoing support from headquarters and updated training.

In Case D, ABC was implemented with a targeted focus on improving cost management and control in 2005 following the top-down order issued by the head office. Through a number of intense training programmes provided by headquarters and the branch, the ABC team, consisting of the cost accountants, management budgeter, statistician and petrochemical budgeter, has observed how ABC can make a difference in accounting for true costs. They also witnessed an improved cost control and management as well as strengthened performance evaluation system.

However, some obstacles emerged. They were difficulties in sourcing and balancing statistical data provided by the Planning Department due to poor cooperation and coordination between the Accounting and Planning departments, and lack of ongoing support and training from headquarters. It showed that these issues along with the lack of well identified associated activities and cost drivers were the main factors critically affecting ABC implementation in Daqing-P. Among them, ongoing support from headquarters has been seen as essential.

In Case E, an initiative of implementing ABC launched by headquarters has facilitated the process in Daqing-R. Positive outcomes derived from ABC implementation rewarded the branch with the top three ranking in profitability among all refineries of PetroChina. ABC also created an opportunity for individuals like Ms Chen who was promoted as Vice-Head of Accounting Department as a result of her commitment and contribution to leading the ABC team and forming a new department-Budgeting. Workers from this department have successfully extended the ABC system into a number of multifunctional costing control and management models including the RPCA, CRA, BPPF, and OCM. These models greatly improved cost control and management as well as cost analysis and planning, which resulted in greater productivity and profitability. This ensured better decision-making on the business's performance and future.

However, difficulties and obstacles were encountered. Among them, lack of strong and ongoing support was acknowledged by all of the interviewees. They urged for strong and ongoing support from top leaders across all levels, and regarded it as a significant factor to successful ABC implementation. Additionally, a technical issue, the inaccuracy of ABC data was a major concern. Amazingly, a cause-effect relation between product lines that may cause the issue had been diagnosed by the dedicated ABC team members. An effort was made through close cooperation between the Accounting, Budgeting, Production, and Planning departments in order to improve the quality of ABC data delivered. Through cooperation between the related departments, a non-technical issue, lack of good cooperation, coordination and communication between these departments also occurred. Both the technical and non-technical issues along with the factor of training were considered as critical to ABC implementation success in the long-term by all of the interviewees.

In Case F, following the initiative of implementing ABC launched by headquarters, led individually by the Department of Accounting, those accountants with technical assistance from BoomLink commenced ABC implementation in 2005.

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One of the major difficulties and obstacles, poor cooperation and coordination between the Accounting, Production and Planning departments, was encountered in the early stage of ABC implementation, due to a lack of understanding of ABC and its applications among branch executives and relevant departments except Accounting. It took the ABC team about a year to improve the situation by demonstrating the difference between ABC and process costing in terms of the transparency and accuracy of costing data that the two systems delivered. Throughout the process, the team also realized it was crucial to form a well equipped and qualified ABC team containing members from relevant departments including Accounting, Production and Planning, with full and ongoing support from senior executives at all levels. This kind of support was desperately needed.

Through the continuing efforts made by the ABC team in informing branch leaders and staff from the Production and Planning departments about ABC, better cooperation and coordination between the Accounting, Production and Planning departments has been developed. The team also developed a new financial forecasting model which can predict profit based on more accurate costing information delivered by ABC within one per cent of rounding error. Cost control and management has been greatly improved since ABC implementation commenced. Thus, the objective of implementing ABC has been achieved.

In Case G, following the top-down order issued by headquarters in 2004, ABC was implemented by the Department of Accounting in 2005. The implementers gained an understanding of how to apply ABC through a number of training programmes organised by headquarters. The importance of cost management was recognised through more detailed, broadened and accurate cost information generated by ABC. Comparisons on the cost information delivered by ABC and other costing systems could

be made. Thus, cost control and management was improved through cost restoring and carrying accurate variance analysis.

However, some difficulties and obstacles were encountered which adversely impacted on ABC implementation. One of them was a lack of appropriate level of human resources. To ease the issue, full and ongoing support along with sufficient training were urgently called for and regarded as mostly critical on ABC implementation by the interviewees. Another obstacle was poor cooperation and coordination between the Accounting, Planning and Production departments due to a conflict between these departments. As a result, strong resistance by those involved occurred. This was viewed as a significant concern by the interviewees.

Changqing-P's experience with implementing ABC highlighted a fact that the conflict of leadership resulted in strong resistance from those involved, thus damaging cooperation and coordination between relevant departments. To improve the situation, it was worth considering setting up incentives to encourage the ABC implementers in relation to their performance evaluation in the future.

Finally with Case H, the cost effective plan was set out in conjunction with implementing ABC with the aim of improving cost control and management. The ABC implementers consisting of the system manager, financial auditor, financial and cost accountants as well as budgeter began researching the component costs of product production in order to discover the real product cost which traditional costing methods fail to accurately forecast. In fact, the investigation progressed well with a discovery of the real product cost and resulted in the acknowledgement of the importance of cost control and management. As a result, more accurate and prompt costing reports were able to be produced efficiently. The value of ABC implementation has been extended into better decision-making through better inter-departmental communication between the Accounting and Production departments. Thus, the objectives of implementing ABC have been realised in relation to achieving the cost effective plan at the early stage of implementation, and developed them with a focus on promoting better decision-making at the later stages.

However, difficulties and obstacles were encountered throughout. They were: lack of strong and ongoing support and sufficient training; lack of effective cooperation and coordination between different departments; and lack of supply of accurate and basic information required by ABC. Referring to them, all the interviewees expressed their concern over the lack of strong and ongoing support and sufficient follow-up training programmes provided by headquarters, and considered them as the key to successful ABC implementation. Eighty per cent of the interviewees indicated that to improve cooperation and coordination between associated departments and to obtain more accurate statistical information remained significant. Meanwhile, 80 per cent of the interviewees indicated the need to further develop technical and relevant IT skills in order to supply accurate and basic information required by ABC and develop skills to identify associated activities and cost drivers would be fundamental in carrying ABC forward.

Chapter 5 Cross-Case Analysis

5.1 Introduction

In this chapter, data will be analysed across all of the individual cases previously investigated in Chapter 4 in order to identify similarities and differences among the eight cases with the purpose of seeking answers to all the research questions posed in Chapter 3.

To undertake such a task, a cross-case study strategy seems to be suitable. When social and casual links that arise in a real life situation, they are too complex to be understood by applying research methodologies such as survey or experiment. However, they will be clearly explained under a methodology of case study research (Yin, 1994). It was argued that validity, generalisability and reliability of the findings can be facilitated by applying a cross-case analysis (Miles and Huberman, 1994) through replication logic based on the use of multiple sources of evidence including interviews, direct observations and documentation (Yin, 1994). Through the theoretical lens of Yin's (1994) case study research, a cross-case analysis guided by Shields' (1995), a study into ABC implementation covering eight of PetroChina's branches is presented.

Following the analytical process in Chapter 4, an analysis of data is conducted across eight individual branches of PetroChina including Jinxi-P, Jinzhou-P, Dalian-P, Daqing-P, Daqing-R, Harbin-P, Changqing-P and Qingyang-R and P. The cross-case analysis examines and investigates relevant factors and issues into the ABC implementations across these branches, and to provide some insights into a detailed understanding of implications of the ABC implementations in PetroChina. The crosscase analysis will focus on the following aspects in relation to ABC implementation: the current costing systems, objectives and outcomes, major difficulties and obstacles as well as critical factors.

5.2 The Current Costing Systems

As indicated in Chapter 4, the current costing systems across the branches of PetroChina where ABC has been implemented have been mainly dominated by FMIS7.0 since 2007 after being updated from FMIS5.0 (before 2001) and FMIS6.0 (between 2001 and 2007). Apart from FMIS7.0, the Coefficient Method (CM), Process Costing (PC), ABC and ERP are also parts of the costing systems currently in use or upcoming. The table 5.1 below summarises the current costing systems across eight individual cases:

Name of the Branch	The System	Cu ns	rrent	nt Costing		Consistency of the Systems between Branches and Headquarters			etween
Drunch	byster	11,5				Drunenes und I	Icauquart	CI 5	
	FMIS	СМ	РС	ABC	ERP	Number of	YES	NO	DNA
	7.0					Respondents	%	%	%
				/					
Jinxi-P	√	✓	✓	✓		2	50		50
Jinzhou-P	\checkmark	\checkmark	\checkmark	\checkmark		4	50	25	25
Dalian-P	\checkmark	\checkmark		\checkmark		3	100		
Daqing-P	\checkmark	\checkmark	\checkmark	\checkmark		4	25		75
Daqing-R	\checkmark	\checkmark	\checkmark	\checkmark		3	67		33
Harbin-P	\checkmark		\checkmark	\checkmark	\checkmark	1			100
Changqing-P	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	2			100
Qingyang-R	\checkmark	\checkmark	\checkmark	\checkmark		5	80		20
and P									
Overall						24	54	4	42

Table 5-1 The Current Costing Systems across Eight Branches of PetroChina

DNA: Did Not Answer

Greatly dominated by FMIS7.0, accompanied by ABC and other costing methods, the current costing systems across these eight branches appear to be a much centralised scheme under control from the headquarters of PetroChina. As per Table 5.1, the majority of interviewees (54%) agreed that there was a consistency between the head office and branches in relation to the use of costing systems while 42% of the respondents did not answer the question. Four per cent of the respondents thought that there was inconsistency between the head office and branches.

It is worth noting that all respondents at Dalian-P thought that there was a high level of consistency between systems used at the branches and headquarters while only one interviewee from Jinzhou-P disagreed. One interviewee from Harbin-P, who was among interviewees who did not provide an answer regarding consistency of the systems, stressed that the fresh start of an initiative-ERP spreading across branches of PetroChina made it difficult to compare the systems across branches and the head office. Findings show that the core accounting system-FMIS7.0 has not been affected by the implementation of ABC within PetroChina as ABC seems to be introduced as a stand-alone system. This corresponds with findings in Friedman and Lyne (1997) where they discovered that activity-based techniques were introduced as standard-alone systems which can be easily adjusted or dropped without affecting the traditional or core accounting systems.

5.3 Objectives

As per Shields' (1995) work, ABC is an administrative rather than a technical innovation and it is implemented in order to seek behavioural changes in an organisation. Thus, behavioural and organisational factors such as organisational directive, competitive strategies and performance evaluation must be taken into account when considering why an organisation would make a decision on implementing ABC (Agbejule, 2006).

The reason for implementing an innovation like ABC to some degree was due to organisational pressure which was shaped by three types of external pressures, namely coercive, mimetic and normative pressures (DiMaggio and Powell, 1983). Coercive pressures are usually exercised by government and regulatory bodies from a political rather than technical perspective on organisational change while mimetic pressures are enforced by an organisation itself with the aim of sustaining its managerial reforms and thus gain legitimacy, whereas normative pressures are in relation to professionalization (DiMaggio and Powell, 1983; Agbejule, 2006). Coercive and mimetic pressures will result in an organisational directive imposed by headquarters to its subdivisions (Agbejule, 2006).

The results of the analysis shown in the previous chapter and responses from interviewees show that the main reason for implementing ABC at PetroChina was an organisational directive enforced by headquarters as a result of incessant pressure of maintaining and sustaining profitability and competitive position in the domestic and overseas markets.

Responses from interviewees show that the most important reason for implementation of ABC across the eight branches of PetroChina was a top-down order from headquarters as a result of an organisational directive enforced by headquarters. This was indicated by 75 per cent of people interviewed across all branches. The result strongly supports Agbejule's (2006) argument that the fundamental motivation for implementing ABC was the organisational directive caused by coercive and mimetic pressures.

The directive from headquarters was primarily aimed at discovering more accurate product costs, which has been a major technical bottleneck within the Chinese oil industry due to the complexity of its products and services, which should result in improved cost management and profitability. This finding is similar to findings of Nguyen and Brooks (1997) and Chong and Cable (2002) on the basis of studies conducted in Australia which indicated that the most important objectives of implementation of ABC were focusing on more effective cost management and control and more accurate costing information.

The objectives of implementing ABC indicated in previous studies included improving product costing and cost control as well as discovering and eliminating NVA activities. These studies also found that firms with vastly complex product and service processes were likely to adopt ABC owing to increased competition and growing cost (Smith, 1995; Cooper and Kaplan, 1998; Chongruksut and Brooks, 2005).

The most important objectives of ABC implementation, namely more effective cost management, better cost control and more accurate costing information followed by improved accuracy for decision-making were some of the empirical results derived from research by Nguyen and Brooks (1997), Chong and Cable (2002), Roztocki and Weistroffer (2004).

Apart from that, Shields (1995) argued that linkage to performance evaluation and compensation as one of the objectives for implementing ABC is important as it provides an organisation and its employees an opportunity to be motivated and rewarded based on their performance, thus improving the organisation's competitive status and reducing employees' resistance. Similarly, Shields (1995) also called for recognition of linkage to competitive strategies being an objective of ABC implementation, which will lead to a sustainable and competitive future for both the organisation and its employees.

In contrast to those identified objectives, results obtained from this study are summarised in the Table 5.2 below. These results demonstrate and provide more empirical evidence within the context of a Chinese organisation.

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Objectives	Number of	(%)
	Responses	
More accurate costing information	20/24	83
More effective cost management	13/24	54
Better cost control	8/24	33
Improved accuracy for decision-making	7/24	29
Discovering and eliminating NVA activities	5/24	21
Linkage to performance evaluation and	3/24	13
compensation		
Linkage to competitive strategies especially ERP	3/24	13

 Table 5-2 The Objectives of Implementing ABC across Eight Branches of

 PetroChina

Results indicate that 83 per cent of the interviewees regard obtaining more accurate costing information as the most significant objective of implementing ABC, this is followed by 54 per cent of those interviewed considered that achieving more effective cost management as an important objective of adopting ABC. Other objectives such as reaching better cost control and improved accuracy for decision-making are proposed by 33 per cent and 29 per cent of the interviewees respectively. The findings are consistent with the empirical results derived from Nguyen and Brooks (1997), Chong and Cable (2002), Roztocki and Weistroffer (2004). Although not considered very significant (13%), the fact that linkage to performance evaluation and compensation is considered as an objective in introducing ABC indicates that Chinese employers are paying increased attention to the needs of employees. With such a good attitude and support from top management, employees' commitment and involvement in ABC implementation seemed to have increased at PetroChina. As a result, employees' resistance to change has also decreased. This result is in line with the findings of Shields (1995). It shows that realisation of building up a sustainable and competitive future by linking the advanced management accounting strategies and techniques called by Shields (1995) is growing in PetroChina. Although only 13 per cent of those interviewed considered linkage to competitive strategies especially ERP as their objective due to the fact that two branches had started the initiative at the time of interview. However, one of the common objectives of using the ABC system indicated in the prior literature i.e. to discover and eliminate NVA activities (Smith 1995; Cooper and Kaplan 1998) was not found to be significant among the main objectives for PetroChina.

5.4 Outcomes

Shields (1995) argued that the outcome of an ABC implementation depended on how well it could match its preferred objectives given powerful alliance of every employee especially top management which was proved to be crucial for successful ABC implementation.

It is well known that companies with a cost-effective ABC system have benefitted from reducing cost and increasing profitability as well as improving cost management, control and accuracy resulting in improved decision-making leading to a better performance measurement and growing competitive capability for the company (Raffish, 1991; Carr, 1993; Anderson, 1995; Chen et al., 2001; Chong and Cable, 2002; Roztocki and Weistroffer, 2004; Chongruksut and Brooks, 2005; Horngren et al., 2009; Wang et al., 2010). Research conducted previously also indicated that there has been a rise in mutual understanding between managers and accountants resulting in improved cooperation on how to efficiently progress the costing system by implementing ABC (Gietzmann, 1991; Friedman and Lyne, 1997). As a result of positive cooperation between users from different departments, any potential costing targets can be promptly identified and developed towards achieving cost effectiveness (Waters et al., 2001; Chong and Cable, 2002; Roztocki and Weistroffer, 2004; Chongruksut and Brooks, 2005). Outcomes derived during implementation of ABC across eight branches of

PetroChina are summarised in the Table 5.3 below:

Table 5-3 Outcomes for Implementing ABC across Eight Branches of
PetroChina

Outcomes	Number of	(%)
	Responses	
Understanding of more accurate product costs	15/24	63
Improving cost management	15/24	63
Improving an understanding on how to apply	15/24	63
advanced cost management theory and technology		
Ensuring accuracy of accumulating cost from product	12/24	50
lines to individual products		
Developing intercommunication of product cost	10/24	42
information among departments		
Identifying multiple cost drivers in order to allocate	10/24	42
indirect costs accurately into individual products		
Improving resource management of production	7/24	29
department		
Controlling indirect costs	6/24	25
Evaluating performance	4/24	17
Reducing product costs	2/24	8

Findings obtained from this study indicate that outcomes derived from implementing ABC across eight branches of PetroChina are highly and equally attributed to an understanding of more accurate product costs (63%) and improving cost management (63%) as well as improving an understanding on how to apply advanced cost management theory and technology (63%).

It appears that outcomes derived through an understanding of more accurate product costs and an improved understanding of how to apply western advanced cost management theory and technology prevail over the current ABC literature since advanced management accounting research, including ABC, is still in an early stage of development in China (Hu, 2001; Lin, 2001; Pan and Zhou, 2002). However, outcomes derived by improving cost management and ensuring cost accuracy are well-matched against studies by Raffish (1991), Carr (1993), Anderson (1995), Chen et al. (2001), Chong and Cable (2002), Roztocki and Weistroffer (2004), Chongruksut and Brooks (2005), Horngren et al. (2009), Wang et al. (2010).

Among those outcomes, identifying multiple cost drivers in order to allocate indirect costs accurately into individual products is an example of one of the technical advantages being achieved through implementation of ABC in China which has been witnessed by Chen and Wang (2007) and Wang et al. (2010). Developing interdepartment communication of product cost information among departments was identified as a significant outcome by 42 per cent of the respondents. This finding agrees with findings indicated by Gietzmann (1991) and Friedman and Lyne (1997) where a major advantage of implementing ABC has been gained through a rise of mutual understanding between the operational manager and management accountants.

Surprisingly, results show that outcomes including improving resource management of production department (29%); controlling indirect costs (25%); evaluating performance (17%); reducing product costs (8%) are not considered as significant outcomes by the respondents of the study. These results are in contrast to the results of studies conducted by Raffish (1991), Carr (1993), Anderson (1995), Chen et al. (2001), Chong and Cable (2002), Roztocki and Weistroffer (2004), Chongruksut and Brooks (2005), Horngren et al. (2009), Wang et al. (2010).

5.5 Major Difficulties and Obstacles

As stated in the literature review, ABC appears to be under- utilised in many developing countries including China, mainly due to problems associated with its implementation (Estrin, 1994; Selto and Jasinski, 1996; Williams, 2005), despite its huge success in developed countries as a refined costing system (Carr, 1993; Anderson, 1995; Horngren et al., 2009). Cobb et al. (1993), Cooper (1990) and Shields (1995) attribute the problems encountered through ABC implementation to particular

behavioural and organisational factors such as lack of adequate internal resources (human and computer resources), lack of support from top management and lack of training.

Wessels and Shotter (2000) found that the major impediment for implementing ABC in South Africa was insufficient training of users and managers. Furthermore, Major and Hopper (2005) explained resistance to implementation of ABC as due to lack of training and poor communication between relevant departments in sharing the basic ABC information. They also found that throughout the whole implementation process top management support held the key to enable ABC being accepted by those involved, thus reducing the degree of resistance.

Similarly, Innes and Mitchell (1991) indicated that one of the difficulties and obstacles was a fact that the implementers failed to realize that successful implementation of ABC requires better communication and cooperation between different departments within the organisation where ABC implementation was undertaken. Without such good communication and cooperation between relevant departments, trust among those involved in the implementation will be impaired according to Friedman and Lyne (1997) and Amrik and Walter (1998).

Meanwhile, Chong and Cable (2002) as well as Nguyen and Brooks (1997) revealed a lack of understanding of the ABC methodology as an impediment to achieve a success in implementing ABC. Therefore, they called for full motivation and commitment by employees with the aim of achieving sustainable success in implementing ABC.

On the other hand, Chongruksut and Brooks (2005) found that most problems encountered by the Thai implementers during ABC implementation were attributed to

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technical rather than behavioural issues. Their argument was supported by implied reasons within the context of Thai culture.

In the previous studies conducted in China (Chen et al., 2001; Lin, 2001; Chen and Wang, 2007), the difficulties of identifying activities, associated cost drivers and consumption of related resource pools, problems in collecting data and modifying the ABC system as well as integrating ABC into the existing accounting system were identified as the shortcomings or drawbacks hindering implementation of ABC. The major difficulties and obstacles encountered by those ABC implementers across eight branches of PetroChina are summarised in the Table 5.4 below.

 Table 5-4 Major Difficulties and Obstacles Encountered during

 Implementation of ABC across Eight Branches of PetroChina

Major Difficulties and Obstacles	Number of	(%)
	Responses	
Poor cooperation between different departments	13/24	54
within the branch		
Lack of full support of basic information required	12/24	50
by ABC		
Poor input of human resources	12/24	50
Lack of full understanding of ABC	10/24	42
Strong support needed from top cost management	5/24	21
Other (such as lack of technical support and	2/24	8
training as well as trust)		

Results derived from this study show that one of the major difficulties and obstacles encountered throughout ABC implementation within PetroChina appeared to be poor cooperation and coordination between different departments within the branches (54%). This is a behavioural and organisational factor and corresponds with findings in Innes and Mitchell (1991) and Major and Hopper (2005).

Meanwhile, lack of full support of basic information required by ABC (50%) and poor input of human resources (50%) attribute evenly to form parts of the major difficulties and obstacles that occurred in PetroChina. They are also behavioural and

organisational factors which had been discussed by Cobb et al. (1993), Cooper (1990) and Shields (1995) as well as Major and Hopper (2005) previously.

The difficulty in the lack of a full understanding of ABC was identified by 42 per cent of the respondents as a major obstacle. This is consistent with the findings of Chong and Cable (2002), Innes and Mitchell (1991), Shields (1995) and Nguyen and Brooks (1997). Furthermore, a lack of strong support from top cost management was regarded by 21 per cent of the respondents as a major difficulty. This is in line with the findings of the Cobb et al. (1993), Cooper (1990), and Shields (1995) as well as Major and Hopper (2005).

Only eight per cent of interviewees recognized other difficulties such as lack of technical support (mainly IT support in maintaining and updating as well as integrating the ABC system with other costing systems) and training as well as trust occurring during ABC implementation. These are both technical and behavioural issues. Apart from lack of training and trust which has been addressed in Cobb et al. (1993), Cooper (1990), Shields (1995), Wessels and Shotter (2000), Major and Hopper (2005), Friedman and Lyne (1997), and Amrik and Walter (1998) as one of the behavioural issues, technical issues encountered in PetroChina are similar to those confronted by other Chinese ABC implementers (Chen et al., 2001; Lin, 2001; Pan and Zhou, 2002; Chen and Wang, 2007).

It seems that both technical and behavioural issues encountered by the ABC implementers of PetroChina have been negatively treated and resisted by those implementers due to lack of much needed technical and managerial support from top management.

Despite behavioural issues overwhelming technical issues in relation to ABC implementation in developed countries, which was demonstrated by Cobb et al. (1993),

Cooper (1990), Shields (1995), both these issues are major barriers to the implementers of ABC in PetroChina. This further provides evidence that developing countries including China are experiencing difficulties in implementing ABC successfully from both technical and behavioural perspectives. Findings drawn from this study add and enrich more empirical evidence to research by Chongruksut and Brooks (2005), Chen et al. (2001), Lin (2001), Chen and Wang (2007).

5.6 Critical Factors

Existing literature shows there are a number of factors which are critical to successful implementation of ABC from a behavioural and managerial perspective. These factors are full and strong support from top management, cooperation and coordination between relevant departments, training and adequate resources supplies (Innes and Mitchell, 1991; Shields, 1995; Chen et al., 2001; Chong and Cable, 2002; Chongruksut and Brooks, 2005; Major and Hopper, 2005; Abdallah and Wei, 2008; Jamaliah and Sulaiman, 2008).

Among the above factors, Innes and Mitchell (1991), Shields (1995), Chongruksut and Brooks (2005), Major and Hopper (2005) argued that an essential factor leading to successful ABC implementation was strong support from top management. Top managers hold the power in providing or denying financial and technical resources needed for implementation, and of directing implementation in an either positive or negative way depending on their attitude and degree of commitment to the organisation. Most importantly, by combining these behavioural and managerial factors, it will create a powerful package through which a strong message will be sent to every employee that ABC implementation is so important that it determines the success of the organisation and individuals, therefore further reducing resistance to change.
Major and Hopper (2005) argued that an implied reason for employees' resistance to implementation of ABC was lack of training and poor communication between relevant departments sharing the basic ABC information such as statistical data. Shields (1995) argued that training is important throughout the whole implementation process as it provides a way for a variety of employees to share and transfer the basic statistical data into ABC information, and to fully understand and accept ABC concepts. Such training is also important for employees from relevant departments to better communicate and coordinate with each other when working on the ABC system. Thus, cooperation and coordination between relevant departments would be developed and improved, and as a result of this, resistance reduces.

Shields (1995) also argued that sufficient internal resources such as employees' IT skills and time are desirable so that employees will not treat the ABC implementation as a pressure without requesting further resources.

From a technical perspective, factors such as improved accuracy of statistical information, clearly identified associated activities and cost drivers, external consultants and the degree to which the ABC system is integrated with other costing systems can help increase the success of ABC in combination with those identified behavioural and managerial factors (Shields and Young, 1989; Shields, 1995; Chen et al., 2001; Lin, 2001; Chong and Cable, 2002; Chen and Wang, 2007).

Chong and Cable (2002) found that an efficient (statistical) information flow linking ABC users (cost accountants) and preparers (statisticians) was claimed to be a contributing factor to successful ABC implementation.

While Chen et al. (2001) indicated how to modify and integrate ABC into the existing costing systems was becoming one of the technical bottlenecks resulting in a low adoption rate in the context of Hong Kong's ABC experience. Whereas some

Chinese ABC researchers, Lin (2001), Chen and Wang (2007) pointed out one of the common technical issues that blocked successful ABC implementation was believed to be identifying associated activities and cost drivers. In the case of PetroChina, factors believed to be critical to successful implementation of ABC are reviewed in the Table 5.5 below.

 Table 5-5 Critical Factors for Successful Implementation of ABC across

 Eight Branches of PetroChina

Critical Factors	Number of	(%)
	Responses	
Support from headquarters of PetroChina	21/24	88
Training	20/24	83
Cooperation and coordination between different	19/24	79
departments		
Improved accuracy of statistical information	18/24	75
Well identified associated activities and cost drivers	14/24	58
Adequate resource supply	12/24	50
Relevant IT and other skills	12/24	50
External experts advice	7/24	29
Other (Integrating ABC into the existing costing systems)	1/24	4

Findings indicate that behavioural and managerial factors engaged in implementing ABC in PetroChina were significant in terms of contributing to the success of ABC implementation.

Predominantly, full and strong support from top management was considered by 88 per cent of the respondents as the most fundamental critical factor. Almost every interviewee has expressed this concern during interviews and urged strong support from top management so as to keep the ABC system running sustainably (details have been provided in Chapter 4). Empirical evidence appearing in this case study strongly supports the argument dominated by the ABC literature (Innes and Mitchell 1991; Shields 1995; Chongruksut and Brooks 2005; Major and Hopper 2005).

Another significant factor was training, accounting for 83 per cent, and proved to be critical in leading to successful ABC implementation. Training has been provided and directly organised by headquarters on average three times annually across PetroChina's targeted branches from January 2005 to the end of 2007, including an international seminar held in Beijing in August 2005. Obviously, quality and types of training programmes offered should be taken into account while quantity has met the expectations in a response to a high demand for training. Future research should be encouraged in exploring this area as indicated from empirical evidence provided by Shields (1995) and Major and Hopper (2005).

The next significant factor identified by 79 per cent of the respondents was cooperation and coordination between different departments. The importance of how to build up positive cooperation and coordination between the Planning and Accounting departments in transferring and sharing the basic statistical data into ABC information was highlighted by the majority of interviewees across the branches. The fact that poor cooperation and coordination among relevant departments was an obstacle means that some implementers were struggling to do their job and resisting the ABC implementation effort. This view is consistent with the issues identified by Shields (1995) and Major and Hopper (2005). However, a solution offered by Shields (1995) that requires sufficient training to develop and improve cooperation and coordination, though this might not work in the case of PetroChina. Instead, strong support and directives from headquarters may hold the key in improving the current situation within the context of Chinese culture.

The factors including adequate resource supply and relevant IT and other skills were identified by 50 per cent of the respondents and are in agreement with the findings of Innes and Mitchell (1991), Shields (1995), Chen et al. (2001), Chong and Cable (2002), Chongruksut and Brooks (2005), Major and Hopper (2005), Abdallah and Wei (2008), Jamaliah and Sulaiman (2008).

Another critical factor contributing to successful implementation of ABC mentioned by 75 per cent of the respondents was improved accuracy of statistical information leading to an efficient (statistical) information flow linking ABC users (cost accountants) and preparers (statisticians). This factor has become a technical bottleneck in creating useful ABC information, and turned out to be an expectation for the majority of interviewees across branches of PetroChina given poor cooperation and coordination between relevant departments. This view is consistent with a view held by Chong and Cable (2002) in their examination of critical success factors for ABC implementation.

The other technical factors identified by the respondents were identifying associated activities and cost drivers (58%), and integrating ABC system into the existing costing systems (4%). These were identified as critical factors in the Chinese context of ABC implementation (Lin 2001; Chen and Wang 2007; and Chen et al. 2001) but not seen as very crucial by the respondents of this study.

As found in studies by Shields and Young (1989), Chen et al. (2001), Lin (2001), Chong and Cable (2002), Chen and Wang (2007), advice from external consultants was also identified as one of the critical success factors for ABC implementation by 29 per cent of the respondents.

The empirical results of this study find that behavioural and managerial as well as technical factors contribute to successful implementation of ABC within the context of PetroChina. As indicated above, the results frequently agree with findings of previous studies that examined the critical success factors in China as well as in other countries.

5.7 Summary of the Chapter

Guided by the theoretical lens of Yin's (1994) case study research and Shields' (1995) exploratory study patterns made up of several behavioural and organisational

factors, this chapter presents the results of an analysis on similarities and differences of various aspects of ABC implementation across eight branches of PetroChina including Jinxi-P, Jinzhou-P, Dalian-P, Daqing-P, Daqing-R, Harbin-P, Changqing-P and Qingyang-R and P.

Findings indicate that although the current costing systems across these branches of PetroChina were made up of FMIS7.0, CM, PC, ABC and upcoming ERP, the core accounting system-FMIS7.0 has not been affected by implementation of ABC. ABC seemed to have been introduced as a stand-alone system given the rest of the current costing systems across eight branches was a much centralised scheme under control of PetroChina's headquarters.

The most important reason for implementing ABC across the eight branches of PetroChina proved to be a direct top-down order from headquarters. The result strongly supports Agbejule's (2006) argument that the fundamental motivation for implementing ABC was an organisational directive caused by coercive and mimetic pressures. The directive from headquarters was primarily aimed at discovering real product costs to break through a major technical bottleneck within the Chinese oil industry due to the complexity of its production process, which should result in improved cost management and increase profitability.

The most significant objective of implementing ABC was found to obtain more accurate costing information, and this is followed by achieving more effective cost management. It is also found that objectives recommended by Shields (1995) such as linkage to performance evaluation and compensation as well as linkage to competitive strategies especially ERP within the context of PetroChina were considered as important by only a few respondents. Although not considered as significant by the majority, the acceptance of these objectives may be seen as an improvement to the Chinese employers' attitudes towards Chinese employees' performance in relation to their selfvalue and developing a sense of belonging to the organisation. It is suggested that a detailed investigation into objectives of implementing ABC relative to promoting employees' self-motivation and evaluation within the context of China should be carried out in future research.

However, to discover and eliminate NVA activities, which is found to be one of the main objectives for ABC implementation in other studies has not been identified by the respondents as a significant objective for implementing ABC in PetroChina.

Outcomes derived from implementing ABC across eight branches of PetroChina were evenly attributed to the following: understanding of real product costs; improving cost management; and increasing an understanding on applying advanced cost management theory and technology. It appeared that outcomes gained through an understanding of more accurate product costs and improving awareness of applying advanced cost management theory and technology prevail over the current ABC literature. This is mainly due to the developing stage of advanced management accounting research including ABC in China (Hu, 2001; Lin, 2001; Pan and Zhou, 2002). However, outcomes gained by improving cost management and ensuring cost accuracy are well-matched against studies from Raffish (1991), Carr (1993), Anderson (1995), Chen et al. (2001), Chong and Cable (2002), Wang et al. (2010).

Surprisingly, results show that outcomes including improving resource management of production departments; controlling indirect costs; evaluating performance; and reducing product costs were identified as less significant contrary to the findings of some previous studies.

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Based on the findings, PetroChina has achieved its objectives of implementing ABC in the following: obtaining more accurate costing information; achieving more effective cost management; and gaining cost control. However, in general, there is a little evidence to show that the following objectives have been achieved by implementing ABC: improved accuracy for decision-making, linkage to performance evaluation, compensation and competitive strategies especially ERP.

Despite the fact that PetroChina has benefited from ABC implementation, it has also faced a number of difficulties and obstacles with its implementation. One of the major difficulties and obstacles encountered throughout ABC implementation in PetroChina was poor cooperation and coordination between different departments within the branches. This is one of the behavioural and organisational factors identified in previous studies.

Apart from the behavioural and organisational issues such as strong support needed from top cost management and poor input of human resources which were highly advocated by Cobb et al. (1993), Cooper (1990), Shields (1995), and Major and Hopper (2005), technical issues for example a lack of technical support in maintaining, updating and integrating the ABC system into other costing systems encountered in PetroChina are similar to those faced by other Chinese ABC implementers (Chen et al., 2001; Lin, 2001; Pan and Zhou, 2002; Chen and Wang, 2007).

The study also finds that both technical and behavioural issues are encountered by the ABC implementers of PetroChina. Although the behavioural issues seem to have overwhelmed technical issues in relation to ABC implementation originating in developed countries, both types of issues are found to be equally significant with ABC implementation in PetroChina. From a behavioural and managerial perspective, full and strong support from top management were identified by the majority of respondents, making this factor the most important issue, closely followed by training and cooperation and coordination between different departments. Poor cooperation and coordination between relevant departments seemed to have frustrated some implementers in carrying out their tasks. However, a solution offered by Shields (1995) that sufficient training is required to develop and improve cooperation and coordination though it might not work in the case of PetroChina. Instead, strong support and directives from headquarters may hold the key to improving the current situation within the context of Chinese culture.

On the other hand, from a technical perspective, factors like improved accuracy of statistical information leading to an efficient (statistical) information flow linking ABC users (cost accountants) and preparers (statisticians) was considered as a critical factor for successful ABC implementation. This factor has become a technical bottleneck in creating efficient ABC information given poor cooperation and coordination between relevant departments.

The empirical results derived from this study find that behavioural and managerial as well as technical factors contribute to successful implementation of ABC within the context of PetroChina.

Chapter 6

Conclusions

6.1 Introduction

ABC appears to be under-utilised in many developing countries despite its huge success in developed world as a refined costing system that provides effective information for cost management. Previous research conducted on ABC has examined numerous issues and problems with implementation. However, the vast majority of these studies have been conducted in developed countries. Since the economic, business and political environment in these countries is vastly different to developing countries, the findings of previous research on ABC practices in developed countries provide little insight for successful implementation in developing world. Despite the fact that an increasing number of companies in developing countries have been introducing ABC into their businesses, relatively little is known about the current status of ABC in these countries due to the dearth of studies in this area. Previous studies provide little evidence on issues such as the reasons for adopting ABC in developing countries, the factors affecting successful implementation of ABC in those countries, associated problems and measures taken by companies to address those problems etc. Therefore, the main objective of this study is to conduct an in-depth analysis of a company in a developing country, the People's Republic of China, examining the above mentioned issues. This study investigates these issues through a case study of a Chinese multinational company, PetroChina, which has implemented ABC successfully in one of its four core business segments since 2004.

The study is structured into six chapters. Chapter 1 provided an introduction to the background and objectives of the study and briefly highlighted the research design in addition to indicating the expected contributions and the limitations of the study. Chapter 2 reviewed the wide-ranging literature on ABC across developed and developing countries with a special emphasis on China. This was followed by a detailed description of the research design and data in Chapter 3. As described in the research design, Chapter 4 presented an analysis of eight individual cases. Based on the analysis of eight individual cases, a cross-case analysis was carried out in Chapter 5. Finally Chapter 6 summarises main findings of the study together with the conclusions and limitations.

6.2 Findings

This study aimed to carry out an in-depth analysis of the ABC implementation process in PetroChina with a special reference to the problems encountered when implementing ABC in its operations. This is achieved by conducting an analysis over eight individual cases and cross-cases based on data collected through interviews with the employees of PetroChina, supplemented by direct observations made by the researcher at the research sites, along with company annual reports, relevant internal publications, the company website as well as regular phone calls and emails with relevant personnel. The following are the major findings based on the analysis:

- 1. The core accounting system-FMIS7.0 has not been affected by implementation of ABC as ABC seemed to have been introduced as a stand-alone system. The current costing systems used across eight branches visited, were a centralised application maintained under control of the headquarters of PetroChina.
- 2. An organisational directive enforced by headquarters was found to be the most noted reason for implementation of ABC across the eight branches of PetroChina that were investigated.

- The two main objectives of implementing ABC at PetroChina were: finding more accurate product costs (83%) and achieving more effective cost management (54%).
- 4. Some of the objectives of implementing ABC identified by Shields (1995) were also found to be among the objectives of implementing ABC at PetroChina. These objectives were: linkage to performance evaluation and compensation and linkage to competitive strategies especially ERP. Although, these objectives were not among the main objectives of implementing ABC, they showed the increased importance placed by the Chinese employers towards inculcating the sense of belonging in the minds of workers. This is seen as a positive sign. If strong support from top management is available, it is expected that employees' commitment and involvement in ABC implementation will increase substantially. As Shields (1995) suggested, such a move will result in a decrease in employees' resistance to change.
- 5. Although discovering and eliminating NVA activities was identified in the ABC literature (Smith, 1995; Cooper and Kaplan, 1998) as one of the common objectives of using the ABC system, this study provides little evidence to that effect.
- 6. Main outcomes derived from implementing ABC across the eight branches of PetroChina investigated, were: increased understanding of product costs; improved cost management; and improved understanding of applying advanced cost management theory and technology in business operations.

- The main outcomes of implementing ABC found in this study are consistent with the findings of previous studies on ABC implementation in China (Hu, 2001; Lin, 2001; Pan and Zhou, 2002).
- 8. Although previous studies have identified outcomes such as improving resource management of the Production Department, controlling indirect costs, evaluating performance, and reducing product costs as main outcomes of ABC implementation in Raffish (1991), Carr (1993), Anderson (1995), Chen et al. (2001), Chong and Cable (2002), Roztocki and Weistroffer (2004), Chongruksut and Brooks (2005), Horngren et al. (2009), Wang et al. (2010), the respondents of this study did not rate them among the most important outcomes.
- 9. One of the major difficulties and obstacles encountered throughout ABC implementation within PetroChina was poor cooperation and coordination between different departments within the branches. This is one of the behavioural and organisational factors that Innes and Mitchell (1991) and Major and Hopper (2005) identified in their studies as a major factor affecting successful implementation of ABC.
- 10. The study also finds that behavioural and organisational issues such as not having strong support from the top management and poor input of human resources were among other difficulties identified by the respondents of this study. This view is consistent with the findings of the studies by Cobb et al. (1993), Cooper (1990), Shields (1995), Major and Hopper (2005).
- 11. Another major problem encountered by PetroChina was a lack of technical support in maintaining, updating and integrating the ABC system into other costing systems. This finding is consistent with the findings of some previous

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studies conducted with ABC implementation in China (Chen and Wang, 2007; Chen et al., 2001; Lin, 2001; Pan and Zhou, 2002).

- 12. Contrary to the findings that behavioural issues overwhelm technical issues in relation to ABC implementation in developed countries in Cobb et al. (1993), Cooper (1990), Shields (1995), this study finds that both issues were major barriers to the implementers of ABC in PetroChina. This further provides evidence that developing countries including China are experiencing difficulties in implementing ABC successfully from both technical and behavioural perspectives.
- 13. Among the behavioural and managerial aspects that are vital to ABC implementation, full and strong support from top management (88%), training (83%) and cooperation and coordination between different departments (79%) are found to be the most important aspects.
- 14. Poor cooperation and coordination among relevant departments is found to be a critical bottleneck as some of the employees involved were struggling to cope with the assigned tasks due to this issue. Although as suggested by Shields (1995) sufficient training to improve cooperation and coordination among interested parties may remedy the situation, given the business culture at PetroChina, it is unlikely that it will deliver the desired results. Instead, strong support and directives from headquarters may hold the key to improving the current situation within the context of Chinese culture.
- 15. As 75 per cent of the respondents agreed, improved accuracy of statistical information leading to an efficient (statistical) information flow linking ABC users (cost accountants) and preparers (statisticians) was a crucial success factor for

ABC implementation. This technical issue has become another bottleneck in creating efficient ABC information and regarded as a factor that contributes to poor cooperation and coordination between relevant departments. This result is consistent with the findings in Chong and Cable (2002).

- 16. Other technical factors experienced by branches of PetroChina such as difficulties in identifying associated activities and cost drivers and in integrating the ABC system into the existing costing systems seem to be common within the context of the Chinese experiences with ABC implementation as noted by Lin (2001), Chen and Wang (2007), and Chen et al. (2001).
- 17. The findings of this study not only verify but also extend the empirical evidence provided by Shields (1995) that behavioural, managerial and technical factors are associated with successful ABC implementation.

6.3 Conclusions

This study aimed to investigate major problems and issues encountered throughout ABC implementation in PetroChina and sought answers to the following research questions based on eight individual cases and cross-cases analysis:

1. What are the objectives of implementing the ABC system in PetroChina?

The study found that ABC was implemented in the eight visited branches of PetroChina on directives received from headquarters of PetroChina which was under incessant pressure to maintain and sustain its profitability in a highly competitive domestic and overseas market. The company decided to introduce the ABC system with a view to achieving a number of major objectives.

As 83 per cent of interviewees agreed, the most significant objective was to obtain more accurate costing information. This was followed by improvement in cost management within the company (54%). Other main objectives were reaching better cost control (33%) and improved accuracy for decision-making (29%).

Although not considered as very significant (13%), the fact that linkage to performance evaluation and compensation was considered as an objective in introducing ABC. This indicated that Chinese employers are paying increased attention to the needs of employees. With such a good attitude and support from top management, employees' commitment and involvement in ABC implementation seemed to have increased at PetroChina. As a result, employees' resistance to change has also decreased.

However, one of the common objectives of using the ABC system indicated in the prior literature i.e. to discover and eliminate NVA activities (Smith 1995; Cooper and Kaplan 1998), was not found to be significant among the main objectives of implementing ABC at PetroChina.

2. To what extent has PetroChina been able to achieve those objectives?

Based on the findings derived from the analysis of individual cases and crosscases, it can be concluded that the most significant objective of implementing ABC regarded by the majority interviewees was to obtain more accurate costing information and has been achieved by the following branches of PetroChina: Jinxi-P, Dalian-P, Daqing-R, Harbin-P, Qingyang-R and P.

With regards to the following objectives: achieving more effective cost management, reaching better cost control and improved accuracy for decision-making, it was established that Dalian-P, Daqing-R, Harbin-P, and Qingyang-R and P have achieved them.

As to the other objectives such as linkage to performance evaluation and compensation, and linkage to competitive strategies especially ERP within the context of PetroChina, there is no strong evidence to suggest that many branches achieve these objectives. The details of the extent that eight branches achieve these objectives are described below:

Jinxi-P has achieved accuracy of accumulating cost from product lines to individual products based on cost information provided by ABC. A comparative cost analysis and evaluation has become transparent and more meaningful for accountants and managers to understand what is going on inside the business, thus to further improve cost management.

In the case of Dalian-P, an improved cost analysis and control system has been achieved through discovering more than 50 activities and researching associated cost drivers persistently. Transparency on cost components and accumulation was obtained, and as a result, the ABC system has become a very helpful tool in production decisionmaking and planning.

From ABC implementation, Daqing-R was expected to analyse activities and calculate the activity costs in order to obtain more accurate product costs. It was able to apply ABC through cooperation, coordination and communication among departments involved. As a result, ABC has become an effective tool in their decision-making system. In fact, they have successfully extended the ABC system into a number of multifunctional costing control and management models including the RPCA, CRA, BPPF, and OCM. These models significantly improved cost control and management as well as cost analysis and planning resulting in great productivity and profitability. This ensured better decision-making on the business's performance and future.

At Harbin-P, the branch was able to achieve better cooperation and coordination between the Accounting, Production and Planning departments through the continuing efforts made by the ABC team to make employees informed by all facet of ABC. Amazingly, the team has also developed a new financial forecasting model which can predict profit based on more accurate costing information delivered by ABC within one per cent of rounding error. Cost control and management at Harbin-P have been greatly improved since ABC implementation commenced in 2005.

In Qingyang-R and P, the ABC team was able to generate more accurate and prompt costing reports. Also, the value of ABC implementation has been extended from delivering an accounting function into better decision-making through developed intercommunication on product cost information flowing between the Accounting and Production departments.

In Jinzhou-P, ABC was implemented and led by the Accounting Department consisting of cost accountants primarily aimed to achieve a number of objectives including: accurately accounting cost; improving costing management by eliminating NVA activities; ensuring authenticity of performance evaluating and making better decisions. However, a conflict emerged between the Planning and Accounting departments as a result of poor cooperation and coordination between them. It seemed to be extremely difficult to solve the conflict unless sustainable and strong support from top leaders at headquarters is available.

Daqing-P has been able to witness the difference that ABC made in accounting true costs comparing to the traditional costing system. It has also been acknowledged that ABC could bring improved cost control and management as well as strengthened performance evaluation system. They have been striving to achieve the objectives since the beginning of implementation. It is worth noting that because of the capabilities and skills of the ABC team which consisted of the cost accountants, management, budget personnel, statistician, petrochemical budgeter and IT personnel, ABC is heading in the right direction taking advantages from different perspective into account. The implementers at Changqing-P were able to better understand advanced cost management theory and technology related to ABC through the supplied training programmes. They were capable of identifying a number of multiple cost drivers and therefore allocating indirect costs accurately into individual products. More detailed, broadened and accurate cost information delivered by ABC can be accessed, which made it possible to compare cost information generated under ABC and other costing systems. Thus, cost control and management has been improved through cost restoring and carrying accurate variance analysis. However, a conflict of leadership emerged between the Planning, Production and Accounting departments in terms of who should be leading ABC implementation, which resulted in strong resistance by those involved from relevant departments. This has been heavily detrimental to achieving the objective at Changqing-P.

3. What are the problems encountered by PetroChina in implementing ABC?

Results derived from this study show that one of the major difficulties and obstacles encountered throughout ABC implementation within PetroChina was poor cooperation and coordination between different departments within the branches. Also, other key difficulties and obstacles were found to be: lack of full support in supplying basic information required by ABC; lack of strong support from top cost management; poor input of human resources and lack of training. These are behavioural and organisational issues as indicated in the ABC literature in developed world.

In addition, a couple of issues remained a major concern as identified by the respondents were: lack of full understanding of ABC; lack of technical support mainly IT support in maintaining, updating and coordinating the ABC system with other costing systems. These are common technical issues encountered by companies in the developing world especially China as discussed in the related ABC literature.

This study confirms the view that both technical and behavioural issues are causing difficulties for ABC implementers in China. This finding is in contrast to the effect seen in western countries where behavioural issues overwhelm technical ones.

4. What measures have been taken by PetroChina to solve those problems?

In order to overcome the difficulties and problems encountered in PetroChina, various measures have been taken. While some of the measures taken have resolved the issues to some extent, concerns regarding what is vital to achieve successful ABC implementation other than measures have been raised. Details of measures taken by various branches are as follows:

As a leading branch in implementing ABC, Dalian-P has put an intense amount of effort in examining, trialling and adjusting the system throughout every stage of implementation. The ABC team has worked out that an adjusted coefficient was a reasonable representative as a cost driver to allocate relevant costs and expenses occurring during crude oil processing since 2001. Thus, a bottleneck of discovering and allocating the major cost driver has been a breakthrough during the trail of ABC implementation in Dalian-P. However, at the late stage of implementation, the use of the coefficient as a representative of major cost drivers was found to be inefficient as a way of allocating relevant product costs. As a result, ABC team members are still looking for a viable solution to overcome this difficulty.

Dalian-P is the only branch that identified an analysis of activities and cost drivers as the most important phrase of ABC implementation. Therefore, it considers research on relevant activities and associated cost drivers as a necessary step to achieve the set objectives of ABC implementation. By establishing a strong and efficient link between the Accounting and Planning departments, Dalian-P was able to improve the accuracy of information provided for ABC activities. At Daqing-R, as a possible solution to minimise the adverse effect to ABC implementation, an effort was made to keep employees informed about the objectives and the potential benefits of implementing ABC. Extraordinarily, a cause-effect relation between product lines and the ABC data has been revealed by the dedicated ABC team members in order to fix a technical issue with the accuracy of ABC data that retarded the progress of ABC implementation. The branch has been able to remedy the situation to a greater extent by improving close cooperation between the Accounting, Budgeting, Production, and Planning departments, thus improving the quality of ABC data delivered. It also put an effort to develop mutual trust among those departments involved to enhance cooperation, coordination and communication. The results suggest that the branch has succeeded in achieving its set objectives.

The branch leaders at Harbin-P were initially not convinced that ABC could provide better cost data in comparison to their current costing system. It took almost a year for the ABC team to convince the branch leaders and people from the Production and Planning departments that ABC can provide better cost information. Eventually, by continually demonstrating the difference between ABC and other costing systems, the branch leaders and people from relevant departments other than Accounting started accepting ABC concepts. As a result, better cooperation and coordination between the Accounting, Production and Planning departments has been promoted. A veracity that ABC team should be made up of members from all relevant departments including Accounting, Production and Planning has been raised and recommended to facilitate successful implementation.

Issues such as difficulties in sourcing and balancing statistical data supplied by the Planning Department due to poor cooperation and coordination between the Accounting and Planning departments, along with lack of ongoing support and training from headquarters have critically impacted on ABC implementation in Daqing-P. It is found that these issues together with well identified relevant activities and cost drivers were main barriers to ABC implementation in Daqing-P. As indicated by three-quarters of the interviewees that successful ABC implementation was impossible to achieve without ongoing support available from headquarters.

Similarly, among the difficulties encountered in Qingyang-R and P, all of the interviewees expressed their concern over the issue of lack of strong and ongoing support, and sufficient follow-up training programmes provided by headquarters. Even though the obstacles were severe, efforts have been made in promoting intercommunication efficiently while delivering product cost information effectively between the Production and Accounting departments.

It seemed that no solution could be found in terms of solving the conflict between the Planning and Accounting departments due to lack of intercommunication during ABC implementation in Jinzhou-P, unless sustainable and strong support from top leaders at headquarters becomes available. Awareness of how to clearly establish the role of leadership when implementing a new system has been raised by all the interviewees at the branch.

At Changqing-P, one of the difficulties was poor input of human resources given the fact there were only ten accountants running and monitoring a range of financial and costing systems including ABC, as well as carrying on other accounting functions. The heavy workload imposed on accountants made it impracticable to search for solutions to the obstacles encountered. Therefore, ongoing support to alleviate the problem, along with sufficient training was desperately called for by the interviewees within the branch.

Same concerns in regards to solving the problems encountered by Jinxi-P were addressed by all the interviewees at the branch.

5. How has PetroChina addressed issues in relation to resistance to change and conflicts arising with ABC implementation?

As discussed in previous chapters, the study found occurrence of some conflicts with ABC implementation at Jinzhou-P and Changqing-P. As a result, these branches experienced strong resistance to some aspects of the proposed changes. Details are provided below:

Since ABC implementation was led by the Department of Accounting in Jinzhou-P, and the ABC team was made up of primarily cost accountants, the basic statistical data delivered by the Department of Planning was not well prepared, thus not ready to be transferred into the information required by ABC. As a result, a conflict emerged between the Planning and Accounting departments owing to poor cooperation and coordination existing between them. Thus, staff from both departments resisted cooperating and argued for a leadership role with ABC implementation. Cost accountants complained that ABC implementation should be led by the Department of Planning within the branch or even headquarters. This raised a concern over a clear and defined role of leadership when implementing a new system. Although efforts have been made to resolve the issue, the conflict still remained unresolved. Suggestions made by the interviewees to address the issues were highly attributed to strong support from top leaders at headquarters.

In the case of Changqing-P, poor cooperation and coordination between the Accounting, Planning and Production departments has become an unresolved obstacle as a result of the conflict between these departments throughout implementation. Staff from the Planning and Production departments strongly resisted getting themselves involved because ABC implementation was led and carried out by the Department of Accounting only. The interviewees argued that ABC should be implemented and led by

the Production or Planning departments rather than Accounting. Again, full and ongoing support from top leaders within the branch and headquarters was claimed to be the only solution to ease the issues.

Changqing-P's experience with ABC highlighted a fact that the conflict in leadership of ABC implementation resulted in strong resistance by those involved, which was a severe impediment for cooperation and coordination between relevant departments. It was worth considering setting up incentives to encourage the ABC implementers in relation to their performance evaluation to ease the situation.

6.4 Limitations

The following are the main limitations of this study.

- 1 As in any case study based research, the outcomes derived from this study may not be generalised to all oil refinery companies. However, as Yin (1984) argued through application of multiple case studies, involving cross-case analysis across separate single cases based on a rich theoretical framework, theoretical propositions developed from the findings can be generalised.
- 2 Data collected through interviews conducted at the research sites was mostly obtained by interviewing managers and accountants of PertroChina. Therefore, limitations inherent in such a form of data collection are present in this study as well. However, this limitation was partly overcome by the use of other supplementary data collected by the researcher from other sources such as direct observations at the research sites, company annual reports, relevant internal publications, the company websites, phone calls and emails with relevant personnel. Every effort is made to promote validation of the data.

3 The case study was carried out in one of the largest state-owned enterprises within Chinese oil industry. The experience of implementing ABC in PetroChina may be different from those small and medium companies outside the oil industry in China.

6.5 Future Research Directions

The following provides some direction for future research.

- 1 The validity of the findings of this study could be tested by conducting a questionnaire survey on a large sample of companies that have implemented ABC in China. Thus, hypotheses can be developed from the findings of this study and attempts can be made to generalise the findings by testing the hypotheses developed using the survey data and statistical methods.
- 2 Future research regarding ABC implementation might extend to small and medium companies from a variety of industries in China.
- 3 A detailed investigation into objectives of implementing ABC in relation to promoting employees' self-motivation and evaluation within the context of China should be encouraged and carried out in the future research.

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Appendix

Appendix 1: A Profile of the Interviewees within PetroChina

Interviewee	Interview Date	Job Title	Branch and Location	Roles involved	Training	Education
				in ABC	records on	background
				implementation	ABC	
Mr. Jiao	26/10/09	Cost Accountant	Jinxi Petrochemical Co.	The ABC team	0	BA
			(Huludao)	member		
Ms. Yang	As above	N/A	As above	The former	1	Accounting
				ABC team		
				member		
Ms. Zhou	28/10/09	Cost Accountant	Jinzhou Petrochemical	The ABC team	1	Financial
			Co. (Jinzhou)	member		Management
Ms. Wang	As above	As above	As above	As above	4	International
						Finance
Mr. Meng	As above	Accountant	As above	As above	3	Accounting
Ms. Shen	As above	Head of Accounting	As above	The ABC team	5+	Master of
		Department		leader		Accounting
Mr. Qu	29/10/09	Head of Cost Unit	Dalian Petrochemical	The ABC team	About 30	BA,
			Co. (Dalian)	member		Financial
						Accounting
Mr. Yang	As above	Assistant Accountant	As above	As above	5+	Accounting
M. 71	A = =1=====	A = = = = = = 4 = = 4		A	5.	A
Ms. Zhan	As above	Accountant	As above	As above	3+	Accounting

Anonymous	5/11/09	Management Budgeter	Daqing Petrochemical Co. (Daqing)	The ABC team member	1	N/A
Mr. Han	As above	Accountant	As above	As above	5+	Chemical Technology
Ms. Wang	As above	Statistician	As above	As above	2	Statistic
Mr. Wei	As above	Petrochemical Budgeter	As above	As above	4	Accounting
Ms. Chen	6/11/09	Vice-Head of Accounting Department	Daqing Refinery Co. (Daqing)	The ABC team leader	4	Chemical Technology
Anonymous	As above	Cost Accountant	As above	The ABC team member	5+	N/A
Anonymous	As above	Accountant	As above	As above	0	Accounting
Mr. Li	12/11/09	Vice-Head of Accounting Department	Harbin Petrochemical Co. (Harbin)	The ABC team leader	2	Accounting

Mr. Yang	3/12/09	Cost Accountant	Changqing Petrochemical Co. (Xianyang)	The ABC team member	2	N/A
Mr. Bai	As above	Financial Accountant	As above	As above	3	Accounting
Anonymous	7/12/09	Financial Accountant	Qingyang Refining and Petrochemicals Co. (Qingyang)	The ABC team member	3	Accounting
Mr. Du	8/12/09	Budgeter	As above	As above	4	Financial Accounting
Anonymous	9/12/09	Financial Auditor	As above	As above	2	Accounting
Anonymous	As above	System Manager	As above	As above	2	Accounting
Anonymous	As above	Cost Accountant	As above	As above	5+	Accounting