Factors Affecting the Deployment of Enterprise Resource Planning in Small and Medium Sized Enterprises: The Case of Hong Kong

PUN Ki Wai David, MBA

Doctor of Business Administration
The University of Newcastle

21 August 2014
STATEMENT OF ORIGINALITY

This dissertation contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my dissertation, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

Signed: ____________________________
Name: PUN Ki Wai David
Student Number: 3034782
Date: 21 August 2014
ACKNOWLEDGEMENTS

This dissertation is the reflection of my efforts made in the fulfilment of my personal academic pursuit at the highest level. I would like to thank my supervisor, Dr L. G. Whitehouse, for his guidance and support throughout the course of study and his detailed comments in the draft dissertation. Special thanks also go to my wife Audrey who has provided unfailing family support and patience during my dissertation work. Finally, I would like to thank the six senior executives who took part in the in-depth interviews to share their valuable experience and views on this subject.
# TABLE OF CONTENT

LIST OF FIGURES viii  
LIST OF TABLE ix  
ABBREVIATIONS AND ACRONYMS x  
SYNOPSIS xi  

CHAPTER 1 1  
INTRODUCTION 1  
1.1 Introduction 1  
1.2 Research Background 3  
1.2.1 Enterprise Resource Planning 3  
1.2.2 Small and Medium Sized Enterprises in Hong Kong 4  
1.2.3 Adoption of Enterprise Resource Planning and Critical Success Factors 5  
1.3 Research Questions and Justifications 6  
1.4 Research Method 7  
1.4.1 Case Study 8  
1.4.2 Interview 8  
1.4.3 Field Procedures 9  
1.4.4 Data Analysis 9  
1.5 Outline of the Dissertation 10  
1.6 Limitations 11  
1.7 Conclusion 12  

CHAPTER 2 13  
LITERATURE REVIEW 13  
2.1 Introduction 13  
2.2 Enterprise Resource Planning 15  
2.2.1 Development of Enterprise Resource Planning 16
2.2.2 Enabler of Business Decisions 19
2.2.3 Advantages of Using Enterprise Resource Planning 20
2.2.4 Disadvantages 20

2.3 Small and Medium Sized Enterprises with Trading Offices in Hong Kong and Manufacturing Facilities in Southern China 21
2.3.1 Common Structure of Small and Medium Sized Enterprises 21
2.3.2 Use of Computers 22
2.3.3 Electronic Marketplaces 23

2.4 Adoption of Enterprise Resource Planning 25
2.4.1 E-commerce Development 25
2.4.2 National Differences 26
2.4.3 Adoption by Small and Medium Sized Enterprises 27

2.5 Implementation of Enterprise Resource Planning System 28
2.5.1 Enterprise Resource Planning Model 28
2.5.2 Organizational, Business and Technological Perspective of Enterprise Resource Planning 30
2.5.3 Business Process Re-Engineering 32
2.5.4 Critical Success Factors 33
2.5.5 Change Management in Small and Medium Sized Enterprises 37

2.6 Discussion and Further Research 37

CHAPTER 3 40

RESEARCH METHOD 40
3.1 Introduction 40
3.2.1 Philosophy and Paradigms 41
3.2.2 Research Approach 42
3.2.2.1 Case Study 42
3.2.2.2 Unit of Study 44
3.2.3 Data gathering Techniques 45
3.2.3.1 Case Study Protocol 46
3.2.3.2 Interview 47
3.2.3.3 Observation 48
3.2.3.4 Triangulation 48
5.2.5 Critical Success Factors
5.3 Implications of Deployment of Enterprise Resource Planning in Small and Medium Sized Companies with Trading Offices in Hong Kong and Manufacturing Facilities in Southern China
5.4 Limitations of the Dissertation
5.5 Contributions of the Dissertation
5.6 Implications for Future Research

REFERENCES

APPENDIX 1 Interview Questions
APPENDIX 2 Information Sheet
APPENDIX 3 Participant Consent Form
LIST OF FIGURES

FIGURE 1 The enterprise resource planning model 18
**LIST OF TABLE**

| TABLE 1 | Key factors affecting the deployment | 115 |
ABBREVIATIONS AND ACRONYMS

APICS: American Production and Inventory Control Society
B2B: Business-to-Business
BOM: Bill of Materials
CEO: Chief Executive Officer
CMA: The Chinese Manufacturers Association of Hong Kong
CRM: Customer Relationship Management
EDI: Electronic Data Interchange
EDP: Electronic Data Processing
ERP: Enterprise Resource Planning
FTP: File Transfer Protocol
ISO: International Organization for Standardization
KPI: Key Performance Indicator
MRP: Material Requirement Planning
MRPII: Manufacturing Resource Planning
MS: Microsoft
OEM: Original Equipment Manufacturer
ODM: Original Design Manufacturer
IT: Information Technology
This research explores factors influencing the development of information communication technology strategies, by small and medium sized enterprises with offices in Hong Kong and manufacturing facilities in Southern China, for managing their internal supply chains. It also investigates factors for the successful deployment of integrated information communication systems, in particular, Enterprise Resource Planning (ERP).

There is little research on the use of enterprise resource planning in small and medium sized enterprises and no research has been discovered on information sharing of small and medium sized enterprises in Hong Kong. Exploring issues influencing the increasing demand for in-time and quality information sharing and success factors during the implementation of enterprise resource planning will help small and medium sized enterprises in Hong Kong to develop and sustain their competitiveness in the new era of a dynamic e-commerce world.

Because the enterprise resource planning market for small and medium sized enterprises in China and Hong Kong is in a development phase, this study will help solution providers and consultants to understand the market for small and medium sized enterprises in China and Hong Kong and assist small and medium sized enterprises in China and Hong Kong to understand the needs for and requirements of enterprise resource planning.
CHAPTER 1
INTRODUCTION

1.1 Introduction

Competitiveness within the international business environment has increased sharply with the opening of the international trade, market globalization, reduction of trade barriers and the elimination of middlemen. Effective application of information communication technologies to businesses is becoming a major strategy for organizational growth (Stockdale and Standing, 2004). According to the study of Sakaguchi, Nicovich and Dibrell (2004), information technology (IT) within an organization is critically affected by the external environment.

The introduction of e-commerce accelerates the review and transformation of an organization’s information communication technology. Organizations must provide timely, accurate and quality information in order to meet customers’ requirements (Morrell and Ezingeard, 2001).

Strategic and operational environments affect the internal supply chain of small and medium sized enterprises in Southeast Asia and critically influence the integration of information within an organization (Huin, Luong and Abhary, 2002). The operational environment includes: (a) thin operational structure; (b) Chief executive officer (CEO) participation in operations; (c) unclear department boundaries; (d) production oriented organization; (e) forecasts used only as a rough guide for production planning; (f) short lead times; (g) frequent changes to customer orders; (h) high staff turnover; and (i) customers’ special requirements. Most small and medium sized enterprises are first or second tier manufacturers or distributors. Long term planning is less important for such organizations compared with manufacturers who sell directly to consumers. The decision making horizon is much shorter. This creates a challenge to balance and
maintain an effective internal supply chain and an integrated information system for decision making.

Statistics on trade from Mainland China for the fourth quarter of 2013 show that “37% of Hong Kong’s imports were related to outward processing [and] 72% of Hong Kong’s re-exports of Mainland origin to other places were produced through outward processing in the Mainland” in 2013 (Census and Statistics Department, 2014). The statistics highlight that most small and medium sized enterprises in Hong Kong are involved in different forms of outward processing. They usually operate trading offices in Hong Kong, for communication with customers and suppliers, and manufacture goods in Mainland China.

Small and medium sized enterprises in Hong Kong use information technology for communication with customers and suppliers. The most common method in use is electronic data interchange (EDI). The two major outcomes from information technology are: (a) improvements in productivity; and (b) less pressure from customers and competitors. However, this is countered by high entry costs, education and training, security, and lack of immediate benefit (CMA, 2001). Few small and medium sized enterprises in Hong Kong have integrated information systems for sharing information between their various offices or departments (CMA, 2002).

Based on surveys by the Department of Census and Statistics and The Chinese Manufacturers Association of Hong Kong (CMA), small and medium sized enterprises with offices in Hong Kong and manufacturing facilities in Mainland China are in the early stages of development of information communication technology within their organizations.

This research explores factors influencing the development of information communication technology in small and medium sized enterprises with offices in Hong Kong and manufacturing facilities in Southern China for
managing their internal supply chains. It also investigates the successful factors for the deployment of integrated information communication systems, in particular, Enterprise Resource Planning (ERP).

1.2 Research Background

1.2.1 Enterprise Resource Planning

Over the past decades, information communication technology has developed significantly for managing and sharing information within an organization. From the first introduction of material requirement planning (MRPI) in the early 1970s to manufacturing resource planning (MRPII) in the late 1980s, large manufacturing organizations introduced integrated information systems within their manufacturing areas for controlling and planning inventory levels, manufacturing resources and capacities (Porter et al., 1999). In the middle of the 1990s, these large organizations extended their control and planning systems to include other back office functions, namely: distribution, order management, warehousing, quality control, human resources and finance. The Gartner Group of Stanford, Conn. first named this form of integrated solution as “enterprise resource planning” (Muscatello, Small and Chen, 2003).

Enterprise resource planning provides quick access to information, integration of different functions and resources and improved business performance (Soh, Kien and Tay-Yap, 2000; Nah, Lau and Kuang, 2001; Sheikh, 2002; Shehab et al., 2004). It can provide a unified view of the entire organization through a centralized database of all transactions (Umble, Haft and Umble, 2003). However, the huge storage requirements, complex computer network technologies, extensive training of users, modification of business processes, large investment and lengthy implementation times create hurdles for the adoption of the system, especially for small and medium sized enterprises (Shehab et al., 2004).
1.2.2 Small and Medium Sized Enterprises in Hong Kong

Small and medium sized enterprises normally operate in a niche market or act as the original equipment manufacturers. The average number of operational layers of employees in small and medium sized enterprises in Southeast Asia is 3.133 (Huin, Luong and Abhary, 2002). Managers usually play multiple roles within an organization.

Computers are used to transform organizations to achieve better performance or sustain business (Chung and Chik, 2001). Information communication systems are used for: (a) communicating with customers and suppliers; (b) controlling manufacturing operations; (c) managing human resources; and (d) developing new products and markets. The critical issues are production and material control. Hong Kong businesses are facing the same strategic and operational requirements as the Southeast Asia small and medium sized enterprises highlighted by Huin, Luong and Abhary (2002). Maintaining timely and accurate information between offices in Hong Kong and manufacturing facilities in Southern China is the major problem facing the developers of integrated information communication systems.

There is a significant relationship between the benefits of business-to-business (B2B) e-commerce technology and enterprise resource planning systems (Bendoly and Kaefer, 2004). The introduction and development of e-commerce and supply chain management create pressure on small and medium sized enterprises. They are required to transform their businesses very rapidly to provide timely and accurate information to satisfy customers’ requirements (Stockdale and Standing, 2004).

Small and medium sized enterprises with offices in Hong Kong and manufacturing facilities in Mainland China are faced with the difficulty of long distance communication between Hong Kong managers and Chinese workers. Chinese workers usually come from villages and do not
understand English. All reports and communications must be in Chinese. However, Chinese workers are passive and seldom provide feedback to instructions even if they do not understand the instructions. The use of verbal instructions, even for a minor change to production, leads to misunderstanding and misinterpretation. A system providing central information and standardized instructions is essential to the effective management of a factory.

1.2.3 Adoption of Enterprise Resource Planning and Critical Success Factors

The major purpose of an integrated information system is to improve the productivity of the internal supply chain. Effective communication with suppliers and customers in the supply chain is critical to the success of a business (Morrell and Ezingead, 2001). The adoption of an integrated information system is a significant contribution to the business, both internally and externally.

Morrell and Ezingead (2001) list the drivers and inhibitors of enterprise resource planning for small and medium sized enterprises in western countries as:

Drivers
- transaction cost reduction,
- quicker response time,
- improved accuracy of the information,
- improved efficiency of the supply chain,
- improved production,
- improved supplier relationship and reliability,
- bargaining power of trading partners.

Inhibitors
• lack of industry standard,
• benefits cannot be easily identified,
• large amount of investment.

Others research (Nah, Lau and Kuang, 2001; Umble, Haft and Umble, 2003) into small and medium sized enterprises in western countries indicates that critical success factors for the implementation of enterprise resource planning are: (a) data accuracy; (b) understanding the system; (c) clear project plan; (d) support from top management; (e) teamwork and composition; (f) effective communication between various functions; (g) good and effective project management; (h) appropriate legacy and business systems; (i) presence of a change management program; (j) business process re-engineering with limited customization; and (k) sufficient software training and testing.

1.3 Research Questions and Justifications

Little research has been undertaken on the use of enterprise resource planning in small and medium sized enterprises and, as far as the researcher has been able to ascertain, no research has been undertaken on information sharing in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China. The exploration of issues influences the increasing demand for in-time and quality information sharing, and success factors for the implementation of enterprise resource planning, can assist small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China to develop and sustain their competitiveness in the new era of the dynamic e-commerce world.

This study has been undertaken at a time which coincides with the commencement of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities
in Southern China. The study can assist small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China to understand the need for, and the requirements of, enterprise resource planning and assist solution providers and consultants to understand the small and medium sized enterprise market in Hong Kong and Southern China.

Research questions are posed as follows:

- Why is enterprise resource planning in high demand by small and medium sized enterprises?
- How does the development of e-commerce and supply chain management affect the deployment of the enterprise resource planning in small and medium sized enterprises?
- How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?
- How is enterprise resource planning implemented in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?
- Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to those small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

1.4 Research Method

This research is considered to be explorative research. This is based on the scope of the research, namely: (a) understanding the factors affecting the development of information systems; (b) exploring the difficulties and pressures on the operation of a dynamic supply chain management and
e-commerce environment; and (c) investigating critical success factors for the implementation of enterprise resource planning.

1.4.1 Case Study

The case study approach has been widely adopted for descriptive and explorative research to understand the complex nature of a subject (Flynn et al., 1990; McCutcheon and Meredith, 1993; Verville and Halingten, 2002; Yin, 2003). Case studies are widely used by researchers in enterprise resources planning studies (Morrell and Ezingeard, 2001; Xu et al., 2002; Lander et al., 2004; Sheu, Chae and Yang, 2004). Case studies are useful for asking “how” or “why” questions about contemporary events over which the researcher has little or no control. Deployment of an integrated enterprise wide solution is not a simple task. This research explores contemporary issues relating to the deployment of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

There is no clear or precise guide to the number of cases in a case study (Perry, 1998). The acceptable number of cases ranges between four and fifteen (Eisenhardt, 1989; Perry, 1998). Hedges (1985) suggests “four to six groups probably form a reasonable minimum for a serious project”. With reference to these scholars, the number of cases for this research is set at six, in view of the limited time frame and resources.

1.4.2 Interview

The most common method of data collection in a case study is by interview (Johnston, Leach and Liu, 1999; Donalek, 2005). In explorative research, the questions are usually open-ended, in order for the interviewees to respond freely and express their opinions without restrictions (Newell, 1998). Although open-ended unstructured questions allow interviewees to express their experiences freely, the interviewees might not provide
information in a form appropriate for this research, or might not have any opinion on a topic (Griffee, 2005).

A semi-structured approach, with a series of planned open-ended questions that focus on the research topic, provides better results. In addition, a semi-structured interview with planned questions assists the interviewer to keep track of the interview (Yin, 2003). Planned questions can be treated as reminders to the interviewer of the information to be collected (Johnston Leach and Liu, 1999). A case study protocol, following previous studies of large organization, is developed to guide the study.

1.4.3 Field Procedures

The management of selected organizations is asked to nominate relevant employees to participate in the research. The consent of senior management is communicated to the participants.

Participants are required to attend a 60-90 minute interview. Through a series of open-ended questions, they are asked to express their opinions on the research questions and report the differences (if any) of operational procedures and environments before and after the implementation of enterprise resource planning in the organization. The interview is semi-structured in order to assist the interviewer to keep track of the information required and to ensure that all topics are discussed during the interview.

1.4.4 Data Analysis

A qualitative analysis approach is adopted for this research. All the information received is labelled and coded with key words. The analysis commences with grouping, categorising, examining and tabulating the data (Miles and Huberman, 1994). This is a very important process to ensure the data collected is relevant to the analysis.
The information collected from individual participants is cross checked and verified in order to highlight similarity, patterns and irregularity in the information. A cross-case comparison test is used to compare the findings from individual organizations.

A case description approach is used to “develop a descriptive framework for organizing the case study” (Rowley, 2002; Yin, 2003; Sakaguchi, Nicovich and Dibrell, 2004). The framework for this research is:

- issues impacting on the development of information management strategies;
- demand for enterprise resource planning by small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China;
- effects of the development of e-commerce and supply chain management; and
- success factors for the implementation of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

1.5 Outline of the Dissertation

The presentation of this research follows the guidelines suggested by Perry (1994) on the presentation of a dissertation. The first chapter introduces the research topic and highlights the issues of implementing enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

Chapter 2 presents the literature background of the development of enterprise resource planning and the issues faced by small and medium sized enterprises. The chapter investigates the existing operations and characteristics of small and medium sized enterprises with trading offices in
Hong Kong and manufacturing facilities in Southern China, in particular those that affect the deployment of enterprise resource planning.

Chapter 3 presents the research methods adopted in this research. The qualitative approach and case study are discussed and justified. This chapter furthers describes the use of semi-structured interview questions as the data collection mechanism and data analysis framework.

Chapter 4 presents the results of the interviews. In-depth discussions on the research questions and responses are presented case by case. The findings are summarised according to the research questions at the end of the chapter.

Chapter 5 provides an overall summary of the research. This chapter further discusses the implication and limitations of the research. Contributions and further research areas are explored at the end of the chapter.

1.6 Limitations

This research is an explorative case study to understand the deployment of enterprise resource planning in small and medium sized enterprises with offices in Hong Kong and manufacturing facilities in Southern China. Due to limited time and resources, only six cases are studied. Only one interviewee (the leader of the implementation team for the enterprise resource planning project) from each organization is interviewed. Although the interviewees are project leaders, they might present personal opinions on the enterprise resource planning solution rather than the opinions of their organizations. Generalization and validity of the research finding might not be as effective compared with other quantitative research methods (Rowley, 2002). However, the findings of this research provide guidelines and directions for the design of future research in this area (Verville and Halingten, 2002).
1.7 Conclusion

This chapter explores and justifies the research background and questions. Research methodology and data analysis mechanism are further discussed. The framework and foundation of the research are established.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

As a result of the opening up of international trade, market globalization, reduction of the trade barriers and elimination of middlemen, the competitiveness of the international business environment has sharply increased. Information communication technologies for enterprise wide planning, decision making and data exchange have been developed and used widely in large corporations, especially multinational corporations. According to Erdem and Utecht (2002), the roles of customers, suppliers and manufacturers have changed due to the development of the Internet and advanced communication tools. The conventional methods of doing business are considered to be outdated and require change in order to meet the demands of a competitive and fast changing business environment.

With the introduction of Supply Chain Management and the development of e-commerce, large corporations have increased their demands for production and delivery information. They require sub-assembly manufacturers, most of which are small and medium sized enterprises, to provide and react in a more efficient manner. These demands are not emanating solely from the manufacturing sector. The demands from the service industries are also increasing. Pressure has been created for small and medium sized enterprises to provide such information.

Enterprise resource planning has developed over the past decades. It was initially considered to be an enabler for decision making. Users in different departments of an organization needed only to input and retrieve information relating to their work. The information was consolidated, processed and recorded in a centralized database. In the past decades,
enterprise resource planning systems have been used mainly by large manufacturing corporations.

Small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China face the pressure of improving their management information in terms of quality and timing to satisfy the increasing demand for information sharing between suppliers and customers within a supply chain. They sought a system that would assist them to maintain up-to-date information and to be able to respond quickly. Enterprise resource planning is one of the solutions. However, the implementation of an enterprise resource planning system is an expensive, difficult and time consuming task. The critical success factors for the implementation of enterprise resource planning in small and medium size enterprises are reviewed.

Many of the small and medium sized enterprises in Hong Kong usually have a trading office in Hong Kong and manufacturing facilities in Southern China. Multi-site operations provide challenges for information sharing for the organization, its customers and suppliers. There is a demand for centralized information systems for the management of daily operations and for providing quick and quality responses to customers.

In response to such a dynamic business environment, small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China must adapt to this new business arena. This paper reviews: (a) the characteristics of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China; (b) the challenges to be faced by small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China adopting enterprise resource planning; and (c) the critical success factors for the implementation of enterprise resource planning in small and
medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

2.2 Enterprise Resource Planning

In the last decade, enterprise resource planning has been widely adopted by the large organizations as well as multinational corporations. An enterprise resource planning system is a business management information system that integrates different business software packages for the monitoring and control of operations and the facilitation of business decisions.

“Enterprise resource planning system is defined by APICS Dictionary as an accounting-oriented information system for identifying and planning the enterprise wide resources needed to take, make, ship, and account for customer orders.” Sheikh (2002)

Brady, Monk and Wagner (2001) describe enterprise resource planning as a system “using a single, common and company-wide database to manage the business process across different functions within the company”. Common management reports are shared between functional managers. Integrating business processes and activities in an enterprise resource planning system improve the efficiency of modern business operations. Effective and efficient sharing of accurate and timely data within and between functional areas of an organization improves the efficiency of business operations.

A common company-wide database is built on “master files about customers, vendors, products, inventory locations and general ledger account” (Hamilton, 2003). Business transactions are recorded in the same central database. Managers of different business functions use the central master information and transaction records to formulate plans for business activities including sales, production, materials, capacity requirements, distribution,
and customer services. Processing staff use the master and transactions data to conduct day to day operations.

2.2.1 Development of Enterprise Resource Planning

In the 1970s, based on the requirements of the manufacturing industry for control and reduction of inventories, a timely response to customer requests and enhancement of efficiency and productivity, MRPI were developed to provide basic material requirements calculations. The first generation of MRPI was mainly used to calculate and schedule the requirement times of materials in manufacturing.

Inventory control at all times is a major concern in manufacturing industries. Excess/insufficient inventory or incorrect scheduling of delivery creates a heavy financial burden on a company. The major objectives of MRPI are the determination of the materials needed for manufacturing and when those materials are required. MRPI determines the requirements for manufacturing (what to order, how much to order, when to order and when to schedule delivery) while maintaining the lowest possible inventory.

MRPI is based on inventory information and bill of materials (BOM). It calculates purchase and production requirements and determines schedules. It uses centralized data storage and computing system for production. However, it allows only limited interaction with other functions within a company (Chung and Snyder, 2000).

In the early 1980s, a broader concept for the integration of data, calculations and policies extended materials and capacity planning into a comprehensive manufacturing resources and control system. This solution was named Manufacturing Resource Planning (MRPII). By storing the business data centrally and providing up-to-date and reliable information, the efficiency of manufacturing could be improved (Chung and Snyder, 2000).
MRPII makes use of backward scheduling logic and bill of materials to
determine requirements. Lead times, process times, routing and capacity
information are included in the calculations. The system calculates the
requirements based on the assumption of infinite capacity.

The system runs in a multi-user working environment. More than one user
is permitted to access the common database at the same time to enter and
share information. Although the aim of MRPII is to integrate manufacturing
data, it concentrates on the primary functions relating to production. The
main output of MRPII is the planning and scheduling of internal
manufacturing resources.

Simultaneously, computer systems for functions other than manufacturing
were being widely adopted by organizations. Hybrid users were required to
go back and forth between the different systems (Chung and Snyder, 2000).
Master and transaction data items had to be entered into the different
systems. The accuracy and timeliness of the data could not be guaranteed.
Users had to spend more time validating data, a process which did not
contribute to overall productivity.

With the evolution of “just-in-time” inventory management techniques and
“lean manufacturing”, manufacturers were required to provide more timely
and accurate information to meet customer orders. Manufacturers focused
on simplifying business processes and minimizing excess wastage and
inventory. Production endeavoured to meet exact customer requirement.
Brady, Monk and Wagner (2001) named this a demand-pull or flow
manufacturing strategy.

Bridges between MRPII and other applications were developed to provide a
truly integrated operational environment for business users. Master and
transaction data was entered into the system only once. Changes to different
functions were automatically updated and reflected in the different modules
(Chung and Snyder, 2000).
In the mid-1990s, enterprise resource planning systems were further enhanced to include back-office functions, namely: (a) distribution; (b) order management; (c) warehousing; (d) quality control; (e) human resource; and (f) financial management. The scope of enterprise resource planning expanded to cover the value chain of the entire company. Enterprise resource planning enhances the flow of the business process from customer orders through material supply and manufacturing to delivery. Different business activities across a company are integrated, including materials, processes, funding and information. This integration provides an efficient operational environment for the fulfilment of customers’ requirements. The enterprise resource planning model is shown diagrammatically in Figure 1.

![Figure 1: The enterprise resource planning model](image)

As business processes link into a single operational environment, the compatibility of tasks and operations becomes one of the major requirements in an enterprise resource planning environment. This is also one of the major inducements for companies to adopt enterprise resource planning systems (Chung and Snyder, 2000). Standardized business processes across different business units or functions can be maintained.
Management can then manage a business in a more effective and efficient manner.

### 2.2.2 Enabler of Business Decisions

Enterprise resource planning is considered an enabler: (a) to quickly access internal information; (b) to integrate different functions and resources; and (c) to achieve improved business performance (Sheikh, 2002). The major attributes and benefits of enterprise resource planning are summarized below (Soh, Kien and Tay-Yap, 2000; Shehab et al., 2004; Nah, Lau and Kuang, 2001):

- integrate and automate across different organizational business functions and resources;
- enable implementation of best business practices of various operations with a view to improve productivity;
- store and share common data across the organization in order to improve data accuracy;
- access and produce timely information for better decision making and improved response to customer requirements.

Business rules for decision making and manufacturing operations are included in most enterprise resource planning packages. An enterprise resource planning system is considered to be more than just computer software. It represents the standard practices of a defined industry. Since the package integrates most of the functions of an entire organization, it embodies the internal value chain of the organization including interaction with customers and suppliers. In order to retain a competitive position in the dynamic business environment, an organization must do more than just keep accurate, timely and quality information. It must include information technology and infrastructure to support decision making, monitoring of operations and response to customers and suppliers (Shehab et al., 2004).
2.2.3 *Advantages of Using Enterprise Resource Planning*

The major benefits of an enterprise resource planning system over non-integrated software packages are: (a) a unified organizational view of the business of the entire organization; and (b) a single and centralized database of all transactions (Umble, Haft and Umble, 2003).

A study by Davenport, Harris and Cantrell (2002) identifies ten benefits of enterprise resource planning systems: (a) improved management decision making; (b) improved financial management; (c) improved customer service and retention; (d) ease of expansion/growth and increased flexibility; (e) faster and more accurate transactions; (f) headcount reduction; (g) cycle time reduction; (h) improved inventory/asset management; (i) fewer physical resources and better logistics; and (j) increased revenue.

Davenport and Brooks (2004) state that the use of an enterprise resource planning system allows the internal supply chain operation to become more cost effective. The main reason is the elimination of conventional business function boundaries. Enterprise resource planning provides a shared environment for the entry, storage and processing of information for the entire organization. Streamlining of operations across different business functions follows. Inefficiencies between different business functions are reduced and the productivity of the internal supply chain is improved. Customer service and relationships are also enhanced.

2.2.4 *Disadvantages*

Although there are many advantages using an enterprise resource planning system, there are disadvantages due to the integrated nature of the system. An integrated system that contains all of an organization’s data and information requires: (a) huge storage capacity; (b) complex network technology, especially for multiple sites; (c) extensive and comprehensive training of the users; and (d) certain modification of the business process in
order to customize the system to fit the organization. These disadvantages necessitate a large investment of capital, human resources and time. The implementation period could require a number of years. The large investment and the long implementation period create hurdles for the adaptation of enterprise resource planning in small and medium sized enterprises (Shehab et al., 2004).

2.3 Small and Medium Sized Enterprises with Trading Offices in Hong Kong and Manufacturing Facilities in Southern China

Small and medium sized enterprises normally start with limited products and services for niche markets, or act as original equipment manufacturers for the parts and/or finished goods for large corporations. They operate with limited human and financial resources.

2.3.1 Common Structure of Small and Medium Sized Enterprises

The operational layer of small and medium sized enterprises is thin and flat. The average level of employees within small and medium sized manufacturing is 3.133 (Huin, Luong and Abhary, 2002). The chief executive officer is involved in all operation and strategic decisions. He/she usually is the major shareholder and/or the founder of the business. Most are directly in charge of the key operations, such as sales and marketing.

The middle level managers form two groups: (a) staff with years of work experience in an organization; and (b) professionals employed by the organization. Huin, Luong and Abhary (2002) state that managers with years of work experience are mainly promoted internally and most professionals are recruited externally.

Inter-departmental boundaries usually do not exist within small and medium sized enterprises. The manager in charge of one department may also be
responsible for other departments. Sometimes there is a conflict of interest regarding the responsibilities of departments under their supervision, such as an accountant also responsible for purchasing or the purchasing manager also responsible for production (Huin, Luong and Abhary, 2002).

Since most chief executive officers are involved in the day to day operations and middle managers are assigned to multiple roles, the decisions of the small and medium sized enterprises are considered to be quick and flexible. However, this kind of response is usually made in an informal manner and without detailed planning. Consistency and communication with colleagues are major issues in such a dynamic environment.

2.3.2 Use of Computers

According to the survey of Chung and Chik (2001), the prioritizing of tasks in small manufacturing firms in Hong Kong are:

- reducing the delivery time when operating as an original equipment manufacturer to gain a competitive advantage; and
- increasing the speed of development of new products in order to gain an increased share of the original design manufacturing market and the original brand-name manufacturing market.

In the same survey, Chung and Chik (2001) found that small manufacturing firms in Hong Kong use computers to transform their organizations in order to solve the issues of organizational structure, human resources, manufacturing operations, supplier and customer relationships, marketing and product development. During the transformation, production and material control are considered to be critical for management. However, management can encounter difficulties in gathering timely, accurate and quality information from their trading offices in Hong Kong and manufacturing facilities in Southern China. Uncertainties in the dynamic business environment also cause difficulties. As small and medium sized enterprises are not usually well structured and are without formal working
procedures and practices, they create strategic partnerships with solution providers in both hardware and software in order to acquire or learn best practice operation in their industry.

Sakaguchi, Nicovich and Dibrell (2004) suggest that “the external task environment does play a critical role in relation to a company’s extent of IT sophistication”. Firms need to contract several suppliers simultaneously in order to reduce uncertainty of supply. The complexity of information technology and the degree of dependency on key suppliers are critical to the integration of the supply chain. The competitive position of the business is strongly affected by the fit between the integration of the supply chain and the complexity of information technology, together with the degree of dependency on key suppliers. IT plays a substantive role in the understanding of the external environment and the management of an integrated supply chain.

2.3.3 Electronic Marketplaces

The cost and availability of personal computers in recent years facilitate the development of the electronic marketplaces. Large operators are moving to transact their businesses on-line and require their suppliers to communicate and transfer information via the Internet or other forms of data interchange. Different forms of electronic marketplaces have been established. According to Sakaguchi, Nicovich and Dibrell (2004), three different types of electronic marketplaces have been identified: (a) the ownership model; (b) transactional mechanisms; and (c) additional facilities.

The ownership model is becoming more commonly used and widespread. It can be divided into four different structures:

- Intermediaries bring together the buyers and sellers of special services and products for trading purposes;
- Consortia provide a special trading hub for traders in a specific industry;
Hierarchical marketplaces are private electronic marketplaces developed by large organizations and governments to allow suppliers to obtain information and undertake business; Cooperative marketplaces are formed by organizations with a common interest.

Transactional marketplaces provide online catalogues, negotiation facilities, auctions and exchange functions for traders to perform business transactions. Some web-sites include additional facilities for online trading in order to increase their attractiveness.

The advantages of participating in electronic marketplaces for small and medium sized enterprises as identified by Sakaguchi, Nicovich and Dibrell (2004) are:

- obtaining and accumulating market information;
- convenience of access, no time constraints;
- access to the global market and widening of choice of lower priced or new products;
- increasing the potential for creating partnerships with suppliers in other regions;
- flexibility and accuracy of communication;
- improvement of customer services;
- catching up with the market through the most up-to-date information;
- low transaction costs;
- customization and/or differentiation of products and services;
- the barriers to joining the supply chains of large companies and government are reduced.

Despite the advantages to small and medium sized enterprises participating in an electronic marketplace, barriers to electronic marketplace participation should also be considered. The major barriers are: (a) lack of support; (b)
lack of industry standards; (c) understanding of the environment; (d) not being considered part of a supply chain; (e) industry environments; (f) benefits cannot be easily identified; (g) difficulties in global trading; and (h) financial constraints (Sakaguchi, Nicovich and Dibrell, 2004).

2.4 Adoption of Enterprise Resource Planning

2.4.1 E-commerce Development

The survey by Bendoly and Kaefer (2004) shows that there is a significant relationship between business-to-business e-commerce technology and enterprise resource planning systems. A significant increase in B2B transactional benefits exists in firms using enterprise resource planning. The main benefit is the reduction in the development cost of B2B e-commerce technology. B2B e-commerce technology provides an exchange of information via the Internet in a fast and efficient manner. An enterprise resource planning system serves as a centralized and integrated support platform providing information on the availability of goods and services. It could be considered as part of a B2B e-commerce system. With the presence of an enterprise resource planning system, the B2B e-commerce system developer is able to concentrate on the development of the communication tools and web-site. The development time is reduced considerably.

Hus (2013) states that there is strong evidence of a complementary effect between ERP and e-commerce. The development of business-to-business portals in China (e.g. Alibaba.com) enhances e-commerce. Trading volumes in this area are increasing rapidly. However, Hus (2013) argues that a complementary effect on business value depends on the integration between enterprise resource planning systems and e-commerce technology. In order to utilise the benefits of the business-to-business platform, small and
medium sized enterprises must change from manual systems to computerised information systems.

2.4.2 National Differences

Enterprise resource planning was first introduced in developed countries and the major designs follow the operational processes and business models of those developed countries. Developed countries have mature information technology levels, favourable computer cultures and excellent information technology infrastructures which facilitate the diffusion of information technologies. The manufacturing industry comprises large corporations with well-defined and strong process management and business process re-engineering experience.

However, developing countries are in the primary phase of the development of information technology and have a low maturity of information technology infrastructure. Their corporations are usually small in size and lack process management and business process re-engineering experience (Huang and Palvia, 2001).

Enterprise resource planning implementation is affected by ten national and organization factors (Huang and Palvia, 2001):

- national (environmental): (a) infrastructure; (b) economy and economic growth; (c) manufacturing strengths; (d) regional environment; and (e) government regulations;
- organizational (internal): (f) information technology maturity; (g) computer culture; (h) business sizes; (i) management commitment; and (j) business process re-engineering experience.

Sheu, Chae and Yang (2004) argue that no universal enterprise resource planning system can be adopted in different countries. National differences of operational processes and business models should be resolved before the
implementation of standard enterprise resource planning systems and integrated international supply chains solutions.

Sheu, Chae and Yang (2004) identify six categories of national differences: (a) culture and language; (b) management style; (c) government/corporate policies; (d) labour skills; (e) time zone; and (f) government regulations. Culture and language affect the adaptation, training and centralization of the system. Management style affects the project duration and implementation methods. Both government and corporate policies and government regulations affect information sharing and adaptation. Labour skills affect training and centralization of the system. Geographic differences and time zones affect adaptation and operation especially for multi-location implementations. Sheu, Chae and Yang (2004) suggest that a cross culture project team be employed to implement multinational enterprise resource planning. The project team should carefully review national differences to formulate the approach to: (a) project duration; (b) adaptation; (c) information sharing; (d) centralization policy and procedures; and (e) training programs.

2.4.3 Adoption by Small and Medium Sized Enterprises

The objective of implementing an integrated enterprise wide system is to manage the internal supply chain in a more efficient and effective manner with the view to improving productivity. Supply chain management and collaboration with suppliers and customers are core business strategies of both large and small organizations. Effectiveness and competitive advantage are the major considerations in supply chain management (Morrell and Ezingeard, 2001). The use of an inter-organizational system is considered a significant contribution to reduce data redundancy and improve data quality.
The drivers and inhibitors to the adoption of enterprise resource planning systems in small and medium sized enterprises, suggested by Morrell and Ezingeard (2001), are:

**Drivers**
- reduced transaction cost;
- quicker response time;
- improved accuracy of the information;
- improved efficiency of the supply chain;
- improved production;
- improved supplier relationship and reliability;
- bargaining power of trading partners.

**Inhibitors**
- lack of industry standards;
- benefit not easily identified;
- large investment.

### 2.5 Implementation of Enterprise Resource Planning System

#### 2.5.1 Enterprise Resource Planning Model

Marnewick and Labuschagne (2005) suggest that an enterprise resource planning model comprises four components: (a) Software; (b) Process Flow; (c) Customer Mindset; and (d) Change Management.

**Software component**

This component is the most visible to users. The major modules include finance, human resources, supply chain management, supplier relationship
management, customer relationship management (CRM) and business intelligence.

**Process flow component**

Process flow controls the flow of information and data between different modules. Understanding of the flow is very important for operating an enterprise resource planning system effectively.

**Customer mindset component**

Marnewick and Labuschagne (2005) state that a good enterprise resource planning system cannot be implemented without the buy-in of users. Implementation of a new system means users must move from their existing comfort legacy system to a new and unknown system. Resistance can be overcome through user, team and organizational influence.

**Change management component**

One of the essential factors of a successful implementation of an enterprise resource planning system is change management. Users being afraid of change represent the most common phenomenon in enterprise resource planning projects. User buy-in and expectations should be carefully managed. The project leader should carefully convert the negative feelings of users to positive responses. All enterprise price planning projects require changes to scope of the processes. Users and implementers must have a comprehensive understanding of the requirements and deliverables of the project. Any deviation should be addressed immediately. As a result of replacing a legacy system, business processes must be changed in order to meet with the tighter requirements of customers and global management of the operations (Marnewick and Labuschagne, 2005). Changing a system is a long and continuous process. Version control of the progress of changes must be present for the monitoring of progress and the evaluation of results.
In addition to the drivers mentioned above, Thong (1999) suggests that information system characteristics play a major role in the adoption of information systems by small and medium sized enterprises, and points out that advantage, compatibility and complexity are the three essential attributes that affect the innovation of information systems. Management, especially chief executive officers with greater knowledge of information systems, are more likely to adopt these attributes. Business size is another significant characteristic to adoption, which is more likely to occur in larger enterprises. Thong (1999) reports that information intensity and environment characteristic of competition have an indirect effect on the adoption of information systems.

2.5.2 Organizational, Business and Technological Perspective of Enterprise Resource Planning

Implementation of an enterprise resource planning project is an ongoing process. An enterprise resource planning system is based on information technology which continually transforms and integrates the business processes. Kraemmergaard and Moller (2000) highlight three basic perspectives on the implementation of an enterprise resource planning project: (a) organizational; (b) business; and (c) technological.

Organizational perspectives

An enterprise resource planning project is often considered to be an improvement to the organization rather than technology, relating more to the enhancement of business processes than technology development (Bingi, Sharma and Godla, 1999). Knowledge of information technology, by itself, is not sufficient for the implementation. The system developer and users require both business process knowledge and technical skills. Knowledge and skills need to be shared between the system developer and the users. One of the objectives of an enterprise resource planning project is to
enhance and streamline the business process. The enterprise resource planning system enables new forms of business activities and processes. It can be viewed as a “change agent” to facilitate organizational change and increase competitive advantage. However, the history and culture of a company must be carefully considered when making changes. Adoption of “best practice” and customizing the company’s existing practice must be carefully balanced.

Business perspective

Implementation of enterprise resource planning requires changes to business processes and leads a company towards a completely new era. From a business point of view, this creates or improves the competitive power of the company. During the implementation, existing business processes are reviewed. They are adjusted or deleted and new business processes may be added. Business process re-engineering is a major contribution in an enterprise resource planning project (Kraemmergaard and Moller, 2000). Managing change is a very important element in a successful implementation.

Management of version control of changes, together with a well-structured change management program, are required to monitor the progress of a project. Enterprise resource planning requires the integration of all business information into one single system and standardizing business processes. The information architecture must cover all functional areas of the company. Kraemmergaard and Moller (2000) argue that future changes to an operational system are very expensive. All changes must be planned carefully at the beginning of the project. Strategies for information technology and system design must be formulated before the implementation of an enterprise resource planning project.

Technology perspective
An enterprise resource planning system is a computer software package purchased and adapted to meet the specific requirements of an organization. Appleton (1997) points out that implementation problems may arise from the selected software. Features of the computer software integrate the process flow and the information flow in the company. Sometimes the selected software includes features that do not create positive contributions to the overall business activities of the company. No single vendor software package possesses all the skills and knowledge that a company may require. A company implementing such a system must determine whether to adopt: (a) all the processes provided by the system; and (b) standardization of business functions (Kraemmergaard and Moller, 2000).

Davenport (1998) states that configuring an enterprise resource planning system requires compromise. If the company cannot adopt the processes provided by the purchased software, the software can be customized. Bingi, Sharma and Godla (1999) further argue that customization is very expensive. The purchased computer software should be retained in its purchased form in order to minimize the implementation, maintenance and future upgrade costs. However, a company must carefully review the “best practice” processes provided by the system. Major problems arise if these processes do not fit the company’s current practices. In addition, customization may cause difficulties in communicating and collaborating with suppliers and customers (Kraemmergaard and Moller, 2000).

2.5.3 Business Process Re-Engineering

Mabert, Soni and Venkataramanan (2001) suggest that the major reason for the adoption of enterprise resource planning is to standardize and simplify information technology systems. Standardization and simplification of information systems require re-engineering of business processes. This usually results in the elimination or redefinition of jobs and tasks in the area of data capture, record processing and reporting (Hall, 2002). As a result of the reduction in inventory levels and processing times, or the introduction of
just-in-time management, certain processes and practices will be downsized and there is likely to be a reduction in the number of management layers. Middle management levels are very sensitive to such changes.

An enterprise resource planning system also requires the centralization and increased control of the information system. Although centralization control of information does not directly relate to the centralization of responsibilities, the perception of middle management is the same. The responsibilities of managers and supervisors will shift to lower levels of employees due to the change in the data processing methods. As the forms of data capture and record processing are changed, lower level employees acquire new skills. The skill set for employees requires redefinition (Hall, 2002).

The research of Muscatello, Small and Chen (2003) shows that there is a strong relationship between successful enterprise resource planning implementations and manufacturing strategies. Business re-engineering should be conducted prior to the selection and implementation of an enterprise resource planning system. A “needs assessment” formulates the basic configuration of an enterprise resource planning system and is critical to the success of the implementation.

2.5.4 Critical Success Factors

Umble, Haft and Umble (2003) identify ten reasons why enterprise resource planning implementations fail: (a) not having clearly defined strategic goals; (b) lack of commitment from top management; (c) poor management of the project implementation; (d) not committed to change; (e) not having a great implementation team; (f) inadequate training and education; (g) data accuracy cannot be guaranteed; (h) no performance measurements; (i) multi-sites issues are not resolved; and (j) technical problems and difficulties cannot be overcome.
Although implementation of enterprise resource planning is considered to be complex and difficult, Umble, Haft and Umble (2003) argue that a disciplined and structured approach facilitates the implementation.

Critical success factors suggested by Umble, Haft and Umble (2003) are: (a) data accuracy; (b) extensive education and training; and (c) performance measures. Due to the integration of information, data accuracy is critical to the provision of correct information. The use of an enterprise resource planning system leads to a shift in skills and knowledge. Understanding the system prevents users from making operational mistakes. Clear project evaluation criteria must be established at the initial stage of the project and tied to the payment of the purchased software.

The major criticisms of enterprise resource planning are: (a) high failure rate of implementation; and (b) long implementation times. It is not an easy task to implement successfully an enterprise resource planning system. Nah, Lau and Kuang (2001) suggest 11 success factors that are critical to the implementation of an enterprise resource planning system: (a) teamwork and composition; (b) support from top management; (c) business vision and plan; (d) effective communication; (e) project management; (f) project champion; (g) appropriate legacy and business system; (h) change management program; (i) business process re-engineering and limited customization; (j) software testing; and (k) monitor and evolution.

*Teamwork and composition*

A strong project team is essential for successful implementation of an enterprise resource planning system. The project team should be cross functional and a mixture of external consultants and internal staff. The team should be dedicated to the implementation of the enterprise resource planning system. The implementation should be the top priority for the team.
Support from top management

The project should be aligned with the development and strategic business decisions of the corporation. Senior management must commit its support and involvement explicitly and publicly.

Business vision and plan

A clear business vision and plan should be developed to guide the project team.

Effective communication

The expectations of the project and involvement of users at every level must be communicated throughout the corporation. This includes project requirements and progress.

Project management

Good project management is critical to the success of the project. Project scope must be clearly defined and measured. Milestones should be set to measure and “celebrate” progress.

Project champion

A project sponsor who has the power to drive the project is essential to success.

Appropriate legacy and business system

A stable business environment is important to the design and initial phase of the project. The success of the project is measured by comparing the results from the new system with those expected from the legacy system.
Change management program

The implementation of an enterprise resource planning system is a management change issue. A carefully designed and managed change program for human, organizational and cultural changes is essential to a successful implementation. Users should be involved in the design and implementation process.

Business process re-engineering and limited customization

Organizations should be open to process change with the implementation of the enterprise resource system. Customization should be minimized.

Software testing

Software should be tested at the beginning of the project. The overall system design and architecture should be examined at the initial stage in order to avoid reconfiguration at later stages.

Monitoring and evaluation

Monitoring and evaluation of progress and performance at every milestone will ensure the project is proceeding in the right direction. Any deviation should be corrected as soon as possible.

Dezdar (2012), Li (2011) and Woo (2007) conclude that project management, support from senior management, effective communication on change management and process re-engineering are essential to the success of the implementation of an Enterprise Resource Planning project in Asian countries, including China.
2.5.5 Change Management in Small and Medium Sized Enterprises

Aladwani (2001) argues that there are two fundamental resistances to the implementation of enterprise resource planning:

- perceived risk: employees’ perception of the risk relating to the adoption of the enterprise resource planning system; and
- habit: the current routine working practices.

In order to overcome resistance to change, Aladwani (2001) suggests studying the needs of users, adopting appropriate strategies to introduce the enterprise resource planning system and to evaluate the progress of change management phase by phase.

Four areas of major vulnerability and weakness that are faced by small and medium sized enterprises in the development of “managers for change” are highlighted by Winch and McDonald (1999) as: (a) communication of the changes; (b) development of new skills required for the changes; (c) gaining support from existing managers; and (d) evaluation of the changes.

External conformance schemes and pressure from external stakeholders provide a useful model for the development of internal processes and procedures to the internally appointed project manager. Recruitment of professional staff has a positive association with the success of change. However, small and medium sized enterprises encounter difficulties in this area. Development of information technology is considered to be an effective tool to overcome the weaknesses of change in small and medium sized enterprises (Winch and McDonald, 1999).

2.6 Discussion and Further Research

In order to retain competitiveness and gain a position in the international trading environment, small and medium sized enterprises should be more
proactive than reactive in the dynamic business environment. Extending conventional trading practices to the new era of the electronic marketplace plays a substantive role in the development and strengthening of an organization’s competitive position.

As a result of the low cost of computer equipment and the Internet, Davenport and Brooks (2004) suggest that demand and supply planning packages will be more closely connected by enterprise systems and will interact in real time. Supplier and customer relationships will be tightened. Data between trading partners will be automatically exchanged through advanced information communication technology and enterprise resource planning systems.

Most large manufacturing organizations are using enterprise resource planning to streamline their operations. They actively participate in the establishment of supply chains and electronic marketplaces. Different forms of collaboration between business partners are established using advanced information communication technology. For any sized organization, the move to join a supply chain and an electronic marketplace is necessary for the survival of its business.

Small and medium sized enterprises are under pressure to provide accurate, timely and quality information in order to retain business relationships with large corporations and respond to customer requests. Cost and inventory control, together with increased efficiency and productivity, become the major concerns of small and medium sized enterprises. Enterprise resource planning systems that integrate information from various internal functions and resources, as well as communicating with external business partners, are considered to be increasingly important to the success of small and medium sized enterprises.

The operation of small and medium sized enterprises is flexible and does not involve formal procedures. The experience of managers is usually
accumulated from their work. The introduction of computer-based information processing systems, together with best practice business models, are a significant contribution to the development and training of managers in small and medium sized enterprises.

In the past, due to the large investment in financial and other resources, and the lack of knowledge and support of information technology, only a limited number of small and medium enterprises have successfully implemented enterprise resource planning systems. However, this situation has been changed by the significant reduction in the cost of information technology equipment, the improvement of information technology infrastructure and an increased number of enterprise resource planning solution providers. Enterprise resource planning solution providers have shifted their focus to small and medium sized enterprises by providing less sophisticated solutions at an acceptable (lower) price.

There is little research into the use and implementation of enterprise resource planning systems for small and medium sized enterprises. This paper has reviewed existing literature defining: (a) the characteristic of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China; (b) the nature of enterprise resource planning systems; (c) the adoption of international enterprise resource planning systems; and (d) the critical success factors for the implementation of enterprise resource planning systems.
3.1 Introduction

Chapter 2 presents a review of the literature on the deployment of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China. Research gaps are identified and research questions are posed as follows:

- Why is enterprise resource planning in high demand by small and medium sized enterprises?
- How does the development of e-commerce and supply chain management affect the deployment of the enterprise resource planning in small and medium sized enterprises?
- How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?
- How is enterprise resource planning implemented in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?
- Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to those small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

This chapter presents research methodology and design, followed by a discussion of data collection and administration methods to provide explorative data to investigate and answer the research questions.
3.2 Methodology

3.2.1 Philosophy and Paradigms

In human and social science research, there are two broad epistemological paradigms: positivist research and interpretivist (or phenomenological) research.

Positivist research is based on precisely and objectively measurable data usually collected by quantitative research methods to provide answers to the research questions (Cavana, Delahaye and Sekaran, 2001). Researchers develop conceptual and theoretical frameworks, usually in the form of hypotheses, prior to the research. These hypotheses are tested by rigorous data collection methods. The data is then analysed statistically. Researchers validate theoretical results by empirical evidence and are able to generalize by way of the theoretical framework. The results of a well performed positivist research project are considered able to be replicated.

Interpretivist research, on the other hand, uses a qualitative approach to understand the reality of a given context. Researchers try to induce a theory by interpreting and analysing the data or information collected. According to Carson et al. (2001), the research results are a reflection of particular past experiences through an understanding of the constructs of the past and formulating abstract concepts, theories and generalizations for the prediction of future experience.

The differences between the two paradigms are summarized by Carson et al. (2001) as follows:

- in positivist research the researcher is independent but in interpretivist research the researcher is involved;
- in positivist research large samples may be used whereas interpretivist research uses small numbers;
• in positivist research, testing theories pervade whereas interpretivist research focuses on generating theories or “theory building”.

As the scope of this study concerns the exploration of issues relating to the adoption and deployment of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China, the posed research questions seek to enhance the understanding of their behaviour and issues with respect to the success of the implementation. The literature review highlights that little research has been undertaken in the past relating to the implementation of enterprise resource planning in small and medium sized enterprises, and no research has been found which relates to small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China. This research is considered to be interpretivist and attempts to understand the views of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China on the implementation of enterprise resource planning and to determine the success factors of such implementations.

3.2.2 Research Approach

3.2.2.1 Case Study

Using a case study as a research tool has traditionally been viewed as “lacking of systematic procedures, objectivity and rigor” (Rowley, 2002). However, Eisenhardt (1989) argues that case studies are suitable for researching new areas or areas with inadequate existing theories. McCutcheon and Meredith (1993) further highlight that case study research is frequently used for new theory development or examination of unfamiliar situations. Oliver and Romm (2002), in their study of the adoption of enterprise resource planning, state that the case study approach is considered to be suitable for the study of special events.
The case study research method is defined by Yin (2003) as:

“an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident.”

The case study research method is widely recommended by researchers for describing and understanding the complex phenomena of specific situations (Flynn et al., 1990; McCutcheon and Meredith, 1993; Verville and Halingten, 2002; Yin, 2003). From the literature review, the implementation of enterprise resource planning is a difficult task for an organization. It involves substantial investment and the integration of a wide range of resources within an organization. The period of implementation often lasts for more than a year. Adopting an exploratory research method for understanding the complexity of ERP implementation, which may be new and unfamiliar to the researchers, is considered an appropriate approach (Muscatello, Small and Chen, 2003).

The case study research method is widely used in the studies of enterprise resource planning. For example, Sheu, Chae and Yang (2004) identify national differences in enterprise resource planning implementation using the case study method. Xu et al. (2002) highlight data quality issues in the implementation of enterprise resource planning by a detailed study of data quality in two organizations. Morrell and Ezingeard (2001) adopt case study methods to explore inter-organization systems in small and medium sized enterprises. Lander et al. (2004) explain trust-building mechanisms among managers, users, project team members and outside consultants through an in-depth case study.

Case studies are useful for asking “how” or “why” questions about contemporary events over which the researcher has little or no control (Yin, 2003). The research questions in this research explore contemporary issues
relating to the development of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China. This research studies the implementation of enterprise resource planning in the small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China over which the researcher has no control. The study adopts a case study methodology and uses a qualitative data collection mechanism appropriate to the research.

3.2.2.2 Unit of Study

Two case study approaches are available: a single-case study and a multiple-case study (Yin, 2003). A single-case study is defined as: (a) a critical case which tests a well-formulated theory; (b) an extreme case or a unique case which determines the precise nature of a theory; (c) a typical case which captures a common situation; and (d) a revelatory or longitudinal case which is used for studying two different points in time.

In contrast, a multiple-case study is considered to be more robust (Herriott and Firestone, 1983). An individual case follows replication logic (Eisenhardt, 1989; Yin, 2003) to produce results. Results from individual cases are predicted, or contrasting results based on predictable reasons are expected (Rowley, 2002; Yin, 2003). The multiple-case approach allows greater generalization of a theory than the single-case approach (Oliver and Romm, 2002).

This research focuses on an understanding of: (a) the dynamic operating environments and complexities of a process; (b) success factors; and (c) the impact of the implementation of enterprise resource planning within the organization. Each case provides a unique picture of the overall scope of the research. Cases are carefully selected to complement each other, in order to predict similar results or produce contracting results based on predictable reasons (Johnston, Leach and Liu, 1999). The adoption of a
multiple-case approach provides an in-depth analysis of the cases and attempts to use replication logic for the generalization of the findings (Oliver and Romm, 2002; Sheu, Chae and Yang, 2004).

According to Perry (1998), there are no precise guidelines for the number of cases to be included in multiple-case research. Eisenhardt (1989) advocates that cases should be included until “theoretical saturation”. The number suggested by Eisenhardt (1989) is between four and ten cases. It is difficult to generate a theory of any complexity and with an empirical basis using only a few cases. On the other hand, it is difficult for researchers to process too many cases due to time and resource constrains. Hedges (1985) suggests “four to six groups probably form a reasonable minimum for a serious project” and set the maximum number to 12. Perry (1998) further suggests that the widest acceptable range is between a minimum of 2-4 and a maximum of 10, 12 or 15. Based on these recommendations, and in view of the time constrains and complexity of this research, the number of cases selected is six.

In general, the organizations selected have the following characteristics:

- they all have trading offices in Hong Kong and manufacturing facilities in Southern China;
- they all are small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China;
- they have all adopted standard enterprise resource planning systems without customization; and
- they have all recently completed the implementation of their enterprise resource planning systems.

3.2.3 Data gathering Techniques

Rowley (2002) argues that “a research design is the logic that links the data to be collected and the conclusions to be drawn to the initial questions of a study; it ensures coherence”. The development of a systematic plan for the
fieldwork identifies the information to be collected and investigated (Johnston and Wright, 2004; Alam, 2005).

3.2.3.1 Case Study Protocol

A case study protocol is used to guide the interviews and the data collection (Yin, 2003; Sheu, Chae and Yang, 2004). The use of a case study protocol allows the researcher to detail the requirement and administrative procedures of the research thus improving the reliability of the research. The case study protocol advocated by Yin (2003) includes:

- an overview of the research project;
- field procedures;
- research questions, or the questions that the researcher needs to pose at the time of data collection;
- an outline of the case report.

The overview of the research project covers the background information relating to the research. Yin (2003) advocates that every project has its own context and perspective. The overview communicates to the informed reader the purpose and setting of the case study.

Well-developed field procedures assist the researcher to: (a) monitor the major tasks in collecting data; (b) enhance the reliability of the research; and (c) make the data collection more robust. The field procedures are based on an interview protocol from the literature, as follows:

- in each organization, identify the person in charge of the implementation of the enterprise resource planning system (normally the project manager) and two users from different departments;
- interview the project manager and the users;
- attend the post implementation project meetings;
- observe the operation of the enterprise resource planning system and review the documents in use before and after the implementation;
- data triangulation – integrate the interview reports, the observation reports and the analysis of documents;
- review the report of the findings with the project manager;
- create a fieldwork database.

3.2.3.2 Interview

As mentioned in the previous paragraph, the researcher has little or no control over the behaviour of events when using a case study approach. The interview is the most common qualitative research method for the collection of data in business-to-business case study research (Donalek, 2005; Johnston, Leach and Liu, 1999). Interview questions are semi-structured and open-ended. The researcher assists the respondents to fully explore their opinions. Within the interview, the respondents may not fully cooperate, may not express their opinion clearly, or may not have an opinion (Griffie, 2005).

The questions in the research protocol are not only interview questions. They are questions that need to be addressed for the research (Johnston, Leach and Liu, 1999). Individual questions serve as a reminder of the information that must be collected for the research and to keep track of the interview and data collection procedures (Yin, 2003).

As the interview and the questions are semi-structured and open-ended, the answers to the research questions may vary depending on the responses from the respondents. This may create problems during the data analysis and report writing phases. The basic outline of the case report included in the research protocol will facilitate the collection of data in an appropriate format, and will reduce the need for return visits (Yin, 2003).
3.2.3.3 Observation

Date collection methods include direct observation and review of secondary data. The researcher is permitted to attend post implementation project team meetings and has free access to relevant documents, such as procedures manuals, implementation and operation guides, training manuals and published financial information. Observation is useful in providing additional information for understanding the impact of the newly implemented technology (Yin, 2003). The reaction to the enterprise resource planning system and its actual usage can be observed. Reviewing documentation provides an opportunity for the researcher to corroborate observed information with that from other sources. This approach is consistent with the scope of case study research to investigate, understand and identify issues occurring during the deployment of enterprise resource planning in small and medium sized enterprises (Flynn, Schroeder and Sakakibare, 1994; Hensley, 1999; Xu et al., 2002).

3.2.3.4 Triangulation

The existence of a detailed research protocol to facilitate interview and data collection procedures indicates that evidence from multiple sources should be collected. The data collected from multiple sources is tested and validated through triangulation. By comparing the evidence from different respondents within the same organization based on the same or similar questions, consistency is determined. The validity of the research is strengthened (Donalek, 2005).

3.2.4 Administration Methods

A case study database of the collected data is created for the organization, effectively documenting the data. The documentation is stored in two different areas, the database and the researcher’s report. The database allows other researchers to review the data in addition to reading the case
reports. Researchers can also directly review the data and the reports of interview. The reliability and credibility of the case study is therefore increased (Yin, 2003; Alam, 2005). Furthermore, the existence of a case study database ensures transferability and the validity of the study (Alam, 2005).

The documents to be included in the database are:
- case study protocol and questions;
- case study notes – including interview notes and transcripts;
- tabular material collected or created by the researcher; and
- analysis of the data.

3.2.5 Brief Outline of Data Analysis Methods

A case study database includes a multitude of different information from various sources. Data analysis is not an easy task. Unlike other statistical analyses, a case study does not have a formula or procedure for the analysis of the data. Data analysis depends on the researcher’s own expert knowledge (Yin, 2003).

Miles and Huberman (1994) suggest that the analysis commences with grouping, categorizing, examining and tabulating the preliminary data. The representation of the data is very important to ensure that the data collected is suitable for the analysis.

The preferred analytical strategy is to follow the theoretical propositions that led to the research. However, this research is an exploratory case study and does not have a proposition for the research to follow. The alternative approach is to develop a case description for analysing the data. A case description requires the researcher to: “develop a descriptive framework for organizing the case study” (Rowley, 2002; Yin, 2003; Sakaguchi, Nicovich and Dibrell, 2004). A framework for the case study is developed and the
The framework for this research is:

- issues impacting on the development of information management strategies;
- demand for enterprise resource planning by small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China;
- effects of the development of e-commerce and supply chain management;
- success factors for the implementation of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

Case analysis techniques applied in the analysis are: (a) pattern matching; and (b) cross-case synthesis. Pattern matching is applied to compare the empirical findings with specific variables defined prior to the collection of data. If the pattern matches, the internal validity of the result is enhanced. Cross-case synthesis aggregates the results across the cases. If the results are replicated from case to case, the analysis is more robust and enhances the generalization of the study (Yin, 2003). As mentioned in the fieldwork procedures, triangulation of evidence and the maintenance of a case study database significantly improve the external validity of the study (Alam, 2005). The internal validity and external validity of this study is achieved through the suggested analysis strategy.

### 3.3 Limitations and Key Assumptions of Research Methodology and Design

This research is a multiple-case study of the deployment of enterprise planning in small and medium sized enterprises with two operational
facilities. It is a new area of study. The case study approach is selected as the most appropriate approach to explore and understand the contemporary issues and complexities of the deployment of enterprise resource planning in small and medium sized enterprises.

However, the case study approach has limitations, as do other research methods. The major limitation of a case study, especially multiple-case research, is the extensive time required to conduct the study (Johnston, Leach and Liu, 1999). In view of the time constraints, the number of cases adopted in this research is six.

A case study is considered to be lacking in systematic procedures, objectivity and rigor (Rowley, 2002), and does not address the issue of generalization as effectively as quantitative research methods. However, a case study is superior for exploring and refining theories, and for advocating the complexity of future studies (Verville and Halingten, 2002).

This study attempts to overcome the generalization issue through adoption of a multiple-case analysis strategy to compare the outcome of the research. Eisenhardt (1989) advocates that “a number [of cases] between four and ten often works well”. In addition, Miles and Huberman (1994) suggest that multiple-case research gives confidence that the empirical findings are generic. This multiple-case study provides the grounds for further generalization of the findings by adopting a larger population.
CHAPTER 4

ANALYSIS OF DATA

4.1 Introduction

The methodology for this research is presented and justified in Chapter 3, based on case study and data collection through in-depth interviews. This chapter presents details of the findings and an analysis of the collected data relating to “factors affecting deployment of enterprise resource planning in small and medium sized enterprises: The Case of Hong Kong”.

Details of the in-depth discussions with participants from the six selected companies are presented individually. Case analysis explores the research questions stated in Section 4.2. The findings from the selected companies are compared, and cross analysis is used to explore common factors concerning the research questions.

Finally, a summary of the findings is presented and conclusions are drawn on the factors affecting the deployment of enterprise resource planning in small and medium sized companies.

4.2 Research Questions

The following research questions are developed for this study:

Q1 Why is enterprise resource planning in high demand by small and medium sized enterprises?

Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern
Chapter 4

4.3 Selection of Companies

Yin (2003) points out that research cases should be carefully selected in order to generate predicted results or produce different results for predetermined reasons. Replication logic is adopted for the generalization of the research results from the selected cases.

One of the aims of this research is to explore the issues of sharing information on business operations of small and medium sized manufacturing enterprises in Hong Kong. Due to the unique history of the development of the Hong Kong manufacturing industry, most companies have moved their production facilities into Southern China. Companies have trading operations in Hong Kong and production facilities in cities around Southern China, a common approach for the manufacturing industry in Hong Kong. Selecting companies from different industries with this business approach helps the researcher to understand the general needs for, and the requirements of, the deployment of enterprise resource planning in small and medium sized companies in Hong Kong.

The six companies selected are presented with pseudo names in order to protect the identities of the companies:
Company 1: Article Ltd. – Card and paper gift bag printing company with a trading office in HK and printing and assembly facilities at Dongguan;

Company 2: Circuit Ltd. – Electronic products producer with a trading office in HK and a production plant at Shenzhen;

Company 3: Device Ltd. – Small electronic appliance original equipment manufacturer (OEM) with design and trading offices in HK and a processing factory at Shenzhen;

Company 4: Animal Ltd. – Pet products manufacturer in Dongguan with a sales office in Taiwan;

Company 5: Timer Ltd. – Watch designer and producer with trading and development offices in HK and a production plant at Dongguan;

Company 6: Food Services Ltd. – Catering and household items design and manufacturing in Hong Kong with a production plant in Shenzhen.

Detailed descriptions of each company are included in the case analysis section (Section 4.5.1) of this chapter.

4.4 Interviewing

In-depth face-to-face interviews are used in this research. As pointed out by Yin (2003), the interview is the most appropriate method for collecting evidence on human affairs. Carefully selected interviewees with special knowledge of the research topic provide important information.

The interview participant is the person responsible for the enterprise resource planning implementation or development in the selected company. He/she is the most suitable person for commenting on enterprise resource planning implementation or development in the company. If the project is headed by more than one person, all are interviewed (Company 4).
4.5 Data Analysis

This research explores the effects of the deployment of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and production facilities in cities around Southern China. The case analysis is of a descriptive nature rather than analytical.

4.5.1 Company 1: Article Ltd.

The company is a private card and paper gift bag printing company. It receives enquiries from customers through its Hong Kong office. Its customers provide either special instructions (complete design, drawing and specific paper requirement) or just an idea. In the case of an idea, the company needs to design and prepare drawings for the customer to review. In either case, the company produces samples for the final approval of customers. Those samples are produced in the Dongguan factory. Drawings and designs are transmitted back and forth between the Hong Kong office and the Dongguan factory through a File Transfer Protocol (FTP) server in Hong Kong. Once a customer has confirmed an order, the company checks the availability of paper stock and prepares production orders in Hong Kong. If the required paper is not in stock, the purchasing staff in Hong Kong contact paper distributors for the availability of stock, and place purchase orders to meet their schedule. After confirmation of the availability of paper, the Hong Kong office prepares production orders, with detailed designs, specifications and shipping date. The production orders are faxed to the Dongguan production office. The Dongguan production office schedules the production based on production requirements and capacity, as well as the shipping date,

Q1 Why is enterprise resource planning in high demand by small and medium sized enterprises?
The main material used by the company in manufacturing is paper. The paper used in most products is very common. Each year the company forecasts the total paper consumption according to its experience and places an order for the paper. Since the order cycle for paper is quite long and the paper is shipped in a regular schedule, the company cannot order paper at the time of receiving a customer’s order. For ad hoc or special requirements for paper, the company must check the availability of the paper with the distributors. If the paper cannot be located, the customer is asked to select another paper. If the customer insists on the original paper, the order is lost.

Paper is produced in batches. Although the specifications are the same, there are slight differences between the batches. The paper usage of individual batches needs to be carefully monitored to ensure that an order does not use more than one batch. At present, this monitoring mechanism is conducted by the stock issuing staff at the time of issuing the paper. Staff members walk around the warehouse to locate a batch that is large enough for the order. The company does not have a system to record the consumption of individual batches of the same specification. As a result, different batches of the same specification are used simultaneously. The existing inventory record shows the overall balance of paper of the same specification. The remaining balance of individual batches is not known to management. Problems arise when monitoring inventory records and placing purchase orders for paper. Every year, the purchasing staff officers must physically inspect the inventory and use their experience to judge what quantity should be ordered.

The estimated accumulated remaining balance of paper is more than HK$ 1 million. A system that reflects the balance of individual batches is recommended, and this would allow the company to utilize the balance of individual batches in a cost effective and productive way. The director of the company, Ms Au, expects that an enterprise resource planning system “would assist them to produce a more accurate result and help them to reduce the investment on the inventory of paper”.

Chapter 4
The other element for determining a paper order is the sales forecast. The ordering lead time from the customer is relatively short and most of the components, such as cardboard used within boxes and bags, pre-printed labels, envelopes, etc., are common. The production department manufactures these components according to the forecast from the sales department. These semi-finished components are kept in the warehouse until they are required. The production department uses Excel files to keep track of the movements and the balances of these semi-finished components. The company requires a system to record and keep track of the running balance of these components for production planning and fulfilment of sales orders.

Other accessories, e.g. small plastic articles, wooden articles, buttons and ribbons, are very common in the market. These may be purchased at any time. Usually, the request for purchase comes from the production department one week before the start of production of an order. Sometimes, delays occur and the purchase of some items is delayed. The company requires a system to remind staff to purchase items in time.

Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?

The company does not have a web-site to communicate with customers. As the company does not have its own brand, having a web-site would be of little benefit. In addition, customers are reluctant to place their own products on the web because of intellectual property rights. Although the customer holds copyright over the products, they consider that it is not appropriate to post their products on the Internet. The reason is that other people could easily copy their designs from the Internet, and the intellectual property rights could not be protected. The company is quite conservative
in this area. It prefers to print product descriptions in a catalogue to be sent to customers by mail. This, at least, controls the distribution.

The company participates in exhibitions every year to show its products. Most new business comes from these exhibitions, where company employees interact with customers face-to-face, after which they communicate through email and fax. Some material, e.g. sample drawings and colour patterns, are exchanged by express mail. Real samples are considered to be superior to pictures or electronic copies. Electronic media is seldom used for reviewing samples.

E-trading is not common in the paper product industry. Most of the products are specially designed. The production cycle is short, usually within two weeks. Most time is spent on the design and correction of samples. The company must keep stock of the most used paper, as the paper ordering cycle is quite long.

As stated by the director, Ms Au, computers are used for calculating paper requirement and for recording purposes. The company does not perceive any benefits from e-trading at present.

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?

The company uses Excel spreadsheets and Word documents to track order information. In some case the file sizes are large, as pictures and drawings are included for easy reference by staff. Files are transferred between the Hong Kong office and the Dongguan factory through an FTP server. Other daily communications are exchanged via email. The director of the company, points out that:
“We did not have any formal plan on the storage of the computer files and version control of the order information. Users were free to upload or download from the FTP server. If the information changed frequently, such as the quantities or shipping date, sometimes the users could not determine which file was the most up-to-date one. They need to confirm by telephone.”

However, users do not check the FTP server regularly, instead they check the server at their convenience. In order to ensure information is downloaded in time, the person who uploads the file to the FTP server usually sends an email to the recipient advising that a new version of information has been uploaded to the FTP server. However, the quality of email service providers in China is not stable. Emails may not be received immediately - there is usually a half-day time delay.

Q4 How is enterprise resource planning implemented in small and medium sized enterprises with trading office in Hong Kong and manufacturing facilities in Southern China?

Software and hardware maintenance services are better in Hong Kong than in China. The electric power supply in Hong Kong is more stable than in the town in which the factory is located. The company elected to install the enterprise resource planning system in its Hong Kong office. Users in Dongguan access the system through Internet connections.

Once an order is received, a detailed specification is sent to Dongguan via email and the FTP server. The workers in Dongguan produce samples for the approval of customers. Based on the sample, the bill of materials is constructed and input into the system. Staff members in Hong Kong then follow up with the customer on any changes. Sales orders are entered into the system after the delivery date is finalized. The purchasing officers in Hong Kong and Dongguan place orders for the paper (if required) and
purchase other material in China according to the required date, as calculated by the enterprise resource planning system.

The company elected not to implement the production control module. The date on production orders, generated by the material requirement module, is for reference only. Commencement of production is highly dependent on two factors: (a) availability of materials; and (b) the shipping date. The company reviews the production schedule every week and determines a production plan for the next two weeks. The production time for each order is less than one week. Production staff members amend the date on the printed copies of the production orders. The production planning module in the enterprise resource system has limitations on making changes and is too inflexible.

The implementation is led by one of the company directors. A small project team from the purchasing, product development and sales departments is formed. The team is wholly responsible for the implementation. Training in the basic concepts of enterprise resource planning and the enterprise resource planning package are conducted for the team. The training concentrates on the modules to be used. The implementation is also assisted by an independent consultant in enterprise resource planning who is not associated with the package provider. He has assisted the company to carry out International Standard reviews developed by the International Organization for Standardization (ISO) for a number of years and is very familiar with the operation of the company. Although he is not an enterprise resource planning system expert, he is able to assist the company to implement the enterprise resource planning package from the point of view of the company. Employing a consultant from an enterprise resource planning package provider is relatively expensive and the consultant may not fully understand the company’s business. The enterprise resource planning package provider is contacted only for technical support.
In view of the present manual system, the management of the company expects that the system provides best practice within the industry. Also, the company believes that customization is very expensive and does not consider this option. Instead, the company elects to adopt the standard system and change its existing manual procedures. However, sometimes this is difficult. A great deal of time is spent matching the standard flow of the enterprise resource planning package with existing operations.

No fixed date is established for the completion of the implementation, nor does the company develop any special measurement or evaluation process for the progress of the implementation. The package is implemented stage by stage using a trial-and-error approach. The company proceeds to the next stage after it has become familiar with the current stage. The first priority of the staff using the new system is to complete customer orders, and no additional staff is employed for the implementation. All implementation team members work on a part-time basis on the project. As a result the implementation takes more than a year to complete.

Q5 Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to those small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

The management of the company is very concerned about the significant investment in the enterprise resource planning system. A director is assigned to lead the project. All staff is made fully aware of the need to improve operational efficiency and productivity. Implementation of enterprise resource planning helps them to control inventory in a more effective manner. The latter is a key driver for implementing the system.

Key users from different departments are grouped together to form an implementation team to discuss and resolve conflicts between different departments during the implementation. However, the company has not
allocated additional resources for the implementation, except for the cost of software and hardware. All of the project team members are required to complete their primary tasks and daily operations before testing and preparing data for the implementation. The progress is therefore very slow.

The company understands that changes are required for the enterprise resource planning system, but does not have a plan on how to execute the changes. No project management or change management program is set up for the implementation. The implementation is progressing at a rate determined by the availability of project team members. It is also limited by the availability of the director in charge of the implementation. If the director is engaged on other tasks, no one else is available to review or monitor progress.

In order to limit the time spent on the system, the company adopts the standard operation procedures of the enterprise resource planning system without any customization. The package is selected based on the presentation of the system by the package provider. Testing of the software has not been conducted. The company expects that the package provides the best practice for them to follow. The company is not in a position to reengineer the business processes in the enterprise resource planning system. It elects to change its processes as needed for the package.

**Conclusion**

The company is fully aware that it needs to change. The company believes that an enterprise resource planning package will assist them to improve inventory management control processes. However, no plan is formulated for the changes. Limited resources are allocated to the project. No enterprise resource planning consultant is engaged. The enterprise resource planning provider is engaged only for product training. The company undertakes the implementation of the enterprise resource planning system
on a trial basis using its own staff. As a result, the project takes more than a year to complete.

The system is partially implemented, with the production module yet to be implemented. Ms Au claims that: “Our production schedule was very flexible and subject to change every day. The procedures for amending the date of the production order in the system were too complicated and a waste of time.” Flexibility is adopted rather than the controlling and monitoring aspects of the enterprise resource planning system.

4.5.2 Company 2: Circuit Ltd.

The company imports electronic components through Hong Kong and produces circuit boards and electronic control devices in China. The production facilities are located in Shenzhen. The company is an OEM company, and produces products in the name of its customers. Designs and specifications are provided by the customers. The company produces prototypes for customers to review and test.

Workers in the factory follow the instruction of the sales department to plan production schedules and material requirement plans. Material planning and control are conducted in the factory. All materials are received and checked in the factory. Finished goods are delivered to the port directly from the factory.

Purchasing and sales departments are based in Hong Kong, and most of the electronic components suppliers and customers are foreign companies. Communication between parties is mainly in English.

All of the electronic components are shipped through Hong Kong. In order to ensure the smooth operation of logistics, part of the shipping department is based in Hong Kong.
Local area networks have been established in the Hong Kong office and the China factory. The two networks are not connected with each other. Staff members in the two locations are allowed to share information freely at their own sites. They exchange information through email, fax and telephone. If files are considered to be too large for transferring via email, they are uploaded to an FTP server through the Internet. The senders advise the recipients of the upload by email. However, most of the management staff lack computer knowledge, and the preparation and uploading of files is conducted by a limited number of staff.

Q1 Why enterprise resource planning is in high demand by small and medium sized enterprises?

The company is an original equipment manufacturer producer. Initially, electronic components are selected and supplied by customers. Customers are notified of the unused balance of electronic components at the end of each month. Customers provide OEM orders to the company each month. Based on the orders and the delivery requirements, a production plan is prepared and presented to the customers for their approval. According to the production orders and the balances, customers arrange the delivery of the required electronic components to the factory. The company is not responsible for delays in shipments due to insufficient electronic components for production.

However, commencing three years ago, the company changed to purchasing the electronic components directly from suppliers, according to the specifications provided by customers. At the beginning of each year, customers provide to the company a forecast of finished goods and a master delivery schedule. The master delivery schedule is revised and updated every month. The company is required to construct a material requirement plan according to the delivery schedules of all customers.
There is also a change in the price structure. The cost of the electronic components is now included in the selling price. The company is required to pay for electronic components at the time of their purchase. All of the risks of purchasing, quality and on-time delivery are shifted to the company. Quality and inventory levels are now critical to the company. Also, the company is required to pay for electronic components before the sale of the manufactured products to customers. Therefore, additional cash burdens are encountered and excess or slow moving inventory affects the cash flow of the company.

As a result of the change in trading arrangement with its customers, the company has an urgent need to improve its material planning, inventory management, production monitoring and quality control. In addition to the above operating issues, cash flow forecasting is another major issue of concern to the company.

Q2 *How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?*

The company is an OEM producer and does not require e-commerce services with its customers. Regular reports, usually in Microsoft (MS) Excel format, are used for communication with customers. The communication methods with the customers are by telephone, fax and email. Telephone and emails are used for enquiries and following up of orders. Fax is used for confirmation of orders and schedules. These methods of communication are considered to be useful only for the next few years.

Most of the electronic components suppliers are distributors. When processing purchase orders, purchasing staff members are required to check price and availability with distributors. Purchase orders are assigned to suppliers who can deliver the required electronic components according to
the schedules and at the lowest price. No electronic data exchange is required for the purchase.

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?

The company does not have any special strategy on the use of computers. Operating staff use MS Office software to record and maintain information. Spreadsheets are widely used. Most of the senior staff are not familiar with computer operations. Daily operations are based mainly on printed documents.

Information is recorded and updated in both locations. The data is exchanged through email or an FTP server. There is a time lag uploading the information. Accuracy of the information is another issue. Staff members are required to verify and confirm information by telephone for critical events between the two locations.

The Finance Manager claims that “the speed and accuracy of the information were hindered by the multi-layer structure of the company”. Sometimes it takes more than a week to respond to simple enquiries, such as the availability of inventory or finished goods, before the implementation of the enterprise resource planning system.

Although the company does not have a strategy for information communications, it acknowledges that there is an urgent need to have a computer information system to replace the manual system. The company has changed from providing sub-contracting services with material supplies from customers to selling finished products with its own purchased materials. With this approach, the risk of mismanagement of the inventory increases. There are demands for increasing the timeliness and accuracy of
information sharing by the two locations. The demand for a speedy response to customer enquiries is also increasing. An enterprise resource planning system is considered to be the solution to these problems.

**Q4** *How is enterprise resource planning implemented in small and medium sized enterprises with trading office in Hong Kong and manufacturing facilities in Southern China?*

The enterprise resource planning system is a client server based system. The server is installed in the Hong Kong office. Client software is installed on the users’ computers. Within the Hong Kong office, clients connect to the server through a local area network. Clients in the China factory connect to the server through the Internet.

Control and maintenance of the system are the responsibility of the staff in Hong Kong. The computer knowledge of staff in Hong Kong is superior to that of staff in China. The enterprise resource planning package provider is a Hong Kong company and can provide maintenance support more economically and effectively if the server is installed in Hong Kong.

Sales orders are input by the sales department in Hong Kong. Production and material planning is initiated by the production and material planning staff in China. The production and material handling staff members are responsible for confirming and monitoring the progress of an order. Purchasing staff members in Hong Kong are responsible for the execution of purchase orders and other purchasing activities.

Overall training on the logic and work flow of the enterprise resource planning system is conducted in Hong Kong. Detailed operational training is conducted in the factory in China. Most of the work flow suggested by the enterprise resource planning system is adopted with minimum customization.
Q5 Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to those small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

The new system requires change to company operations and this is fully communicated to staff before commencement of the implementation of the enterprise resource planning system. Staff members are fully aware that the inventory control, production planning, material planning, sales order monitoring and quality control must improve. The demands for speedy and accurate responses to customers are increasing. The benefit of the enterprise resource planning system is conveyed to operational staff by the managers.

Although the company does not have a strategy on information communication technology, senior management fully supports the implementation of the enterprise resource planning system. Additional resources of manpower and equipment are provided for the implementation. Managers of individual departments conduct daily checks on data input during the testing and implementation period.

An implementation team is established for the enterprise resource planning system. The team members are managers and staff from operational, accounting and personnel departments. Periodically, senior management participates to review progress. The team is responsible for selecting the enterprise resource planning system, monitoring progress and answering queries from other staff who participate in the testing and data set up.

During the selection stage, the implementation team requests that solution providers use company data to set up presentations. The implementation team members consider they can understand and compare the differences between the various systems using data that is familiar to them.
Enterprise resource planning system consultants from the solution providers conduct training in the project implementation and the progress monitoring tools of the implementation. The overall set up and implementation is performed and monitored by the implementation team.

The company adopts the standard work flow of the enterprise resource planning system and modifies the existing manual process to match that workflow. As mentioned by the finance manager, “the introduction of the enterprise resource planning system provided a good opportunity for us to standardize our operations”. However, business process re-engineering is not conducted for the whole company. Only processes that do not map with the enterprise resource planning system are changed.

No special project management technique or change management program is used for the implementation. Milestones are set according to a guide from the solution provider. The completion dates for the milestones are not followed and are frequently changed. The primarily roles of the staff members are their day-to-day operations. Although they have been assigned to the enterprise resource planning implementation, they must complete their daily work first. The work of the implementation team is affected by the daily operations of individual departments. In addition, the enterprise resource planning packages are found to be unstable. Time is wasted as the package providers repair faults in the packages. The overall implementation follows the stages established at the beginning of the project. The result of each individual stage must be examined and accepted by the implementation team before progressing to the next stage.

As most of the staff lack knowledge of the enterprise resource planning system, the implementation team needs to monitor closely the progress of the implementation. A daily review of the work undertaken by the staff is conducted to manage progress during the implementation period. In order to boost the spirit of staff participating in the implementation, special allowances (bonuses) are given at the end of each stage.
Conclusion

Staff members are fully aware of the changes to the business nature of the company. Material and production are more important. The company needs to improve the efficiency and effectiveness of information sharing between its two locations. The enterprise resource planning system is its solution. Senior staff provides full support for the project.

A dedicated implementation team directly reporting to senior management is formed to manage the project. The team plans the project with assistance from the enterprise resource planning package provider. However, the company considers that the consultant from the package provider does not understand its operational processes. Eventually the use the consultant decreases.

Although an implementation plan is established, the schedule is not followed. Other than the stage-by-stage implementation plan, the company does not formulate any plan or program for the changes. No business process re-engineering is carried out to improve the process. The company elects to change only those procedures that are not matched in the enterprise resource planning package.

Feedback from staff indicates that the overall implementation of the enterprise resource planning package is successful. The company uses the enterprise resource planning system for the day-to-day operation of its manufacturing business, although there are some complaints concerning operational procedures.

4.5.3 Company 3: Device Ltd.

The company is a small electronic appliance original equipment manufacturer. The company has designed and produced products for brand
owners for more than twenty years. A few years ago, the company commenced selling some products under its own brand. However, the company does not have its own marketing staff and relied on trading companies to distribute the products for two years. The result was far from satisfactory. As the market for small electronic appliances is very competitive for a newcomer, the cost of building a new brand is very high. Additional resources for marketing and advertising are required, but the results cannot be predicted. The owner of the company considers this approach to be too risky. As a result, the company focuses on original equipment design and manufacturing for existing markets.

The company moved its factory to Shenzhen, a city in Southern China near Hong Kong. The factory acts as an extended production workshop of the Hong Kong operation. All materials are purchased in Hong Kong and shipped to the factory for production. The finished goods are shipped directly from the Shenzhen factory after quality checking by engineers from Hong Kong. The workers in the factory follow the instructions and production schedules provided by the Hong Kong office. They report to Hong Kong daily on the progress of production, and seek approval for any unplanned events. All selling, purchasing, material planning and control are undertaken in Hong Kong. The company uses fax and telephone as the major communication tools for exchanging information on production and inventory movement. Two set of records are maintained, one in the Shenzhen factory and the other in the Hong Kong office. The records in Shenzhen only maintain quantities. The records in Hong Kong maintain both quantities and values for planning and accounting purposes.

After five years of operation, the company decides to move all operations except the sales, purchasing and finance departments to the factory in Shenzhen, in order to lower operating costs. Four years ago, a new plant was constructed. The role of the factory in Shenzhen is increased, from solely a production workshop to a semi-independent production plant. It undertakes material planning and control instead of just following the
production orders provided by the Hong Kong office. The Shenzhen factory is required to manage and control production. Once an order is received, the factory is responsible for planning the material consumption and production schedule according to the sales order. Then, the planning staff members advise the Hong Kong office on the materials to be purchased and the expected delivery dates. Based on the material requirements and the inventory levels, the Hong Kong office places purchase orders with appropriate suppliers. The Shenzhen factory produces weekly production progress reports on the sales orders. The sales department, located in Hong Kong, is responsible for communicating with customers on changes to sales orders. The operation of the whole company is divided into two main sections. Production, including material control and planning, is in Shenzhen. Trading activities and overall finance control are in Hong Kong. The company maintains two set of inventory records as before.

Q1 Why enterprise resource planning in high demand by small and medium sized enterprises?

When the company moved most of its production operations to the Shenzhen factory, the exchange of information increased exponentially. All departments in the two locations work interactively. The Hong Kong office passes sales orders to the factory for the calculation of material requirements and production planning. The Hong Kong office is given the material requirements and arranges the purchase of components. The Shenzhen factory receives the materials, produces the goods and ships them to customers. The information flow is quite straight forward.

In the beginning, the company used the telephone for communications. The company designs many different business forms for the factory to report a wide variety of activities. Some forms are daily, some are weekly. All the daily forms are faxed to Hong Kong on the morning of the following day. The weekly forms are faxed to Hong Kong on Monday mornings. After the forms are received in Hong Kong, the information is entered into a
spreadsheet for record keeping. The purchasing department uses the reports to prepare purchase orders. The sales department uses the reports to update the status of sales orders. The finance department uses the reports to prepare payments to suppliers or invoices and shipping documents to customers. However, the accuracy and timeliness of the data becomes an issue. The company commences to input the data into spreadsheets and to transfer the files through the Internet.

The accuracy and timeliness of information become an issue for new product development. Information must be exchanged between four departments (sales, engineering, warehousing and purchasing) in two locations. Information initiated by one department is vetted and checked by the other three departments. For example, when a customer changes the specification of a product, the specification passes to the engineering department for review and testing. Then, the availability of the new components is checked by warehousing and/or purchasing staff. The data files are transferred between difference departments.

**Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized Enterprises?**

The company has only a limited number of products sold under its name. Those products are sold to the wholesalers with their input on the design. Most of the products are designed for customers and sold to brand owners or shipped to specific customers under the names of the brand owners.

There are no specific requirements concerning information exchange between the company and its customers. They usually communicate by email and fax. For large files (e.g. artwork, design drawings, photos of the sample and finished products) that cannot use email, customers log into an FTP server to download files directly.
With the exception of components suppliers, most of the suppliers are small sub-assembly factories near the manufacturing plants. Communication is face-to-face or by telephone. There is no specific requirement concerning communication methods. Most of the components parts are standard components. The company makes use of a stock system to control inventory and periodically place orders. At present, the company does not see the need for developing an electronic data exchange with either suppliers or customers.

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?

The ability to use computers is one of the criteria for employing staff in both the Hong Kong and Chinese offices. Staff members from both offices use computers to perform daily tasks and to generate reports. Email and file transfers through FTP servers are used for communication between the two offices.

Most of the daily and weekly reports are produced using Microsoft Office software. These reports are stored by individual staff and passed to others by email. Some large files (e.g. designs, art work and photos) are transmitted to the server in Hong Kong using FTP. However, the company does not have a standardized method to control original and amended versions of such files. It is easy to misinterpret versions and telephone verification is always required.

The security awareness of the staff is very low. Although the company has established different passwords for individual staff to access individual FTP servers, the control is not considered effective. Staff members share or use the same password to log into an FTP server. Audit tracking of users of FTP servers is very limited and not straight forward. Users also share the same
password or give the password to others to upload or download the files. It is difficult to apply effective controls on the transfer of files. On the other hand, management is concerned that the FTP server is accessed via the Internet. The risk of access to files by unauthorized users is high. The company eventually uses the FTP server to transfer only production schedules. All the sensitive information (e.g. designs, drawings and prices) is communicated through physical hard copies.

Q4 How is enterprise resource planning implemented in small and medium sized enterprises with trading office in Hong Kong and manufacturing facilities in Southern China?

At the time of selecting an enterprise resource planning system the manager of the company attends product seminars and demonstrations organized by different software vendors in Hong Kong. His knowledge of enterprise resource planning comes from these seminars.

He selects a service provider from: (a) the information obtained from the seminars; (b) viewing demonstration; and (c) brochures provided by the service providers. The shortlisted service providers are required to conduct a demonstration of two or three company orders, concentrating on material requirement planning.

Only basic product training is conducted for managers, followed by a three months “test run” using the actual data. The managers are then considered to have an understanding of the enterprise resource planning system, mainly material requirement planning aspects, and start to use it.

The company implements the enterprise resource planning system in its Hong Kong office. All of the information is centralized in Hong Kong. Staff members at the Chinese factory cannot directly access the system and they provide data in the form of weekly reports to staff in Hong Kong for
inputting into the system. The accuracy of such copied data has always been queried.

The company does not plan to implement other modules of the enterprise resource planning system, as the manager considers the existing results have not yet been confirmed. The system has been developed by a small Hong Kong software provider, and it is not mature. It is not running smoothly. Some technical issues are yet to be resolved.

As mentioned in the previous section, security awareness of the staff is very low. Staff members share passwords with other users, or allow non-authorized users to use their passwords. The manager is also concerned about data security in the enterprise resource planning system, and this is another reason that hinder steps forward to using more modules of the enterprise resource planning system.

Although the company commenced implementing the system two years ago, it still considers the system to be under implementation.

Q5 Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

At the beginning of the project, the managers were very busy with their own operational tasks. They do not have any knowledge of enterprise resource planning systems. All their knowledge has been learned from seminars provided by enterprise resource planning vendors. They consider enterprise resource planning software to be off-the-shelf software that can be used with only basic product training.

The managers follow the procedures and the standard settings of the enterprise resource planning system. They are not aware of the need for
employing a consultant to assist with the implementation and adjusting their operational procedures to suit the enterprise resource planning software.

The software provider has a good technical knowledge of the enterprise resource planning system and is able to provide training on how to use every function of the system. However, the software provider is not able to provide consulting services on how to match the individual function of the enterprise resource planning system with the company’s business requirements and operations. During the implementation, some business processes do not match with the enterprise resource planning system. The software provider attempts to fix the problems by customizing the software.

There are no signs of involvement of lower level staff in the selection of the enterprise resource planning system and subsequent training. Lower level staff members are notified when the system is installed and follow instructions from the manager on how to use the system.

No formal implementation team is established. Key members of the project are directors, accountants and relevant operational managers. They have no implementation plan and the implementation is undertaken on a trial-and-error basis. Progress is reviewed on a needs basis.

**Conclusion**

The company is a small factory with limited resources, although it has two production plants. The owners, a middle-aged couple, manage the company like a family. They control all operations. The husband manages the design and marketing of products. His wife manages the accounting and all back office support. Production is run by their relatives under their direction.

The owners consider the enterprise resource planning system is a software tool like AutoCAD for design drawings. They are aware that enterprise
resource planning would assist them to improve their efficiency, but are not aware of the time and resources needed to use it effectively.

Operational managers are not consulted on the selection of an enterprise resource planning system. During the implementation, the managers find that the workflow of the system does not match company operations and the system needs to be modified. One of the managers even claims that the system is useless. The company uses the system only to: (a) record the inventory; (b) maintain the bill of materials; and (c) calculate material requirements. No manager wants to move further into exploring other features of the system.

On the other hand, the owners do not want to spend more resources on a project without an accurate estimation of cost saving. One of the owners states that the enterprise resource planning system is used only for inventory control.

4.5.4 Company 4: Animal Ltd.

The company is engaged in providing pet products to customers. The company designs and produces high quality products according to the requirements of its clients.

The company started operations in early 2000s with a factory in Panyu and moved to Dongguan in 2011. The factory in Dongguan is responsible for operations, including product design, sample making, order processing, production, shipping and local account matters. Sales and marketing is undertaken in Taiwan. Accounting and corporate matters are undertaken in Hong Kong. Part of the sales effort is undertaken by an associated company located in Germany.

The company has established an enterprise resource planning system to allow the director to control and monitor the business when he is in the
Taiwan office. All information is entered into the system by staff in
Dongguan through a virtual private network (“VPN”). Reports are
generated and printed in Dongguan through the VPN.

All office staff members use computers to accomplish their daily tasks. Production managers also use computers to monitor the production process and to manage production staff. Computers are widely used in company operations and staff members are familiar with various office software packages.

Q1 Why enterprise resource planning is in high demand by small and medium sized enterprises?

Staff members in the Taiwan office control all shipments to and payment from customers. They are responsible for controlling and monitoring shipments. Most of the customers are large distributors in Europe and North America. Their orders require shipping to different locations according to the shipment schedule provided by them. Payment is according to the shipment date. The Taiwan office is required to follow up customer payments. If a customer does not make a payment on time, the Taiwan office instructs the factory to hold the shipment. The enterprise resource planning system provides an effective means for staff in Taiwan to retrieve required information in a timely and accurate manner.

On the other hand, the company operates in a low volume, high mix production mode. Each shipment contains an assortment of products. The enterprise resource planning system speeds up and manages production planning and material requisition.

Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?
The company frequently exchanges product information with customers. Communication is mainly through telephone and email. The enterprise resource planning system is not open to customers. Some of the customers visit the factory periodically to review samples of newly developed products.

Most of the suppliers are small sub-contract factories scattered around the factory in Southern China. The suppliers normally use telephone and fax to communicate order information. Exchange of electronic data is not required.

At the time of interview, the company does not have any need for e-trading. The company is planning to enter e-trading in the near future to enlarge turnover, to utilize fully their production capacity and to promote their brand name and products.

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?

Most of the daily operations are located at the factory. Staff members in the factory prefer to communicate face-to-face on issues that occur. This kind of communication leads to data not being input into the system in a timely manner. Staff members consider the issue is solved after talking to the relevant person. They consider that inputting the data into the system is only for the purpose of recording and generating reports. Staff members are not enthusiastic about updating the system in a timely manner. They prefer to pile up the data and input it into the system at the last moment, before the generation of reports. The newly appointed financial controller complains that they are not using the system as an enterprise resource planning system. They are using it as an electronic recording system with the capacity to calculate the inventory usage of each order.
Although staff members communicate face-to-face, the financial controller considers the communication is poor. No formal communication channel is established. Issues identified in one function are not applied appropriately to all other related functions. This is the result of the loose establishment of the organization, without clearly defined responsibilities for each function. As a result, information is not properly communicated. Because no formal communication process has been established, staff is not clear about what information has to be shared, the sharing mechanism and who has to be informed.

**Q4** How is enterprise resource planning implemented in small and medium sized enterprises with a trading office in Hong Kong and manufacturing facilities in Southern China?

The enterprise resource planning system was selected by senior management at the time of establishment of the business. At that time, business processes had not been established and no requirements had been laid down for the selection process. The founder of the company had little understanding of enterprise resource planning systems and how they controlled production. The enterprise resource planning system was introduced by business partners.

The server for running the enterprise resource planning system is established in Taiwan. The factory is required to connect to the Taiwan office to run the system. The slow speed of the data line between the factory and Taiwan hinders the operation. This significantly affects the ability of management to respond to changing conditions.

The company purchases an enterprise resource planning system from a Korean service provider. An Electronic Data Processing (EDP) manager is employed to maintain the system. During the last few years, a great deal of customization of the system has taken place to accommodate the business and operational requirements.
Brief training for the enterprise resource planning system is conducted by the service provider during and after the implementation. After that, staff members are trained by the EDP manager only on the functions that they use. No comprehensive and overall training of the enterprise resource planning system is conducted.

Q5 Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

The company commenced using enterprise resource planning when the company was established. At that time, management had only a plan of how to establish and use such a system. No actual data or detailed business processes were available for the selection and evaluation of the enterprise resource planning system.

The founder has the view that enterprise resource planning is a tool for the company to manage and control the inventory. Due to limited investment, the company does not employ a consultant or provide comprehensive training in the operation of the enterprise resource planning system.

After the implementation, there is no formal monitoring or evaluation of the implementation of the enterprise resource planning system or its on-going performance. Staff members undertaking various functions report numerous issues/short-comings of the system through the EDP manager to management. Management then decides if enhancement (e.g. customization) is warranted.
Conclusion

During the selection of the system, management considers the enterprise resource planning system to be a tool for managing production planning and material requisitions. They view enterprise resource planning as an off-the-shelf software package that can be learned and managed by themselves. Management assigns one EDP manager to be responsible for the running and maintenance of the system.

Management does not give a great deal of support to the development. For the past few years, the system has been maintained by company staff. EDP staff members are obliged to solve issues/short-comings encountered by staff using the system. As a result, quite a number of small programs were developed to run independently of the enterprise resource planning system.

The company considers it makes substantial use of the enterprise resource planning system.

4.5.5 Company 5: Timer Ltd.

The company has produced digital and analogue watches and clocks for thirty years. The company places special emphasis on innovation and high quality product design. Eighty percent of the products are designed and manufactured for customers’ private brands in the market place. Twenty percent of the products are sold under the company’s own brand names. The company owns the design and intellectual property rights to the watches provided by them.

The company has an office in Hong Kong for: (a) design and engineering; (b) sales and marketing; (c) quality control; (d) shipping; (e) accounting; and (f) personnel. The main production facility moved to Dongguan in the late 1980s.
A material requirement planning system was introduced after the manufacturing facility was moved to Dongguan in the 1990s. In the beginning, some Hong Kong staff members working in the factory were required to maintain their offices in Hong Kong. They carry reports to and from the Hong Kong office and the Dongguan factory. Since most of the reports are produced in Traditional Chinese characters that workers in the factory do not understand, they are required to explain the reports to the workers in the factory. The manager of the company states that “they were ‘massagers’ instead of ‘managers’ at that moment”.

It is very ineffective and time consuming to continue with the operating mode of the 1990s. The company attempts to improve efficiency by having managers relocated permanently to the factory, and generates reports in Simplified Chinese. A director of the company states that: “We could not expect the local workers to learn Traditional Chinese. Hong Kong managers must adopt and overcome the barrier of using Simplified Chinese.” The company also amends the reporting system to print reports in either Traditional or Simplified Chinese characters. This becomes a strategy on entering a new region – using the language and characters of that region.

The other means of improving efficiency and reducing the work load (carrying piles of documents to and from the Hong Kong office and the Dongguan factory) is implementing an FTP server in the Hong Kong office. All reports and other documents, e.g. design drawings, are stored in the server for staff and workers in Dongguan to download. In the beginning, the quality of Internet services in Dongguan was poor. After years of improvement, use is being made of voice-over-IP and web-cam for communication between the Hong Kong office and the Dongguan factory.

Q1 Why enterprise resource planning is in high demand by small and medium sized enterprises?
The manager of the company mentions that the company is “order driven”. Staff members are required to respond to customers quickly and accurately. Most customer orders are made-to-order. The company requires accurate information on the demand for and availability of materials, especially as some components are designed and used for one to two models.

A director of the company states that: “One of the critical successful factors of the company for the past year was quick and quality reply.” In order to maintain this success factor, the company decides to implement an MRP system to monitor inventory, moving the factory to Dongguan. The company continues to develop and enhance the system. A web-site and customer relationship management portal is designed and implemented in the early 2000s, to allow customers to keep track of their orders. This system allows the customers to view the company’s catalogue and place orders. After placing an order, customers can trace the order and its shipment status, and check the inventory kept by the company.

Centralizing information between offices in two locations is another reason for implementing the enterprise resource planning system. Traditional methods of information keeping cause difficulties in finding updated information, with so much paper “flying” around the two offices. Every report generated by the system carries a date stamp which staff can use to determine which parts of a report are recent. Accuracy and quality of the information are therefore improved.

The company expands rapidly during the 1990s and most orders are tailored for individual customers, requiring that large volume of orders and product information be handled and exchanged between the Hong Kong office and the Dongguan factory. The travel bags of the “massagers” travelling between the two offices are overloaded with documents. They require a system that reduces the weight of their travel bags. This is also the case for marketing staff travelling overseas and attending exhibitions. They are able to locate and download updated production information for presentation.
Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?

In the watch business most of the suppliers in Southern China are small companies. They usually do not have computer information systems for communications. Using computers is not common among such small suppliers. The normal communication methods are telephone and fax.

Although customers expect a quick turnaround time of their requests, their main communication tools are email and fax. After the introduction of the CRM web-site and portal, most of the enquiries about orders and shipments are reduced. This CRM portal reduces the work load for answering order and shipment status. The ordering staff is able to concentrate on new orders and the response time for these is reduced.

The company does not see the need for developing e-trading. The CRM web-site and portal are satisfactory for existing customers. It is a closed system and customer accounts are created by the company after the first order is placed.

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?

As mentioned in the previous section, the control office (design and engineering, sales and marketing, quality control, shipping, accounting and personnel) is located in Hong Kong. The staff in Hong Kong is responsible for communicating with customers and instructing the factory on producing samples and final products. Every day, a great deal of information flows
between and within the two offices. There is a high demand for a reliable centralized system to process all of the information.

The control office is required to distribute design drawings, product specifications, bill of material, production orders and shipping schedules to the factory every Monday. The factory produces progress reports on designs, product samples, inventory balances, shipping status and many other reports relating to inventory movements and production each week, in response to the information provided by the control office the previous Friday. All of these “paper reports” are carried by the “massagers” described by the manager of the company. In case of emergency, some special “massagers” are required to deliver urgent reports. In order to overcome these difficulties, a system is designed that allows all reports to be stored in a centralized area for all staff to upload and download.

The operation of the watch production business is quite unique. Most of the parts are tailor designed to individual products, especially at the high end of the product range. It is difficult to find a solution in the market in the 1990s. As a result, the company decides to employ its own information technology staff to develop the required system. At the time of the interview, the system is in its third generation and is capable of operating with either Traditional or Simplified Chinese characters.

**Q4 How is enterprise resource planning implemented in small and medium sized enterprises with trading office in Hong Kong and manufacturing facilities in Southern China?**

The enterprise resource planning system is initiated by the managing director of the company. She is the daughter of the founder. Although she is not from an information technology background, she has a solid knowledge of information technology and experience in how to use new technology. She realizes that no MRPII or ERP solution in the market can match the uniqueness of her business. If the company engages outsiders to
develop the system, the cost is very high. The company undertakes a
detailed study of its business operations before commencing the
development of its own enterprise resource planning system. As a result she
decides to build an enterprise resource planning system using information
technology staff employed by the company. This decision is based on the
company having a detailed understanding of the requirements of the system.

Information technology staff members do not have knowledge of the
company’s business operations. They are required to work with individual
operations managers for some time to learn and understand the business
processes before designing and writing the enterprise resource planning
program. The operational managers are fully aware of the aims of the
development process and enthusiastically participate in the development and
testing. The information technology personnel work with the operational
managers as a team. By the time the system is ready for use by the company,
the individual managers are very familiar with the functions and features of
the enterprise resource planning system. They are able to teach their
subordinate without difficulty.

Another benefit of building its own system is that the company can review
and enhance the system at any time to cope with the rapid change of
business environments. The company manager states: “Such as the design
of the CRM system, this came from one of the request of the ordering
manager.” In one meeting, the order manager complains that his staff
expends a lot of time finding and answering enquires from customers
relating to production progress and the shipping status of orders. Was there
a solution to shorten the time to answer the enquires? After discussion, they
elected to redesign the CRM web-site and portal to allow customers to
toch check that information.

Q5 Can the critical success factors of implementing enterprise resource
planning in large enterprises be applicable to those small and medium
sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

Before the implementation of the project, senior management carefully studies the solutions available in the market and search for a product that matches the operating mode. However, they find that their business is new to the enterprise resource planning market. There are only a few systems developed for make-to-order operational mode. The available solutions are oriented towards engineering businesses rather than their business, with so many small hand-craftsmen processes.

No consideration is given to using an enterprise resource planning consultant. Such consultants available in Hong Kong at the time do not have the required knowledge of the watch industry.

The company builds its own team of information technology staff to work on the enterprise resource planning system. Even though not a formal team, all operational managers work with the information technology staff hand-in-hand to develop and test the system.

All operational managers are fully aware of the requirements of the enterprise resource planning system to: (a) reduce the turnaround time of the transfer of information; (b) have more accurate and up-to-date information of inventory; and (c) have better communications between different managers. They benefit from the improvement of efficiency and the growth of business without increasing their staff levels.

Most of the operational managers have little knowledge of the enterprise resource planning system in the beginning. Their involvement in the development and testing of the enterprise resource planning system gives them an opportunity to learn. The company manager states: “Now some of them have become expert on ERP systems in the watch making industry.”
The project is overseen by one of the directors with support from the information technology manager. The company does not employ a special project team but undertakes its own review of the implementation. All development progress is discussed and reviewed as part of the regular management meetings.

Conclusion

The company is customer and technology driven. It ensures its business systems match changes in the business environment and the needs of its customers, in order to maintain high customer satisfaction.

Using new technology to improve the company’s efficiency is one of its strategies. The development is continuous. At the time of the interview, the system is in its third generation. Although staff members in China are allowed to log into the system to update data and generate reports through dedicated telephone lines, the project has commenced to develop an accessing method using the Internet so that the company can save on the cost of leasing dedicated telephone lines.

Senior management supports the system and considers that using technology is not an excessive cost. It is a tool to increase the productivity and profitability of the business. A director of the company claims that “without the development of the information communication system the company would not take on such an ambitious program of expansion in the last 15 years”.

4.5.6 Company 6: Food Services Ltd.

The company is Hong Kong based and specializes in the manufacture of catering and household items. The company had been established for more than 30 years.
The company has two manufacturing facilities in two cities located in Southern China. One factory is mainly for product development, with a well-equipped tool shop. The other larger factory is equipped with advanced machine and tooling workshops for production of various kinds of large scale machine equipment.

The company develops products under its own brand name. Every year it launches new and better products for households and catering businesses. The company's philosophy is to offer quality products and services, and constantly launches new products.

Most of the products are produced in high quality stainless steel. Over 80% of the products (teaware, kitchen tools, chafing dish sets, plastic products and electrical appliances) are sold in 70 countries.

Computers are used throughout the company. Each department has its own network and systems for staff to share information and monitor operations.

Q1 Why enterprise resource planning is in high demand by small and medium sized enterprises?

In the past decade, a number of systems have been implemented by the company. Most of them have been developed by EDP staff within the company to solve issues in individual departments. These systems include: (a) an inventory system for the warehouse to record and track the movement of stock; (b) an ordering system for sales and marketing staff to monitor customer orders; (c) a production order system allowing the production department to monitor production orders; and (d) an accounting system to maintain financial records. The EDP manager of the company, states: “All were standalone systems. Although those systems were developed by our department, they were not connected with each other. They are just like individual islands scattered on the sea.”
Similar items of information might appear in different systems. Due to timing differences when processing the information, reports generated by different department are not easy to reconcile. Managers cannot obtain an accurate and timely report on operations without verifying that all departments are using the same items of information. There is a need to use a single source of information for the generation of all reports.

Data exchanges between different departments are frequent. The company requires a better information technology system to facilitate the exchange of data in a timely manner. Users should not be required to double check that data is correct.

Some of the business processes and information is retained in more than one department. Individual departments keep their own files and are not willing to share the information with others. This causes duplication and wastes resources. Senior management intends to streamline some of the processes with changes in the methods for keeping and using information.

Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?

The company has developed a web-based platform for customers to access their order information, order history and shipping information. Customers are not permitted to place orders through this platform. All pre-order processes and order placement are communicated by email. The turnaround time for the exchange of this information is approximately one day. There is no pressure from customers to improve this situation. The platform is self-initiating to improve customer services.

There is no data exchange requirement from suppliers. Suppliers prefer using traditional methods of communication – telephone and fax. The usual turnaround time is three days.
After the implementation of the ERP system, the company is going to explore using e-commerce. The company is trying to develop a new group of customers through a new B2B platform.

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies for information management?

The company has its main control office in Hong Kong for accounting, sales and marketing, shipping and information technology functions. The two Chinese manufacturing facilities are required to submit reports periodically to the Hong Kong office. The Hong Kong office provides instructions on product design, sample production, production and shipping schedules to the two Chinese manufacturing facilities.

The Hong Kong office is required to consolidate reports to show sales and production of orders. Staff members in the Hong Kong office accept and verify information from individual departments and sometimes must reconfirm with staff in China where variations occur in the same piece of information from different departments.

Some components are produced by one factory and assembled in the other factory. The two factories are required to exchange information periodically on production schedules for these products.

As mentioned in the previous section, individual departments accumulate their own information. Information is kept and processed in different “island” systems. Exchange of information is not efficient or effective. The company requires that the information is maintained in a central data base to ensure that every department uses the same information to review and monitor operations.
Management, traveling between the Hong Kong office and the two manufacturing facilities to review and monitor operations, finds that the traditional reporting system does not provide accurate and timely information.

Q4 How is enterprise resource planning implemented in small and medium sized enterprises with a trading office in Hong Kong and manufacturing facilities in Southern China?

Management considers there should be a change in the use of the computer system to match the comparative business environment and establish a solid basis for the development of a world class business. The company decides to link all of the “island” systems to create a central database for all information for all users.

The company searches the market for an enterprise resource planning system that matches its operations. The process is conducted by the EDP manager. He chooses systems that exist in similar operations. After a shortlist of suppliers has been prepared, the selected suppliers are required to present their solutions with data provided by the company. The presentations are made to managers who will use the enterprise resource planning system. Every manager is required to give a view of the systems.

The selected supplier arranges training and research into the requirements of the company’s operations. The selected supplier is required to present these finding and suggest changes to the enterprise resource planning system. It communicates with users throughout the company. The EDP manager and his staff provide support on technical issues and data structures in the existing “island” systems. The EDP manager also mediates conflicts between user departments and the supplier concerning user requirements and system modifications. He also assists senior management to solve conflicts between user departments by giving technical advice.
A project team of key personnel (managers and supervisors from selected departments which are to use the system immediately after implementation) is established.

The implementation is conventional, namely: (a) review the overall operation; (b) train the key personnel; (c) generate solutions; (d) train the users; (e) input company data to test the suggested solution; (f) fine tune the solution; (g) conversion of production data; and (h) post implementation review.

The implementation of the enterprise resource planning system requires the company to review some of its operations, e.g. goods cannot be received without creating a stock code. While this seems minor, the goods receiving section passes the receipt note (without a stock code) to individual departments, the warehouse, production and accounting. The departments process it in their own way even without a stock code. They update their records after the stock code is issued. However, with the new enterprise resource planning system, because no stock receiving record appears in the system, production orders and payments cannot be generated.

The company establishes an appraisal system and Key Performance Indicators (KPI) for the data input to motivate staff to complete the data entry correctly. Milestones and periodic reports are generated for senior management to monitor progress.

Q5 Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

Senior management initiate and fully support the implementation of the new enterprise resource planning system to replace the existing “island” systems.
They pay close attention and lead the project throughout the implementation process.

As mentioned in the previous section, there are many conflicts between user departments concerning the new system. They must change some of their work practices. Most staff want to follow existing work practices and are reluctant to change. Without the direction from management, these conflicts may not be settled. The EDP manager states that the attitude of the senior management played a significant role in the completion of the implementation.

At first the company considers employing a consultant, but eventually it does not. The main reason is that the company did not know how to evaluate and remunerate such a consultant. Although the company reviews proposals from some consultants, they are unable to match the services provided with its situation. There is also a “trust” issue. The company is run by a family based on Chinese traditional culture. Some of the family members resist the release of business information to outsiders whom they do not know.

Although a project team is in place, project management is not proficient, as stated by the project leader. He admits that he does not have training in project management. He starts learning about project management after the implementation commences and lacks the skill to manage the project to the expectation of all the stakeholders. On the other hand, he is at the same level as other stakeholders within the company. He does not have the authority to enforce some changes, especially in the area of process change. Time is lost by waiting for endorsements from senior management before changes can be made.

The company undertakes quite an amount of customization of the enterprise resource planning system. The standard features of the system are considered too general for its operations. The company need more
specialized functions and controls for its operations. Due to its culture regarding the release of information to outsiders, the ERP supplier is given only the information relating to an individual feature. Some issues are created when all of the features are merged together. Time is lost making further modifications. This is one of the reasons that the implementation schedule is not followed.

An appraisal and evaluation system is set up based on the milestones. KPI is used only for data input. There is only a limited effect on the overall implementation process.

Conclusion

The senior management is very concerned about the implementation. One of the directors is involved in the process from selection of the system until completion. After completion of the implementation, he establishes a post review mechanism to monitor the use of the system. The attitude of senior management places emphasis upon the completion of the implementation.

The company attempts to follow all the steps of implementation as mentioned above. However, the company does not have experience in project management and does not have an experienced person to manage the project and handle conflicts between stakeholders. Even though milestones are established, they are not achieved. The EDP manager admits that the company should have employed a consultant to manage the process. However, the company’s culture does not allow this.

The EDP manager considers that the implementation is complete. He uses the word “successfully” during the interview, but there is still a great deal of work remaining to complete the fine tuning of the system. Success or not will depend on the comments of users over the next six months.
4.6 Summary

Company 1 to Company 4 are mainly OEM companies. Company 5 is a mixture of OEM and original design manufacturer (ODM). Company 6 produces and sells products under its own brand.

4.6.1 Accuracy and Timeliness of Information

Inventory management is identified as the major reason for moving to an enterprise resource planning system. Although Company 1 to Company 4 are OEM companies, they purchase raw materials for production. As businesses expand, the financial risk of excess raw material increases. The issue is exacerbated when manufacturing facilities are moved to South China. Company 1 and Company 4 claim that they have more than HK $1 million of slow moving inventory in their warehouses.

Company 3 and Company 4 ship goods to the distributors of brand owners. The orders to individual distributors are low volume per product but with a high product mix. They require a system to consolidate the demands and to detail a delivery schedule for each product and distributor for material and production planning.

Company 5 and Company 6 sell their products under their own brand names. Sales and marketing departments are requested to provide sales forecasts for material planning. An accurate inventory figure is very important in the preparation of a sales forecast. They face a new challenge with the expanded use of email. Customers expect to receive feedback on their orders within one or two days. Ready, accurate and up-to-date information is very important.
4.6.2 E-Commerce

The suppliers and sub-contractors of all companies are small factories located in the South China region. No data transfer is required. None of the companies undertake e-commerce activities. Their customers are brand owners or distributors. They do not exchange data frequently. E-commerce is not a concern when choosing enterprise resource planning systems.

4.6.3 Operations in Two Locations

Computers are widely used in all the companies. Most of the staff is familiar with Excel spreadsheets used to prepare reports. All the companies have installed FTP servers for transferring files between different locations. However, all interviewees comment that this form of data exchange is not effective, the speed of transfer is too slow, it is not easy to use, and they cannot easily identify which file is the most recent.

Email is the major communication tool for use between different locations in all of the companies. Files are attached to emails for exchange of information and reports.

All of the companies have implemented some kinds of periodic reporting mechanism. However, staff requiring the most up-to-date information experience difficulties.

Company 6 has developed different systems for individual departments to allow tracking of their own information. The same information is kept in more than one department. Due to timing differences of system updates, variations exist for the same information in different departments. The Hong Kong office has to verify information received from the different departments.
4.6.4 Implementation of the Enterprise Resource Planning System

All enterprise resource planning system implementations are initiated by senior management. They all base their decisions on better inventory control and good communication within their companies.

Almost all of the companies start by attending seminars prepared by ERP suppliers (except the management of Company 4). After shortlisting suppliers, Company 1, Company 2, Company 3 and Company 6 request the suppliers to present their solutions for review using a few orders from their companies. The reviews of Company 1 and Company 3 are undertaken by responsible directors. Company 2 and Company 6 establish teams of managers to attend the reviews and comment on the presentations.

Company 4 selects the supplier based on a recommendation from one of its business partners.

Company 5 decides to develop an enterprise resource planning system by employing its own EDP staff, as the management is of the opinion that no suitable enterprise resource planning solutions exist for a watch making application.

Company 1 to Company 4 consider that enterprise resource planning systems are off-the-shelf software packages, requiring only technical training on the functions and features of the package. They do not appreciate the complexity of enterprise resource planning systems and the importance of enterprise resource planning knowledge for their staff. They try to adopt the standard workflow of the enterprise resource planning system for their operations. Eventually they elect to use the material requirement planning modules for calculating material requirements and monitoring the inventory.
Company 5 and Company 6 pay more attention to the enterprise resource planning training for their staff. The training is on-the-job training, giving more time for testing the system. As a result, they learn more from the system and find a better enterprise resource planning match for their company. Company 6 does not adopt the standard practices provided by the system. It undertakes a great deal of customization to meet the requirements of its operations.

Company 2 and Company 6 establish project teams to function from the selection of the enterprise resource planning system until completion of the implementation. Operational managers participate in the review, testing and monitoring the implementation progress. However, the companies do not have knowledge of project management and do not employ professional consultants to assist with the implementation. All of the companies report that they could not adhere to the original agreed time frame to complete the implementation. One of the critical issues is that they are responsible for their daily operational tasks within their companies. At the same time, implementation is not the first priority. The managers treat the implementation as a part time job that they conduct after they complete their normal company tasks. Although project teams are established, the work flow problems cannot be easily solved. The senior managers are required to negotiate workflow conflicts at Company 2 and Company 6.

Company 5 develops its own enterprise resource planning system, the development and implementation becoming the daily responsibility of all relevant managers. They discuss all the issues as part of their regular management meetings. Although a formal project team is not established, the development and implementation progress smoothly. All issues are settled within the management meetings.

Only Company 1 employs a consultant to assist in the implementation. However, the consultant is not an enterprise resource planning consultant.
His job is to ensure all the changes will pass the next ISO standards review only.

In order to speed up data input and reduce the error rate, Company 2 provides special allowances for the data input staff. Company 6 establishes a KPI system to monitor and reward staff on meeting milestones. Other than that, none of the companies makes use of an appraisal system.

4.6.5 Critical Success Factors

All of the companies show strong support from senior management for enterprise resource planning. Senior management initiate and lead the implementation. The participation of senior management provides a solid grounding for the completion of the implementation.

Teamwork is seen in all the companies. Company 2, Company 5 and Company 6 establish project teams. These three companies provide a positive response to the completion of the implementation. Those companies without a project team comment that there are some unsolved issues they need to follow up. They are using the enterprise resource planning systems to calculated material requirements and monitor inventory.

Company 5 and Company 6 have business plans to expand their businesses by using their enterprise resource planning systems. They consider enterprise resource planning as the basic building block for further development of a customer relationship management system, as well as entering into e-commerce. They conduct better planning than the other four companies.

Communication between company staff of Company 2, Company 5 and Company 6 is more effective than the other three companies. The relevant managers are involved throughout the implementation process. Most of the issues during the implementation are resolved.
No formal project management is evident in any of the companies. All companies report that they could not meet the pre-determined implementation schedules. Company 2 and Company 6 try to ratify this situation by providing incentives to staff and using KPI to achieve milestones, commenting that incentive and KPI systems are useful for motivating staff to complete tasks within set time limit.

Company 1 to Company 4 consider that enterprise resource planning systems are off-the-shelf software packages. At the beginning of the implementation, they are not aware that changes to the enterprise resource planning software would be required. Company 5 develops an enterprise resource planning system in-house and Company 6 customizes the enterprise resource planning system to match its operations. All companies adopt a trial-and-error approach to the implementation. They do not plan for changes. As a result, many conflicts arise. Resolving conflicts is a major reason for not adhering to the pre-determined schedules.

Although Company 1 to Company 4 try to adopt the standard practices of the enterprise resource planning system, they do not conduct a review of the enterprise resource planning solutions during the initial period. They face issues during the implementation and, eventually, can only partially use the system. Even though the project team of Company 6 did review the system in detail, it still required considerable customization to allow the system to match its operations.

During the interviews, all companies report that their systems are tested with company data in the initial stage. However, the scale of the tests is small, except for Company 6.

All companies establish an implementation schedule at the beginning of the project. Company 2, Company 5 and Company 6 conduct reviews and attempt to monitor progress of the implementation through an appraisal...
system. The other three companies have no monitoring. The three companies respond with the same reason: “*We did not have enough resources to follow up. Staff was required to finish their daily works first.*”

Company 3, Company 5 and Company 6 highlight that support from senior management, team work, and effective management are key factors in the success of the implementation.

All companies claim that software testing had been undertaken before the selection. However the testing is limited to a few transactions. It is not enough to be considered a comprehensive review. All interviewees indicate that more extensive testing is required but, due to limited resources, the companies and the enterprise resource planning suppliers are not willing to conduct more extensive testing with more company data.

Although there is no formal business vision or plan, the management teams of Company 5 and Company 6 have a clear vision on what their businesses would achieve. The implementation teams of the two companies are guided by this vision.

No company has made use of project management, change management, business process re-engineering, or monitoring/evaluation during the implementation. They all suffer different levels of problems. Comments during the interviews indicate that the adoption of the above would have been beneficial. The introduction of incentive and KPI systems by Company 3 and Company 6 for data entry emphasises the importance of these factors.
CHAPTER 5
CONCLUSION

5.1 Introduction

This chapter presents research findings for research questions relating to factors affecting the deployment of enterprise resource planning in small and medium sized enterprises with offices in Hong Kong and manufacturing facilities in Southern China. These findings, drawn from the questions presented in Chapter 3, provide an insight into such small and medium sized enterprises adopting enterprise resource planning and the critical success factors for the implementation of enterprise resource planning.

Section 5.2 presents the findings and inferences relating to each of the research questions. Summaries drawn from the interviews identify the needs of small and medium sized enterprises for: (a) enterprise resource planning; (b) better relationships with external businesses due to enterprise resource planning; (c) strategies for information management of the dual operations in Hong Kong and Southern China; (d) the implementation of enterprise resource planning in Hong Kong and Southern China; and (e) the identification of critical success factors for the implementation of enterprise resource planning in these organizations.

Section 5.3 discusses the implications of the research findings on the deployment of enterprise resource planning in small and medium sized companies with offices in Hong Kong and manufacturing facilities in Southern China. Section 5.4 outlines the limitations of the research and Section 5.5 highlights the contribution of this research to the development of enterprise resource planning in small and medium sized enterprises. Section 5.6 suggests further research areas for the deployment of enterprise
resource planning in small and medium sized companies in two administrative regions.

5.2 Findings and Inferences of Each Research Question

After relocating their manufacturing facilities to Southern China, small and medium sized enterprises in Hong Kong face significant changes to their communication methods. Small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China look for solutions to maintain their competitiveness in this fast developing electronic information exchange environment. After reviewing the successful use of enterprise resource planning systems in large organizations, they gain an expectation that enterprise resource planning is a solution for them. This research aims to determine the need for, and requirement of, enterprises resources planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

The following research questions are developed for this study:

Q1 Why is enterprise resource planning in high demand by small and medium sized enterprises?

Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies on information management?

Q4 How is enterprise resource planning implemented in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

Q5 Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to those small and medium
sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

5.2.1 The Need of Enterprise Resource Planning

Q1 Why is enterprise resource planning in high demand by small and medium sized enterprises?

Research Question 1 aims to determine the need for enterprise resource planning in small and medium sized enterprises with operations in Hong Kong and Southern China. The interviewed companies have structures that are classified as “thin and flat” (Huin, Luong and Abhary, 2002). Most managers undertake more than one role in the company. Decisions are based mainly on the hands-on experience of the managers of the companies. Due to the expansion of the businesses, an increase in transaction volumes and a decrease in the interaction with other managers, an enabler for business decisions is required.

From the interviews the companies face issues on information flow within the companies. Staff members in different departments are using different methods or systems to record information. Individual departments develop “island” systems according to their own needs. As such systems are developed for one particular department, the context and format of information matches only the requirements of that department. The same item of information may appear in different contexts and formats within other departments. Electronic exchange of information between departments is impossible. In addition, each department has its own schedule for updating the information. At any one time there may be more than one version of an item of information within the company. Management and operational staff members are unable to determine the accuracy or the context of the information at the time of information exchange. All information must be checked and reconciled before being used.
In addition to the accuracy issue described above, the timeliness of communications is another challenge. When the administrative and manufacturing facilities were both located in the same facility in Hong Kong, staff members could easily find each other to discuss problems and information immediately. Since the relocation of manufacturing facilities to Southern China, face-to-face discussion has become more and more difficult. Communication now relies more on recorded information. There is always a significant time difference between enquiries and responses. Sometimes staff members need to exchange information more than once before the information is clear. The timeliness of the information also becomes an important issue. In the computer age, external parties (suppliers, customers, shippers, etc.) expect a very short response time to their enquiries. There is a strong demand for both timeliness and accuracy of information. An integrated company-wide system to provide unique and up-to-date information is required. Enterprise resource planning is the selected solution.

Beside the accuracy and timeliness of information, inventory management is another issue that benefits from enterprise resource planning. This is a common issue in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China. Inventory records are not always up-to-date. For example, Company 1 needs to increase its stock of different types of paper for selection by customers. The purchase order cycle for the raw material paper is longer than the sales order cycle of paper products. Company 1 requires a system which estimates the use of the different paper types at the beginning of the paper order cycle. Although other companies do not have such long purchase order cycle times, they require careful planning of raw material purchases in order to match the demand from customers. Excess inventory is a common issue which creates a heavy financial burden on the working capital of the interviewed companies. The material requirement planning module of enterprise
resource planning is considered to be the most appropriate function for solving this inventory issue.

5.2.2 E-marketplace Interaction

Q2 How does the development of e-commerce and supply chain management affect the deployment of enterprise resource planning in small and medium sized enterprises?

The second research question is to determine the correlation between external business relations and enterprise resource planning. Computers are widely used in the business environment. In the current computer era, supply chain management, or the transactional marketplace, becomes more and more important. Electronic information exchange between companies is increasing.

However, the interviewed companies report that their business partners (suppliers, customers, shippers, etc.) do not regard information exchange as an important issue. Most of their business partners rely upon telephone, fax and email communication. Most of their suppliers are of the same size as the companies interviewed and have not adopted enterprise resource planning. None of the interviewed companies provides intermediate products in supply streams. Once an order is placed, the most important information required by a customer is the order and its delivery status.

Although the methods of communication have not changed significantly, the response times for business partners have decreased from 3-5 days to 1-2 days in the last ten years, especially regarding customer enquiries. Order changes currently require only a few hours. A timely response to customer enquiries is a challenge to the “order” department.

Most of the companies do not participate in an e-marketplace, though Company 5 and Company 6 are considering the development of customer
portals to allow customers to check the status of their orders. None of the companies identified a need for electronic information exchange as part of enterprise resource planning. However, a timely response to sales orders is identified as a requirement of enterprise resource planning.

5.2.3 Operation between Two Administrative Regions

Q3 How does the operation of small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China influence the development of their strategies on information management?

The third research question discusses the impact of operating in two administrative regions. Many researchers and scholars regard enterprise resource planning as an enabler of business decision-making. One of the objectives of enterprise resource planning is to provide an information system that enhances the efficiency and effectiveness of a business. Information is stored in a single system. Up-to-date information is provided to all users. Redundancy of data is reduced and quality of data is increased.

All six of the companies interviewed moved their manufacturing facilities to a region outside of Hong Kong. The cost of communication is the first issue to be encountered. Before the move, face-to-face discussions and local telephone conversations were the major means of communication. After the move of manufacturing facilities to Southern China, long-distance telephone communication is required. Communication costs increase sharply. Management seeks a balance between effective communication and cost of long-distance telephone calls. Similar problems apply to the exchange of reports and memoranda. Initially, all companies assign staff members to transport such paper documents on a weekly basis between their offices in Hong Kong and their manufacturing facilities in Southern China. In the beginning, the use of email is limited because most of the staff members are not familiar with computers. Experienced (older) staff members insist on
having direct conversations with other staff, either face-to-face or by telephone. They usually delegate assistants to print the emails they receive for them to read and determine a reply which is sent by the delegated assistant. The education level of local workers is low. It requires many months to train them to use computers and email.

At the same time, independent “island” systems are developed by different departments to record information and produce reports. The quality of the information becomes an issue. Users in different departments must verify and/or reconcile the accuracy of the information. Another issue of exchanging information is the timing, as the information is updated, generated and distributed once a week.

Although Company 1 and Company 3 established FTP servers for the exchange of data files, they report that this was not effective. However, it was difficult to determine which of the files stored on the FTP contained the most up-to-date information. Clarification of which is the most recent version of information in a file is required before the information is released for use. This indicates that an integrated enterprise wide system that generates accurate and timely information is required.

5.2.4 Implementation Processes

Q4 How is enterprise resource planning implemented in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?

The fourth research question addresses the implementation process for enterprise resource planning. This includes the changes to the organization in terms of business processes and technology. New business processes, knowledge and skills are adopted by management and new computer software is introduced. All levels of a company face changes to daily
operational tasks as a result of implementing an enterprise resource planning system.

With the exception of Company 5, the interviewed companies have no knowledge of enterprise resource planning at the beginning of the implementation. They rely on external consultants or recommendations from existing users. They treat enterprise resource planning as an off-the-shelf product and expect that the system can be used after some training. The processes offered by enterprise resource planning are standard and they expect they can adopt them easily. If they have queries, they expect to be able to find solutions without difficulty. Migration from existing manual processes to the processes of enterprise resource planning is not addressed during the selection stage. Only Company 6 spends time reviewing more than one enterprise resource planning system at the selection stage.

Most of the companies, with the exception of Company 5 and Company 6, direct little effort to the implementation. Staff training is minimal. The system is tested using only one or two sets of sample data. All companies respond that there are many issues with the selected enterprise resource planning system during the implementation stage, especially relating to data set up, and the mapping of existing business process flow to the enterprise resource planning system. The companies find that they must change existing data formats, and some of their existing processes, in order to meet the requirement of the enterprise resource planning system. However, inter-departmental conflicts hinder these changes. Compromises are required to resolve the conflicts between users from different departments. As a result, Company 1 to Company 4 implement only the material requirement planning module of the enterprise resource planning system. This module is considered by them to be the most cost effective module of the whole enterprise resource planning system. The benefits, better material control and more accurate estimation of material consumption, can be identified immediately after the implementation.
Company 5 establishes an information systems department to develop its own enterprise resource planning system. Senior management considers that a system cannot be found in the market place to match the company’s unique watch manufacturing requirements. Senior management treats the development of the enterprise resource planning system as another operational function of the company. Information systems staff members have regular meetings with all operational departments. They implement the enterprise resource planning system function by function. They complete the system in three years. During the implementation, some functions have required modification many times. The company claims that modifying the developed enterprise resource planning system to match changes to its business environment is the on-going task of the information systems department.

Company 6 establishes an implementation team comprised of representatives from its different departments. The team reviews the requirements, undertakes training, supervises the staff from its own departments in the testing and data conversion processes, discusses conflicts and monitors overall progress. The result of the implementation is superior to that of Company 1 to Company 4.

Only Company 6 has considered and established management measures for organizational changes. Company 5 also considered organizational changes. It developed its own enterprise resource planning system module by module and adjusted system and business processes in parallel.

5.2.5 **Critical Success Factors**

Q5 *Can the critical success factors of implementing enterprise resource planning in large enterprises be applicable to those small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China?*
The fifth and last question explores critical success factors. Earlier research into the implementation of enterprise resource planning identifies 11 critical factors: (a) teamwork and composition; (b) support from top management; (c) business vision and plan; (d) effective communication; (e) project management; (f) project champion; (g) appropriate legacy and business system; (h) change management program; (i) business process re-engineering and limited customization; (j) software testing; and (k) process monitoring and evolution.

In this research, all of the implementations are initiated and supervised by senior management. Five companies form project teams for the implementations. Only Company 4 implements its enterprise resource planning system using EDP staff. Although four companies implement only the basic module of the enterprise resource planning system, they establish a clear business vision for effective and efficient material control and planning of the project at the beginning of the implementation. The implementations can be described as “successfully completed”.

Most of the companies lack knowledge of enterprise resource planning. Only three companies (Company 3, Company 5 and Company 6) investigate what enterprise resource planning is and attempt to formulate a detailed plan to guide their projects.

Senior management of all companies successfully explain the purpose and expectations of enterprise resource planning to lower level employees in their companies. However, effective communication between team members is recognised in only three companies (Company 3, Company 5 and Company 6). These three companies establish monitoring systems and regular project management meetings to measure and reward progress. They also establish performance indicators and reward systems for achieving defined milestones.
All six companies conduct software testing using their own company data, but the extent of the tests differ. Company 3 and Company 6 conduct more detailed testing than the other companies. As a result, they initiate more changes to both the enterprise resource planning system and their own data formats than the other companies. Company 6 uses its existing company information for the development of its enterprise resource planning system which is fully customized to its operations.

Even though three companies formulate detailed work plans for their implementations, no company considers a change management program for its project. Existing practices and the perceived risk of implementing an enterprise resource planning system create a hurdle at the beginning of the implementation. Such resistance leads to a substantial amount of customization of the system. The companies are reluctant to change their existing operations to match the enterprise resource planning systems. No company attempted business processes re-engineering to optimize their existing business prior to the implementation of the enterprise resource planning systems.

Table 1: Key factors affecting the deployment

<table>
<thead>
<tr>
<th>The need of Enterprise Resources Planning</th>
<th>Expansion of businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accuracy of the information</td>
</tr>
<tr>
<td></td>
<td>Timeliness of communication</td>
</tr>
<tr>
<td></td>
<td>Better inventory management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The need of Enterprise Resources Planning</th>
<th>Expansion of businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accuracy of the information</td>
</tr>
<tr>
<td></td>
<td>Timeliness of communication</td>
</tr>
<tr>
<td></td>
<td>Better inventory management</td>
</tr>
</tbody>
</table>

| E-marketplace Interaction | Timeliness of information exchange between partners |

<table>
<thead>
<tr>
<th>Operation between two administrative regions</th>
<th>Reduction of the cost communication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Centralizing the information</td>
</tr>
<tr>
<td></td>
<td>Increasing the quality of information</td>
</tr>
</tbody>
</table>
5.3 Implications of Deployment of Enterprise Resource Planning in Small and Medium Sized Companies with Trading Offices in Hong Kong and Manufacturing Facilities in Southern China

The results indicate that most of the companies studied lack knowledge of both enterprise resource planning and computers. The companies consider that enterprise resource planning systems are simple off-the-shelf software. The primary objective of senior management (usually the owner of the company) is cost savings rather than productivity and operational efficiency. Significant cost savings are achieved by implementing only the materials requirements planning module of the enterprise resource planning system. Once this objective is achieved, they are not willing to spend time and resources on the implementation of the other modules. The cost saving created by modules other than material requirement planning is too abstract and not easy to quantify. Spending on the materials requirements planning module is immediately realised and returned.

Resistance from existing staff members is another major reason for implementing only the material requirements planning module. They claim that implementation of the enterprise resource planning system beyond

<table>
<thead>
<tr>
<th>Implementation process</th>
<th>Lack of Enterprise Resources Planning knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Directing little effort to the implementation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Critical success factors</th>
<th>Participation of senior management</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clear business vision for effective and efficient management control</td>
</tr>
<tr>
<td></td>
<td>Knowledge of Enterprise Resources Planning</td>
</tr>
<tr>
<td></td>
<td>Effective communication between management and staff on the implementation</td>
</tr>
<tr>
<td></td>
<td>Testing of sample data</td>
</tr>
<tr>
<td></td>
<td>Presence of a change management program</td>
</tr>
</tbody>
</table>
material requirements planning is a waste of their time and the benefits cannot be justified.

E-marketplace is not popular within the companies studied as they do not have a need to manage their supply chains by exchanging electronic information. Most of their suppliers operate in the same business mode as the companies. The suppliers are also flexible in their operations, with a thin and flat structure. By contacting the right person, most issues can be solved. However, the demand for a speedy reply to customer queries is increasing. Some companies are considering the establishment of customer portals to allow order enquiries by customers directly. Enterprise resource planning systems provide these facilities.

Support from management, effective communication, project management, software testing, monitoring and evaluation are significant to the success of implementation of an enterprise resource planning system. These five critical factors, also identified by other researchers, are found in all of the interviewed companies. The two companies which implemented most of the enterprise resource planning modules show positive relationships between: (a) teamwork and composition; (b) business vision and planning; and (c) change management. However, change management, business process re-engineering and limited customization of legacy and business systems were never considered by the interviewed companies. This is due to the thin and flat structure of the companies. Managers perform multiple roles in such an organizational structure. This flexibility within the companies is considered to be one of their winning strategies. However, the companies agree that this flexibility will decrease as they expand. Business processes re-engineering will be required at some point in the future.

Complaints are directed towards software providers because they are not familiar with change management, business process re-engineering and limited customization of legacy and business system. Consultants concentrate on technical areas only. They do not provide assistance on the
management of changes or the mapping of existing business flow with system flow. The interviewed companies stated that senior management was not advised of the importance of these factors.

For the development of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China, further promotion of the concepts and difficulties of enterprise resource planning is required. In addition, software providers must improve their knowledge of business processes and change management.

5.4 Limitations of the Dissertation

This research adopts a case study approach to explore issues relating to the adoption and deployment of enterprise resource planning in small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China. The data collection method is based on interviews with people responsible for the implementation of enterprise resource planning in such companies. Each interview is a face-to-face semi-structured in-depth discussion between the researcher and the participant. Owing to time constraints, only six participants, usually the project leaders for enterprise resource planning are interviewed. More time would allow interviews with participants from different functions within companies, and a larger number of companies. This would provide a more comprehensive view of the implementation of enterprise resource planning systems.

5.5 Contributions of the Dissertation

Enterprise resource planning is widely used throughout the world. There has been much research into the implementation of enterprise resource
planning systems in large companies. Research into small and medium sized enterprises is limited. No research appears to have been undertaken on small and medium sized enterprises with trading offices in Hong Kong and manufacturing facilities in Southern China.

This research shows that, in the existing dynamic information era, there is a need for centralized and up-to-dated information within small and medium sized enterprises in Hong Kong. Even though they do not engage in e-commerce, they require quick responses to enquiries from customers. They are demanding systems that show the progress of their operations. Enterprise resource planning system could be one of their solutions.

Financial and human resources for the implementation of enterprise resource planning systems are very limited for small and medium sized enterprises in Hong Kong. These enterprises do not undertake adequate planning prior to purchasing an enterprise resource planning system and do not prepare adequately for its implementation. Their main focus is on cost savings on inventories and up-to-date, accurate information. A standard, simple and easy to use system may be more suitable for them.

Enterprise resource planning is new to small and medium sized enterprises in Hong Kong. Businesses are not familiar with enterprise resource planning. Practitioners of the enterprise resource planning industry must devote more effort to promotion and education in this area. In addition to technology, soft skills (change management, business process re-engineering, etc.) must be considered. The research shows that software consultants are not familiar with such soft skills.

5.6 Implications for Future Research

Small and medium sized enterprises in Hong Kong operating in two different administrative regions are very common today. The theory and
The framework of enterprise resource planning are not fully applicable to this new situation. Further research is required to explore the deployment of enterprise resource planning in such situations. Further research is also required to explore and identify the critical success factors for the implementation of enterprise resource planning in Hong Kong as compared with similar enterprises in the western world.

Lastly, this qualitative research is based on interviewing a small number of senior personnel to explore contemporary issues relating to the development of enterprise resource planning in small and medium sized enterprises with trading office in Hong Kong and manufacturing facilities in Southern China. Future quantitative research, using questionnaires developed from the results of this research, could be directed to staff at all levels participating in the implementation of ERP.
REFERENCES


The Chinese Manufacturers Association of Hong Kong (CMA) 2001, 2001 Survey on CMA Members' E-commerce Development, Hong Kong.

The Chinese Manufacturers Association of Hong Kong (CMA) 2002, Survey on the Business and Management Strategies of CMA Members, Hong Kong.


Miles, M. B. & Huberman, A. M. 1994, Qualitative data analysis: an expanded sourcebook, *Sage Publications*.


APPENDIX 1  Interview Questions

Background
1. Please describe the background of your company.
2. Please describe the information technology strategies of your company.
3. Please describe the use of computer in your company.
4. Please highlight the major issues on the information sharing within your company.
5. How does the organization set up affect the information sharing within your company?

Communication with suppliers and customers
6. Does your company require exchanging data with suppliers / customers?
7. How do you communicate with your suppliers / customers?
8. Are there any other external requirements on the information to be provided?
9. What is the turnaround time of the information required by the suppliers / customers?

E-commerce
10. Is your company conducting e-trading? If no, does your company plan to conduct e-trading in the near future?
11. What benefit does your company gain (or expect to gain) from e-trading?

Implementation of ERP system
12. Has your company implemented any integrated information and communication system? If yes, is it an ERP system?
13. How long has your company been implementing the ERP system?
14. How did your company select the ERP system?
   a. Has any testing and evaluation of the ERP system been done?
b. Has any prior study of the business process of your company been conducted?

15. What are the reasons for adopting an ERP system?

16. Has any customization of the ERP system been made? Why?

17. Has any business process re-engineering been conducted? Why?

18. Did your company employ consultant(s) for the selection and/or implementation of the ERP system? Why?

19. Please describe the process of implementation of the ERP system.
   a. Was there any training in ERP and/or computer knowledge before and/or during the implementation?
   b. What is the attitude of senior management towards the ERP system?
   c. How does your company communicate the implementation of the ERP system to your employees?
   d. Are project teams being formed and/or project management technique being applied?
   e. Are any change management programs being applied?
   f. How does your company monitor and evaluate the progress of the implementation and performance of the ERP system.
APPENDIX 2 Information Sheet

For further information:

Researcher: PUN Ki Wai David  
Tel: +852 8208 2309  
Email: david_unc@punplanet.com

Supervisor: Dr L. G. Whitehouse  
Tel: + 61 409 707 717  
Email: lwhitehouse@bigpond.com

[Insert Date]

Potential Participant  
Organization Name  
Organization address

Project Title: Factors Affecting the Deployment of Enterprise Resource Planning in Small and Medium Sized Enterprises: The Case of Hong Kong

INFORMATION SHEET

Dear Potential Participant,

I am PUN Ki Wai David, a student in the Newcastle Graduate School of Business at the University of Newcastle, Australia, undertaking the degree of Doctor of Business Administration. As part of my studies, I am conducting a research project titled “Factors Affecting the Deployment of Enterprise Resource Planning in Small and Medium Sized Enterprises: The Case of Hong Kong”. You are invited to take part in this research project which aims to understand the issues influencing timely and quality information sharing and success factors in the implementation of enterprise resource planning in HK based SMEs with trading operations in Hong Kong and manufacturing facilities in China.

Please read this Information Statement and be sure you understand its contents before you consent to participate.

Participation in this research is entirely your choice. Only people who give their informed consent will be included in the project. Whether or not you decide to participate, your decision will not disadvantage you in any way. If you do decide to participate, you may withdraw from the project at any time without giving a reason and without penalty.

If you agree to participate, you will be asked to answer questions relating to:
- the information technology strategies of your organization;
- the effect of e-commerce on your organization;
factors affecting the implementation of Enterprise Resource Planning in your organization.

All information collected will be treated as confidential and will be stored securely. Once the information has been analysed, it will be stored securely by the University of Newcastle for a period of five years and then destroyed. Individual participants will not be identified in any reports arising from the project.

If you have any concerns, or would like to know the outcome of this project, please contact my supervisor Dr L. G. Whitehouse at the above address.

Thank you for considering this invitation,

PUN Ki Wai David
Contact number: +852 8208 2309

Complaints Clause:
This project has been approved by the University's Human Research Ethics Committee, Approval No. Bus-Law/110/05A.

The University requires that should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher; or if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, telephone (02 49216333, email HumanEthics@newcastle.edu.au)
APPENDIX 3  
Participant Consent Form

For further information:

Researcher: PUN Ki Wai David
Tel: +852 8208 2309
Email: david_unc@punplanet.com

Supervisor: Dr L. G. Whitehouse
Tel: + 61 409 707 717
Email: lwhitehouse@bigpond.com

[Insert Date]

Potential Participant
Organization Name
Organization address

*Project Title: Factors Affecting Deployment of Enterprise Resource Planning in Small and Medium Sized Enterprises: The Case of Hong Kong*

**PARTICIPANT CONSENT FORM**

I (please print) have read the information on the research project "Factors Affecting the Deployment of Enterprise Resource Planning in Small and Medium Sized Enterprises: The Case of Hong Kong" which is to be conducted by PUN Ki Wai David from the University of Newcastle, Australia, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, a copy of which I have retained.

I understand I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I consent to:

- participate in an in-depth interview that will take approximately 90 minutes;
- attend the in-depth interview which will be held at an office meeting room;
- the audio-taping of my contribution in the in-depth interview;
- review the transcript of the in-depth interview to edit or erase part or all of my contribution.
I understand that all information collected will remain confidential to the researcher. All information collected will be confidential. All information gathered from the in-depth interview will be stored securely and once the information has been analysed the audio tapes and transcripts will be destroyed. My identity will not be revealed without consent to anyone other than the investigator/s conducting the project. Further, I have had the opportunity to have questions answered to my satisfaction.

Print Name:

Signature:

Date:

Complaints Clause:

This project has been approved by the University's Human Research Ethics Committee, Approval No. Bus-Law/110:05A.

The University requires that should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, telephone (02 49216333, email HumanEhtics@newcastle.edu.au)