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STRATEGIC INFORMATION SYSTEMS PLANNING FOR
COMPETITIVE AND CO-OPERATIVE ADVANTAGE
IN A DEVELOPING COUNTRY

by
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Declaration

None of the material contained in this thesis has been submitted for publication prior to the beginning of candidature. Some of the work in the thesis, however, has been published or submitted for publication prior to the completion of this thesis. The publications include refereed international conferences and refereed journals in the UK and USA.

Summary

This thesis is concerned with the emerging role of information systems in the strategies of business in developing countries and the potential for improved business use to significantly increase national levels of utilisation of IT. A report by the United Nations in 1971 called for major efforts to increase the level of utilisation of IT in developing countries in order to accelerate the rate of their economic and social development. The current level of computer utilisation, however, remains low. There is uncertainty as to why this is so since our present understanding of the prevailing rationality in strategic information systems decision-making by indigenous firms is incomplete and has not been adequately captured in any established body of knowledge.

This research sought to help address the problem of low utilisation by conducting exploratory case study research into strategic IS decision-making, and by the development of a framework of good practice to assist indigenous firms in their strategic decision-making. This research contends that the underlying cause of lower levels of utilisation of technology by indigenous companies is their particular environmental and financial circumstances, coupled with a lack of models to assist this management process. Iterative case study research was conducted on manufacturing and banking firms.

The results of this research should be interpreted through the limitations of a single study in a single country, however, it provides a more detailed understanding of the dynamics of SISP by indigenous companies than has been offered previously. The major research outcome is a framework of practical SISP models of decision-making, sectoral placement and stages of development which can be applied to assist firms in their determination of appropriate actions and directions. Moreover, the research processes and techniques utilised can be applied by investigators in other contexts where they seek to examine qualitatively relationships between factors, processes and levels of utilisation of Information Technology.

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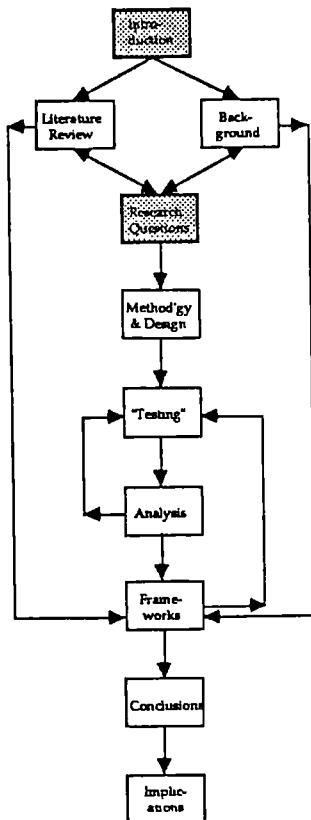
Abbreviations used in this work

ATM	Automated Teller Machine
CEO	Chief Executive Officer
COO	Chief Operating Officer (i.e., head of a SBU)
DSS	Decision Support System
EFTPOS	Electronic Funds Transfer Point Of Sale services.
FHKI	Federation of Hong Kong Industry
HKPC	Hong Kong Productivity Council
IS	Information Systems
IT	Information Technology
JETCO	Joint Electronic Teller Services Limited - joint venture by Hong Kong banks to provide ATM services.
MD	Managing Director
MIS	Management Information System
OA	Office Automation
POS	Point Of Sale services.
PRC	People's Republic of China
SBU	Strategic Business Unit
SISP	Strategic Information Systems Planning
SME	Small / Medium Enterprises

Interview sites

BEA	Bank of East Asia, Limited
BX	BankX requested confidentiality
HKW	Hong Kong Worsted Mills, Ltd
LCHB	Liu Chong Hing Bank Limited
MG	Manhattan Garments (International) Ltd
PK	Peninsula Knitters Ltd
SHK	Sun Hing Knitting Factory Ltd
WLB	Wing Lung Bank, Limited
WTG	Wing Tai Garment Industry Holdings Ltd.

Chapter 1 Introduction



This thesis is concerned with the emerging role of information systems in the strategies of business in developing countries and the potential for improved business use to increase significantly the levels of utilisation of IT in these countries. In this chapter, the relevance and importance of this research are discussed and its links with mainstream IS research examined. The research questions and propositions are presented, followed by a brief outline of subsequent chapters.

1.1 IS/IT in Developing Countries: potential and reality

In 1971 a report by the Secretary-General of the United Nations on the application of computer technology in developing countries noted a very low level of utilisation of computers. In its conclusion, the report called for major efforts to assist developing countries in increasing their level of use of computer technology as,

"its diffusion and sound application can make a significant contribution in accelerating the rate of their economic and social development."

(UN Report in response to Resolution 2458(XXIII), 1971)

Twenty years later, and despite some examples of rapid growth, the current level of computer utilisation is still low for indigenous firms in developing countries. There is also uncertainty as to what hampers a higher level of utilisation. (Bhatnagar 1990, Lind 1991, Avgerou and Land 1992, Odedra-Straub 1993). Based on professional experience and observation it is the contention of this research that the underlying cause of lower levels of utilisation of technology by indigenous companies is their particular environmental and financial circumstances. These circumstances are compounded by a lack of role models and management models to assist strategic decision-making.

Western models dealing with strategic information systems decision-making focus on the firm and its internal functions, approaches and attitudes to the exploitation of IT. These models include two major types: models to locate the firm in relation to the activities of a sector, which indicate the types of management approach to the use of IT (McKenney and McFarlan 1982, Earl 1989), and "phases of development" or "stages of growth" models which identify the

issues and indicate directions for a firm as it develops in its planning, use and management of IT. (Nolan 1979, Earl 1983, 1987, 1988 and 1989, Bhabuta 1988, Hirschheim et al 1988, Galliers and Sutherland 1991).

The cultural, environmental and economic circumstances in the East and West, (or North and South), are obviously and significantly different, however, since these sectoral and stages of growth models do not rely on a particular environment for operation, and since they focus on the firm's own activities, it is contended that these Western models would be suitable for use in developing countries, with some structural modification. If this link can be shown, then irrespective of the particular cultural, environmental and economic conditions facing a firm in a developing country, that firm would have access to models of sectoral placement and stages of development to assist in its strategic decisions to invest in Information Technology.

Subsequent to this initial proposal, other researchers have published details which indicate a growing importance to developing countries of strategic management models. Attempts have been made to apply the stage of growth model in China, (Zhao and Grimshaw, 1991), Singapore (Liang, 1993) and Greece (Doukidis et al, 1993). Doukidis and colleagues find that, "the growth of IT use and management in [Greek small and medium] companies does not follow existing models", and call for the development of a new framework for small and medium enterprises. (ibid).

The objective of this research is to develop such a framework of good practice for indigenous firms in developing countries. This is to be accomplished, initially, by determining the critical factors and processes used in strategic information systems planning (SISP) decisions by these indigenous firms and, subsequently, by devising and testing models which can assist the firms in their proper

utilisation of Information Technology. It is intended that this framework will be based on comparison with and structural modification of Western SISP models. Notwithstanding difficulties in measurement of its benefits (Weill and Olson 1989, Butler Cox 1990, Hochstrasser and Griffiths 1991) Information Systems are believed to be capable of supporting competitive advantage (Porter 1980, Ives and Learmonth 1984), which may be sustained where aligned with a firm's strategic objectives, structure and practices. (Clemons 1986, Scott Morton 1991).

It is believed that this research is firmly grounded in the mainstream of Information Systems research. The Harvard Business School (HBS) Research Colloquium in 1984 identified 15 most important research questions, of which one was, "An examination of management of the diffusion of technology." (McKenney, 1985). This research area has maintained its importance. In the HBS 1991 Research Colloquium, the adoption of computing in organisations remained one of 10 most prominent areas of IS research. Propositions from the propositional inventory published in the 1991 Colloquium have been analysed and applied in this research. (Kraemer and Dutton, 1991).

This research is also applied to an area of importance to practitioners both in developed and developing countries. Surveys from 1980 to 1989 in the USA established strategic planning and associated areas as the single most critical issue facing IS management in the 1980's. (Niederman et al, 1991). Similar emphasis has been given to strategic information systems planning by management in UK and Australia. (Parker and Idundun 1988, Watson and Brancheau 1991, Galliers et al 1994). Less attention has been given to surveying management issues in developing countries, although separate comparisons of issues in Singapore, Taiwan and Hong Kong have been conducted. The results from Singapore and Taiwan, while being quite tentative, indicate greater current emphasis on short term issues than in developed countries but with an increasing future

importance being given to strategic planning. (Rao et al 1987, Harrison and Farn 1990). A survey undertaken in Hong Kong in 1990 showed more of a general alignment with Western rankings. The top issue of concern was retaining, recruiting and training IT staff, which has a short term orientation, however, this issue was closely followed by IS/IT planning. Seven of the top ten issues in Hong Kong were included in Western studies. (Saxena and Gulati, 1990).

The contribution of this research to Information Systems is seen in five areas:

- Exploratory and confirmatory research into the identification of SISP factors and processes used in the adoption and diffusion of IT.
- The devising of SISP models for factors and processes used in the adoption and diffusion of IT.
- The application of existing SISP models of placement and progression and their subsequent review and revision based on the applications.
- Identification of differences in SISP activities between organisations in Western and Eastern countries, with subsequent impact on IS theory.
- The application and review of a rigorous framework for longitudinal case study research based on current IS research theory, particularly as proposed by Yin (1989).

This research focuses on IS research in developing countries, in particular, to which it contributes by:

- undertaking comparative research into SISP decision-making activities in organisations in developing and developed countries.
- providing additional linkages with mainstream IS research theory.

- development of SISP models for sectoral placement, IS/IT progression and investment decision-making which are specifically designed to assist firms in developing countries.
- providing an up to date framework for conducting IS research in developing countries.

The research aims at supplying a more detailed understanding of the dynamics of SISP undertaken by indigenous companies in developing countries than has previously been offered. This aim has been recognised as being an important aspect of efforts to increase the level of IT in developing countries.

Unfortunately, little research is focused on this area, as this recent call for more research shows:

"There are significant aspects of information systems in developing countries which are poorly understood. These include: the capacity for and the process of organisational reform of institutions such as government bureaucracies, or small size enterprises; the prevailing rationality in decision-making processes; and the cultural aspects which affect the use and value of information, the communication and decision-making processes and the work procedures. Still, research in such areas is almost non-existent." (Avgerou and Land, 1992).

Empirical research, consisting of case studies of indigenous firms in two sectors: manufacturing and banking, was undertaken in two iterative phases in 1992 and 1993 in Hong Kong. The research project received strong support from the Hong Kong Productivity Council, the Federation of Hong Kong Industries and the Chinese Banks' Association.

1.2 SISP research in Developing Countries

The previously mentioned report by the Secretary-General of the United Nations in 1971 noted a very low level of utilisation of computers by developing countries and called for major efforts to increase this level in order to accelerate the rate of their economic and social development. Despite this noble objective and a high level of optimism, the current level of computer utilisation is still low for indigenous firms in developing countries, with uncertainty as to why this is so. (Bhatnagar 1990, Lind 1991, Avgerou and Land 1992, Odedra-Straub 1993). While concern about this situation has been a consistent theme for researchers in recent years there are many aspects which remain unresolved. In 1988 the International Federation of Information Processing (IFIP) convened a conference on IT in Developing Countries. Two of the five major objectives of the Conference dealt with "strategies, methodologies and procedures for the application of computers" and "major problems in relation to the development and use of information systems in developing countries". (Bhatnagar and Bjorn-Andersen, 1990).

A Southeast Asia Information Technology Organisation (SITO) Conference was held in Hong Kong in September 1990 with the theme: "Indigenisation of Information Technology". This Conference, with more than twenty presenters from seven countries highlighted the lack of research and knowledge on the theme. In March 1992 the Conference of IFIP WG 9.4 (Social implications of computers in developing countries) was held in Nairobi, Kenya. Fifty delegates from twenty countries participated in the conference. One of the four major issues explored was the availability of "design approaches and methodologies which are especially suitable for promoting diffusion of IT applications". (Bhatnagar and Odedra, 1992). The 1994 IFIP 9.4 Conference to be held in

Havana, Cuba, has as one of its major themes, "increasing the competitiveness of business".

These background details are included to show the sustained interest in the question of the utilisation of computers and IT in developing countries, and the close alignment between important research issues in mainstream IS research and in IS research in developing countries. Unfortunately, and notwithstanding the level of sustained interest, little practical assistance for firms has emerged. Most studies focus on empirical examples which highlight problems in the utilisation of IT. Also, there has been a concentration on national policy issues and the IT experiences of government or quasi-governmental bodies with minimal consideration of the business sector. Due to the economic importance of the private sector (as outlined in Porter 1990), this research focuses on competitive enterprises.

1.3 Thesis

In 1991 a review of publications on IT and developing countries found the most important perceived advantages of IT were employment opportunities, acceleration in industrial development, improvement in levels of administrative efficiency in government, the development of service industries and enhanced opportunities for trade. (Saraswat and Gorgone, 1991). The reasons which have been propounded to explain the low utilisation of IT range from national policies designed to limit its use due to concern that it would displace labour, (Odedra-Straub (1993) identifies this as being largely a historical concern, but it is interesting in comparison with the current perceived advantage of employment creation found by Saraswat and Gorgone above), to the determination of cultural incompatibilities between West and East. (e.g., Tricker 1988, Zhang and Angell 1990, Woherem 1992).

Based on personal observation and professional experience, however, it is the contention of this thesis that indigenous firms in Hong Kong (as an example of a developing country) make decisions to invest or not to invest in Information Technology for substantially similar reasons to firms in advanced economies. This research will attempt to show that a major cause of lower levels of utilisation of technology by indigenous companies is the environmental and financial situation rather than cultural factors. It is further contended that Western SISP models would be suitable for use in developing countries, with some structural modification. If this link can be shown, then irrespective of the particular and adverse environmental conditions facing a firm in a developing country, the firm would have access to models of sectoral placement and stages of development to assist in its strategic decisions to invest in Information Technology.

The objective of this research is to determine the critical factors and processes used in SISP decisions by indigenous companies in Hong Kong, and, by comparison with and structural modification of Western models, to devise models which can assist firms in developing countries to utilise Information Technology effectively. Indigenous Hong Kong firms are considered most appropriate as role models for this research since Hong Kong has a non-Western culture; there is minimal positive or negative government influence or intervention regarding IT in the economy; Hong Kong firms have been internationally competitive and successful and, in certain sectors, have a low level of utilisation of IT.

1.4 Research Questions and Propositions

Research Objectives

The objectives of this research are to:

1. determine the critical factors and processes used in SISP decisions by indigenous companies in Hong Kong, and
2. devise one or more models of SISP by comparison with and structural modification of Western models.

The purpose of these models is to provide assistance to indigenous firms in developing their level of utilisation of Information Technology for the dual purposes of improved efficiency and competitive or co-operative advantage. Since Hong Kong shares many of its characteristics with developing countries, it is anticipated that these models will be of general applicability to developing countries.

Due to the documented importance of the research area to developing countries, the absence of existing paradigms and the uncertainty as to the causes of the low level of utilisation, the research is initially exploratory. Subsequent to the exploratory stage, the research enters a developmental stage as required to devise practical models of SISP.

Research Questions

Questions considered by this research are:

1. How do indigenous organisations decide to use IT?
2. How do indigenous organisations decide not to use IT?

3. What factors are most important in these decisions?
4. What processes are most important in these decisions?
5. How do these factors compare with those used by organisations in Western countries in their decisions to invest in IT?
6. How do these processes compare with those used by organisations in Western countries in their decisions to invest in IT?
7. Can Western models of the utilisation of IT be structurally amended to enable their use by firms in developing countries?

It is accepted that these questions are very broad and encompass a large body of knowledge in a range of disciplines. The problem of IT utilisation, however, is real and significant, both in practical terms and in terms of IS research. There is reasonable concern that limiting the research questions would limit the applicability of the outcome of the research. It is noted that there is an increasing tendency for research in both IS and in international business towards multi-disciplinary research. Multi-disciplinary research is seen as being necessary to enable more realistic treatment of the practical problems being faced.

The problem of what is achievable in terms of workload must be resolved by the scope and the depth of research. The scope will limit the evaluation of Western models to two, which should be sufficient to confirm or disconfirm the thesis. The depth will be sufficient to establish the viability of the thesis without being superficial.

Research Propositions

Notwithstanding the exploratory nature of the the first six research questions, and the lack of available research in this multi-disciplinary area, predictive propositions have been identified.

Proposition 1. There are common factors in the decisions of prominent competitive indigenous organisations to utilise IT. These common factors may be grouped, for example, by economic sector or size of organisation. Proposition 1 addresses research questions 1 and 3.

In 1992 Bacon published a landmark paper on the use of decision criteria in the selection of IS/IT investments. He surveyed 80 large companies in USA, UK, Australia and New Zealand to identify their decision-making practices. In this paper he reviews previous work in the area and finds that,

"little empirical work has been done on the financial and other criteria actually used in practice in deciding on project selection and capital investments in IST." (Bacon, 1992)

This is a largely accurate but somewhat surprising statement as decision-making factors and processes would seem to have a significant impact on the effectiveness of IT investments. An earlier study by Earl (conducted in 1988-89 but reported most recently in 1993) indicates why this may be. Earl collected details on the SISP practices of very large UK firms - their aims, objectives, benefits, success factors, problems, procedures and methods - but not their decision-making factors! (Earl, 1993). Studies such as this serve to emphasise the complexity of SISP practices and the breadth of this area as a research subject.

Bacon categorises decision criteria (or factors) into primary - the decision to or not to invest, and secondary - the decision to purchase a specific product. The results of this survey of primary decision criteria can be seen in Table 1.1.

Category	Criteria	Ranking
Management	Support explicit business objectives	1
Financial	DCF - Internal Rate of Return	2
Management	Support implicit business objectives	3
Financial	DCF - Net Present Value	4
Financial	Payback method	5
Management	Response to competitive systems	6
Management	Support management decision-making	7
Financial	Budgetary constraint	8
Management	Probability of achieving results	9
Financial	Average / Accounting Rate of Return	10
Development	Probability of project completion	11
Development	Technical / system requirements	12
Management	Legal / governmental requirements	13
Financial	DCF - Profitability Index Method	14
Development	Introduce / learn new technology	15

Table 1.1. Value ranking of IS/IT Investment / Project Selection criteria.
(Adapted from Bacon, 1992).

Bacon (1992) finds common decision-making factors, by size of organisation, across several industry sectors. Nine out of ten companies surveyed in the USA, UK, Australia and New Zealand use the top ranking criterion - support of explicit business objectives. 75% of companies use a form of DCF, 67% apply budgetary constraints, and 61% respond to competitive systems. No similar studies have been identified which document decision-making factors in developing countries.

Proposition 2. The influence of environmental and financial factors are of prime importance in the decision of a competitive indigenous organisation to utilise or not to utilise Information Technology. Proposition 2 addresses research questions 1, 2 and 3. Bacon's work provides the framework for this exploratory proposition.

Proposition 3. There are common purposes in the processes of decision-making of competitive indigenous organisations to utilise or not to utilise Information Technology. Proposition 3 addresses research questions 1 and 4.

There is a larger body of knowledge in the area of such processes on which this proposition can be based. Rockart and Crescenzi (1984) give an overview of the critical processes in IT decision-making. They identify three main areas of processes: the link between IS and the management needs of the business, prioritisation, and prototyping / trailing. Huff and Munro (1985) give details of four separate models of the IT assessment and adoption process. The models are dependent on the relative emphasis given by firms to technology and to business issues. The emphasis varies from technology driven solutions in search of problems to business issues seeking solutions. Decision-making processes were found to differ according to the emphasis.

Parker et al (1989) find that the starting point for planning and decision-making processes is a common business and technology vision. The particular processes may be formal (e.g., establishment of a special planning group with a fixed agenda) or informal (e.g., interaction over time between concerned management). Western firms show great diversity in decision-making processes, but uniformity in purpose.

Few details are available on the processes utilised by firms in developing countries. Yap et al (1992) identify some processes in an examination of success factors in Singapore's small businesses. These processes in the planning to execution phase include: use of a consultant, vendor assistance, CEO involvement in decision processes, user involvement in decision processes. These processes are considered in more depth in section 2.4 below.

Proposition 4. The factors and processes are substantially similar to those used in Western organisations, as shown in contemporary models of SISP.

Proposition 4 addresses research questions 5 and 6.

Details of factors and processes are provided above. If the research outcomes are found to be confirmatory they will support the devising of SISP models for developing countries.

Proposition 5. This proposition is made up of a series of propositions seeking to establish areas of similar environmental characteristics between developing and developed countries which will support the previous propositions in resolving research question 7. In order to support proposition 4, it will be necessary to show that the characteristics of IT usage bear some similarities with those in Western economies. The following research propositions have been studied in the West and will be examined in this research. All of these propositions relate to environmental factors, and all have implications for analysis of low levels of utilisation of IT.

Note that of the following propositions, 5.1 to 5.5 are from Kraemer in the HBS Research Colloquium (1991). Proposition 5.6 is from Li and Rogers (1991), 5.7 from Galliers and Sutherland (1991) and 5.8 from Earl (1989).

5.1 Larger organisations are earlier adopters of IS, and use them more extensively.

As more than 95% of Hong Kong firms employ fewer than 50 persons, implications between company size and use of IT are important as an explanation for utilisation rates. Early IS research found a link between organisation size and use of IT. Gremillion's study (1984) was of National Forest

Service units, which may not be directly applicable. Raymond's (1985) survey of 464 manufacturing firms may be more relevant. Both Gremillion's and Raymond's studies are disconfirmatory.

5.2 Organisational size is associated with the sophistication of IS.

A confirmatory survey of MIS directors in business firms found that the larger firms used sophisticated IS systems such as computer graphics more frequently than smaller firms. (Lehman et al, 1986). Li and Rogers (1991) surveyed 123 companies in the USA. They found company size to have no significant effect on the level of sophistication. Differences in findings between these two researchers may be due to differences in definitions of size. Li and Rogers ranked firms by annual sales, with small classified as being less than \$US 100 million. By international standards, this value of turnover would classify large companies, not small. Li and Rogers smallest company grouping by staff numbers was 500 or less, with 90 of the 123 companies employing 2,000 or more staff. The classification of companies by size is explored further in section 3.3 below on site selection.

5.3 Larger organisations have both a higher proportion of managers and a higher proportion of information workers than smaller organisations.

5.4 Organisations with more knowledge workers and information workers versus material workers tend to use computers.

5.5 The adoption of computers has no relationship to overall profitability, regardless of industry sector.

Implications of these propositions, all from Yap and Walsham (1986), relate to the possibility of linkages between size, operations and performance and use of IT as pertinent factors in the level of use of IT. These findings were based on a

survey in 1984 of 638 small to medium firms in the UK service sector. Turner's (1985) findings in an earlier study of 58 US banks support proposition 5.5.

5.6 Regardless of company size, IS is being used primarily for operational and management controls rather than at a strategic level. (Li and Rogers, 1991)

This proposition is to support comparison of characteristics of IS use in firms in developing and developed countries.

5.7 Information systems in organisations move through stages (phases) in their evolution. (Nolan 1979 and 1985, Earl 1983, 1987, 1988, and 1989, Bhabuta 1988, Hirschheim et al 1988, Galliers and Sutherland 1991).

Nolan's stages of growth model (1979, 1985) is seminal in information systems. (Earl, 1989). Its popularity was found to be "probably due to its bold approach to dealing with a phenomenon of great complexity in a straightforward and clever manner." (King and Kraemer, 1984). The model has been developed over time providing greater explanations and more characteristics of each stage. The benefit to managers in developed, as well as developing, countries lies in the concept of orderly growth, with assistance provided to identify critical issues and to set directions at each stage.

5.8 Firms can be positioned in a strategic grid according to the present and likely future impact of IS/IT. (McFarlan and McKenney 1983, Earl 1989).

As shown in Table 2.9, the axes of the strategic grid are the strategic impact of existing operating systems, and the strategic impact of application development (or acquisition) portfolio. The strategic grid can then be used to indicate the types

of management approach to the use of IT. This concept of sectoral placement could be of considerable assistance to firms in developing countries.

As can be seen from the propositions above, this research is multi-disciplinary. Information systems are complex and application oriented, so research into information systems must consider not only the discipline of technology (computer science) but also other disciplines which include cognitive psychology, management science and social psychology (Keen 1987, Land 1992). SISP focuses on strategic matters, frequently in business, so these sub-disciplines also must be taken into account. Consequently, eminent researchers in IS have called for increased levels of multi-disciplinary research. (McFarlan 1985, Davis 1985, Swanson 1987, Earl 1987, Walsham 1991, Land 1992, Galliers 1993). Business in developing countries incorporates sub-disciplines of international business. Researchers in international business have also called for multi-disciplinary research. (Buckley 1991, Macharzina and Engelhard 1991).

Unfortunately, multi-disciplinary research can be a high risk activity. (McFarlan, 1985). It is complex, frequently longitudinal and is applied against a moving target of technology. Many IS researchers possess strong technical skills but lack the tools and perspectives necessary for cross disciplinary research. While these skills are being acquired and applied, the mainstream of IS continues, but at a much faster rate than in other disciplines. Nonetheless, multi-disciplinary IS research is considered necessary for the development of practical outcomes since information systems do not operate in isolation. (ibid).

The research questions and propositions identified above meet the requirements specified by Lee (1989) for case study research to be considered scientific, in that they are:

- falsifiable (i.e., research questions and propositions contain the potential to be shown to be false).
- are logically consistent (research questions and propositions are not mutually contradictory).
- at least as explanatory, or predictive, as any competing theory.
- potentially able to survive attempts made at their falsification. While being falsifiable, the research questions and propositions should survive the research.

The future possibility of disconfirmatory studies is always present. The application of rigorous site selection criteria, however, supports analytic generalisations from the research. The research is designed to generate preliminary conclusions regarding these research questions and propositions which could serve as a basis for subsequent studies. Based on these preliminary conclusions, models will be developed for practical application in SISF by firms and organisations. These models could also serve as a basis for subsequent studies both within Hong Kong and in other developing countries.

1.5 Overview of the Chapters

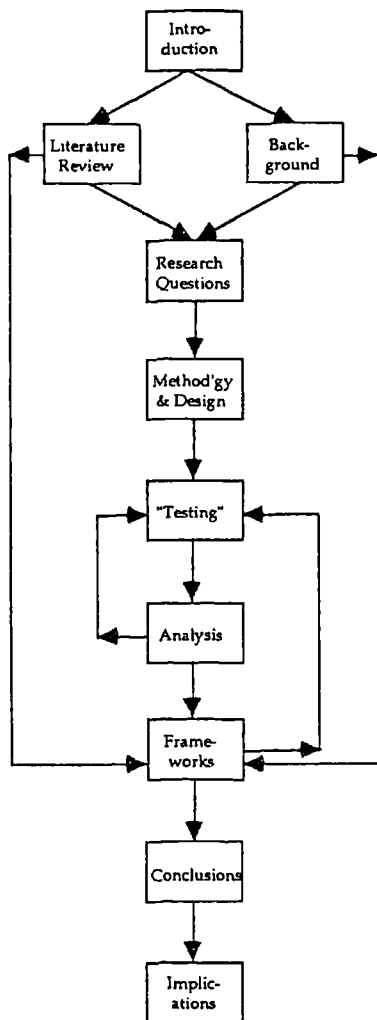


Figure 1.1. Major processes of this research

The major processes of this research have been represented in Figure 1.1. These processes are included in the dissertation as follows: Chapter 1: introduction and research questions; Chapter 2: literature review and background details; Chapter 3: research frameworks, methodology and design, testing and analysis; Chapter 4: frameworks of research outcomes and Chapters 5 and 6, the conclusions and implications, respectively.

Each chapter commences with an overview and concludes with a summary.

1.6 Definition of terms

This research is directed at SISP for competitive and co-operative advantage in a developing country. These major terms are defined as used in this work.

Information Systems are viewed in a broad sense. In addition to the application of IT in support of more traditional financial and administrative operations, Information Systems are seen as utilising Information Technologies such as computer aided design systems and computer controlled manufacturing plant. (Porter and Millar, 1985). Since IS focuses on applications of IT, the orientation in this work is towards broader, context-rich 'soft' systems rather than the narrower, purely technical concerns of computer-based systems. (Checkland 1981, Keen 1987)

The definition adopted for Strategic Information Systems Planning is based on Lederer and Sethi's (1988) broad dichotomous view, which on one side includes: "the process of identifying a portfolio of computer-based applications that will assist an organisation in executing its business plans and realising its business goals." This area of SISP is seen as encompassing associated functions such as information management, infrastructure and strategic implementation issues as well as recent developments which include business process re-engineering and inter-organisational systems. On the other side of the dichotomy SISP incorporates: "searching for applications with a high impact and the ability to create an advantage over competitors." This second area of SISP is seen as including environmental and technological scanning as well as the generation of new products and IS/IT based changes in the balance of power in supplier relationships. (McFarlan 1984, Clemons 1986).

Competitive advantage represents the degree to which a potential or actual project can provide an advantage in the market place. Porter and Millar (1985) identify three basic paths for a company seeking competitive advantage:

- Altering the industry structure by changing the competitive relationship between buyers, suppliers, potential entrants, substitutes or rivals.
- Improving the company's position in its existing business by differentiating its products, services or changing the competitive scope of the business.
- Creating new business opportunities.

Co-operative advantage occurs where self interest is furthered (but not replaced) by common interest and firms achieve mutual advantage through co-operative action. An example is reduction in individual cost due to economies of scale or elimination of duplicated processes (such as through electronic data interchange). (Rotemberg and Saloner, 1991). A range of possible avenues for co-operative action has been proposed including suggestions that firms should co-operate on infrastructure projects while keeping leading edge research and development to themselves (Cane, 1992) and that co-operation may be appropriate for mature markets where advantages of preemptive innovation are limited. (Rotemberg and Saloner, 1991). A significant co-operative advantage is the potential for small firms to reduce the cost of competition by banding together to form co-operative product or service providers (Yates and Benjamin, 1991) which may be important for local firms in developing countries particularly when they face competition from overseas firms. Co-operative efforts for developing countries could be in joint sourcing or development of manufacturing support systems, joint networks for the provision of electronic banking services or in strategic alliances to develop critically needed IT skills.

There is some difficulty in defining exactly what is a developing country. In 1988 the International Federation of Information Processing (IFIP) convened a conference on IT in Developing Countries. Not one of the more than twenty papers defined "developing countries". Countries as diverse as China, Greece, Bangladesh and Brazil have been classified as Developing Countries. Avgerou (1990) notes:

"Any attempt to generalize in studies concerning developing countries faces the problem of the enormous differences between them."

These differences can be seen readily, even within the region, by the following contrasts: the Gross National Product of Taiwan is more than 100 times greater than that of Mongolia; the number of people per telephone ranges from 2 in Singapore, through 126 in India to 1429 in Cambodia; the literacy rate ranges from 93% in Thailand and the Philippines to 29% in Afghanistan and 26% in Nepal. (source: Asia Week, 4 August 1993, p12). All are classified as developing countries.

Lu and Farrell (1990) provide a summary of the conditions and management practices of developing countries (see Table 2.1). Hong Kong does not exactly fit this pattern but neither does Singapore, Taiwan or South Korea, all of which are designated as developing countries. The obverse case should be considered: is Hong Kong a developed country comparable to countries in Western Europe or North America? Clearly not! Therefore, must it be classified as developing? Technically, Hong Kong is not even a country, it is presently an overseas territory of the UK government, and after 1997 is to be a 'Special Autonomous Region' within China.

It is beyond the scope of this dissertation to resolve this issue. The World Bank's World Development Report 1992 provides a classification of Developing Countries. The World Bank's designation is based either on United Nations classification or is an economy "regarded as developing by their authorities", (World Bank, 1992). The World Bank Report uses the term "country" to refer to economies, but states this "should not imply judgment by the Bank about the legal or other status of a territory". This source was recommended by the Chair of IFIP WG 9.4, Social Implications of Computers in Developing Countries, in private correspondence. For the purposes of this work it is sufficient to acknowledge Hong Kong's designation as a developing country by the World Bank and also by the Asian Development Bank; its acceptance as a developing country in publications (e.g., Nilsen 1978, Lu and Farrell 1990, Okot-Uma 1992) and to recognise that Hong Kong shares sufficient characteristics with developing countries for results from research conducted in Hong Kong to be *prima facie* applicable to developing countries. The issue is of importance only as a means of assistance to developing countries, as there is currently a scarcity of research in this area. For this reason, this research has been designed to be more widely applicable than just dealing with Hong Kong. Comparisons between developed and developing economies frequently refer to countries collectively as belonging to the North or the South and the West or the East respectively. As this research is set in Asia the collective terms West and East are appropriate. Where reference is made in this work to East and West, however, it should be seen as referring to differences between developing and developed countries in general, and not necessarily restricted to Asia.

1.7 Summary

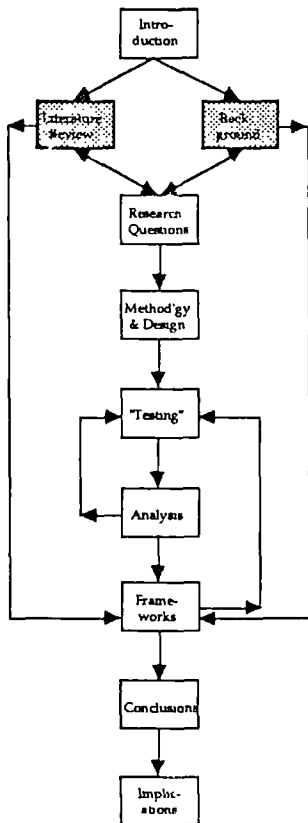
IS/IT is seen as having the capability to accelerate the rate of economic and social development in developing countries, however, the level of computer

utilisation by indigenous enterprises in these countries is low. There is uncertainty as to why this is so since the current rationality of strategic information systems decision-making practices by these indigenous enterprises has not been formally or completely documented. This research seeks to help address the problem of low utilisation by conducting exploratory case study research into the strategic IS decision-making practices of enterprises in Hong Kong and by the development of a framework of good practice to assist indigenous firms in their strategic decision-making. This chapter stated the contentions of this research that:

- indigenous enterprises make decisions to invest or not to invest in Information Technology for substantially similar reasons to firms in developed countries.
- the reason for a lower level of utilisation of technology by indigenous companies is the particular environmental and financial situation faced by these companies.
- Western SISP models would be suitable for use in developing countries, with some structural modification.

If a framework of good practice can be developed from this research, then irrespective of the environmental circumstances facing a firm in a developing country, that firm would have access to factor and process models and models of sectoral placement and stages of development to assist in its strategic decisions to invest in Information Technology. The level of utilisation of IT by business is seen as being important as there is the potential for sustained improvements in business use to significantly increase levels of utilisation of IT in developing countries.

2. Literature Reviews and Background



This chapter provides the conceptual foundation and structure of the thesis by presenting the current status of knowledge in areas of concern. Strategic decision-making in developing countries is described with specific attention given to the range of potential factors and processes. Profiles of developing countries in general and Hong Kong in particular are presented. Two Western models of SISP are examined to determine their potential applicability to developing countries.

Due to the multi-disciplinary nature of the thesis, it must be grounded in several areas. Literature reviews were conducted to examine critically and to determine the current status of research of:

- SISP in developing countries,
- SISP and use of IT in Hong Kong,
- Western models of SISP,
- IS research frameworks.

In addition, an ongoing review of reports, surveys and research literature was carried out to create a profile on Hong Kong and establish the level of adoption and utilisation of IS/IT in Hong Kong.

2.1 SISP in developing countries: a taxonomy of factors and processes

Based on published research, the range of potential factors and processes relating to SISP decision-making are defined.

SISP factors

Reasons for the low level of utilisation of IT have been attributed by different researchers to various cultural and environmental factors. Lu and Farrell (1990) provide an important framework within which environmental and other factors can be considered and within which empirical studies can be placed. They identify six major macro / environmental differences between developed and developing countries which were seen as having an important influence in IS development and use. Table 2.1 refers.

Factor	Impact in developing countries
Cultural conditions	<ul style="list-style-type: none"> • at a macro level, culture permeates all aspects of a society, i.e., all factors. • at an organisational level, culture governs inter-personal behaviour and since IS activities are group activities, culture has an impact. • difficulties associated with non-native language products. • precision of computer systems may conflict with local practices.
Economic and social conditions	<ul style="list-style-type: none"> • information and perceptions are culturally determined. • wage and price levels lower. • IT prices higher. • businesses smaller and family owned so policies and operating procedures lack formal structure.
Political/ legal conditions	<ul style="list-style-type: none"> • national and social policies e.g., on full employment, nationalisation, support for IT use; • legal environment such as copyright protection and enforcement.
National infrastructure conditions	<ul style="list-style-type: none"> • telecommunications and power supplies often not well developed.
Educational conditions	<ul style="list-style-type: none"> • critical shortage of IS professionals especially those with application experience. • end users / managers computer illiterate so are often over optimistic about IT capabilities.
Management practices	<ul style="list-style-type: none"> • short to medium planning horizons . • informal ad hoc policies and plans. • little use of specialised staff. • unclear definitions of authority e.g., no formal organisation chart. • high degree of centralisation. • leadership style autocratic or paternalistic.

Table 2.1. Differences between developed and developing countries which can impact IS use and development. (Derived from Lu and Farrell, 1990).

A recent review of existing literature on factors influencing success or failure of IT in developing countries supports the categorisation of these factors. (Odedra-Straub, 1993). This framework will be used as a base of the study of factors influencing IT diffusion.

Cultural conditions

Culture has been defined as:

"the collective programming of the mind that distinguishes the members of one category of people from those of another." (Hofstede and Bond, 1988).

Culture can be seen as operating at three interdependent levels. The base level is the world of values and ideals which makes a society distinct from others. The second level contains the elements of interpersonal behaviour and the third level is that of institutions which includes forms of organisation and legal and political systems. (Redding, 1982). Consequently, culture is seen as applying to national or ethnic as well as corporate culture. The issue of concern is whether low levels of utilisation of IT in developing countries can be attributed to culture as a basis for resistance to change in general and to IT-based change in particular. Research on the effect of culture in decisions to utilise IT is inconclusive with researchers finding support for both sides of the argument and also for neither side. Since the resolution of this question would require a major research focus beyond the scope of this work no further investigation of the importance of culture will be made. Recommendations for further research in this area are made in section 6.4 below.

Economic and social conditions

The three major areas of impact highlighted for this factor in Table 2.2 above are wage and price levels, IT prices and smaller family owned businesses. In developing countries, wage and price levels are lower than in developed countries. Note Table 2.3 below, an international comparison of labour costs in the clothing industry, which shows that the cost of labour in a range of developing countries comprises between 3% and 42% of the comparable wage

cost in the USA. Consequently, there is significantly less incentive in developing countries to replace labour with capital intensive technology.

IT prices in developing countries are frequently much higher due to transport, duties and tariffs, higher vendor cost structures and lack of competition. (Odedra 1992, Odedra-Straub 1993). A survey of 123 papers presented at international conferences and published in journals found the major perceived disadvantage of IT in developing countries was its high cost. (Saraswat and Gorgone, 1991) This compounds the disincentive for labour replacement by technology.

Developing countries have a large proportion of small companies many of which are family owned. Yavas et al (1985) find that smaller family owned businesses with less formal procedures are less likely to utilise computers.

Political / legal conditions

The frequent calls for national policies and conditions which support the utilisation of IT are an indication of the necessity for these policies. These conditions extend far beyond national Information Technology strategies such as in Singapore, South Korea or Bangladesh and range from lowering of customs barriers on imported IT through copyright protection for software to mechanisms to encourage the use of IT. (Siddik 1990, Bhatnajar 1992, Odedra-Straub 1993, Liang 1993)

National infrastructure

Restricted availability of telecommunications networks and unreliable power supplies can act as constraints on the level the use of IT. (Bhatnajar 1992, Avgerou and Land 1992, Burgelman 1992)

Educational conditions

The critical necessity for relevant and appropriate education for IS professionals and users alike is well documented and seen as applying to most, if not all, developing countries. (Bhatnagar 1992, Odedra 1992, Okot-uma 1992, Owolabe 1992 and others).

Management practices

Management practices shown in Table 2.1 above have been confirmed by Yavas et al (1985) as being representative of those in developing countries. Clearly this is not to cast all organisations in the same mould as variations in practices will occur based on particular circumstances. Sufficient numbers of researchers, however, have commented on similar practices for them to be considered typical. (e.g., Yavas et al 1985, Redding and Wong 1986, Tricker 1988, Harrison and Farn 1990). Management practices are a most important factor, and the focus of this research, which is consistent with the suggestion that the most urgent IS/T problems in developing countries are managerial rather than technical. (Mohan et al, 1990).

SISP processes

Western firms show great diversity in SISP decision-making processes (Parker et al 1989, Earl 1993) and the level of quality of those processes has been found, in Western firms, to be a significant influence on the contribution of IT to a firm's performance. (Premkumar and King, 1991). Little is known, however, about the SISP processes utilised by firms in developing countries. Calls which have been made for further research into decisions to utilise IT include processes as well as factors. (Avgerou and Land, 1992). Yap et al (1992) identify some processes in an examination of success factors in Singapore's small businesses. These processes

include: use of a consultant, vendor assistance, CEO involvement in decision processes, user involvement in decision processes.

Based on two cases in Africa, Bell and Wood-Harper (1990) consider modifications to be necessary to the Western developed Data-Pro Recommended Processes to facilitate their application in developing countries. To the basic processes of requirements specification, information gathering on existing systems, short list, systems evaluation, reference site discussions, conducting benchmarks, decision-making and contract negotiation, installation and review, they add additional feedback loops for all steps from information gathering to benchmarking. While being interesting, this work does not identify the processes actually being used.

2.2 Outline profile of Hong Kong

Hong Kong is a British-governed overseas territory. It has a population of approximately six million living in an area of some 1000 square kilometres. The population is not spread evenly throughout the territory. More than 70% of the land is designated undeveloped. Less than 1% is available for industrial purposes. Hong Kong enjoys one of the highest per capita incomes in Asia, and in July 1997 it will become a Special Administrative Region of the People's Republic of China.

Hong Kong, one of the four 'Dragons' of Asia (with Singapore, South Korea and Taiwan), is designated by the World Bank as a developing country. It would seem that this booming, bustling economy would have little in common with many developing countries. As argued above, there are great difficulties in defining the characteristics of developing countries as a whole because they are so diverse. (Avgerou, 1990). One characteristic that Hong Kong certainly shares

with developing countries in general is concern over low levels of utilization of IT by indigenous firms. Government initiatives have been implemented to raise this level of utilisation. Unfortunately, as is the case in many developing countries, there are few statistics available to show the full extent of this situation. There has been little or no research into either the reasons for this low level of utilisation, or how to improve the utilisation level.

It is important to compare Hong Kong's profile with differences between developed and developing countries which can impact IS use and development, as shown in Table 2.1 above. Apart from infrastructure, and the lack of national policies which could constrain the use of IT, it can be seen in Table 2.2 that Hong Kong shares the factors which differentiate developing countries from developed countries and hence models developed as a result of research in Hong Kong may well be appropriate to developing countries in general.

Factor	Impact in Hong Kong
Cultural conditions	<ul style="list-style-type: none"> • In the population of nearly six million, of which more than 98% are Chinese, cultural influences are as strong in Hong Kong as in other Chinese societies. While both English and Chinese are official languages, frequent concerns have been expressed about the general population's poor level of abilities in English.
Economic and social conditions	<ul style="list-style-type: none"> • All conditions highlighted for developing countries apply to Hong Kong.
Political / legal conditions	<ul style="list-style-type: none"> • No national / social policies on full employment or nationalisation, but also no 'national' IT plan in support of IT use. • Legal environment such as copyright protection and enforcement is in place.
National infrastructure conditions	<ul style="list-style-type: none"> • Telecommunications and power supplies developed to an internationally high standard.
Educational conditions	<ul style="list-style-type: none"> • Hong Kong shares a critical shortage of IS professionals especially those with application experience. This problem is exacerbated by emigration prior to 1997. • The level of end users / managers lack of knowledge and understanding of IT has been raised as an important issue.
Management practices	<ul style="list-style-type: none"> • All practices highlighted for developing countries are seen as applying to Hong Kong.

Table 2.2. Hong Kong profile on differences between developed and developing countries which can impact IS use and development. (Based on Lu and Farrell, 1990).

Although classified by the World Bank as a developing country, Hong Kong is one of the world's major trading economies. Historically this has been due to its manufacturing industries. Hong Kong's manufacturing industries, however, are facing decline.

Profile of Hong Kong's manufacturing industries

Hong Kong's manufacturing sector grew rapidly from the 1950s to the 1980s, and as recently as 1986 was the largest single contributor to GDP (with 22.3%). (Roberts, 1990). Since 1986, manufacturing has declined in importance. In 1991, manufacturing represented 15.5% of GDP, following the wholesale/ retail/ import/ export and the financing/insurance/real estate/business sectors. Even in this declining state, manufacturing contributed \$US 1,217 million (\$HK 9,491 million) to GDP. (Witt, 1993)

The development of manufacturing industries was influenced by major factors including an absence of natural resources, a relatively small domestic market, and a shortage of land available for industrial use. These factors inhibited capital and space intensive industries such as automobile manufacture or iron and steel plants. Hong Kong's manufacturing companies are predominantly light consumer goods producers which operate from multi-storey factory buildings.

These manufacturing companies are mostly small in size with an average number of 13.6 employees in 1992. This number has been dropping in recent years as a result of increasing automation and the shifting of labour intensive industries to low labour cost countries, particularly China. Nonetheless, the companies have experienced difficulties in filling vacancies as Hong Kong's

unemployment rate has fallen to record lows (less than 2%) and manufacturing wages have risen sharply as a result.

In 1992 there were 41,937 manufacturing companies. (ibid). Some 86.1% of companies employed fewer than 20 persons, and 94.8% employed fewer than 50 persons. Companies employing fewer than 50 persons, however, comprised less than half of all employees in the sector. (HKGID, 1992) In other words, larger companies employ more than 50% of all employees.

Due to its limited domestic market, most manufactured goods are exported. The Hong Kong Industry Department estimates that 90% of local industrial production is eventually exported. The USA has been Hong Kong's largest export market since the 1960s. The level is gradually declining but stood at 27.6% of manufactured exports in 1992. China is the second largest with 26.5%. West Germany is third (6.8%). (Witt, 1993). Textiles and clothing industries represent the largest export earner, accounting for 39.3% of domestic exports in 1990 and 40.3% in 1992.

Profile of Textile and Clothing industries

A 1992 study of the textile and clothing industries identified Hong Kong as,

"the world's leading exporter of clothing products."
(Kurt Salmon Associates, 1992).

Reasons for this international leadership include: the capability to manufacture garments designed or specified in the major consumer markets of USA and Western Europe; cost advantages over domestic manufacturers in those markets; and the ability to manufacture products of superior quality. The clothing industry is of great significance in both Hong Kong and globally. Within Hong Kong it accounted in 1990 for "32% of domestic exports, 12% of re-exports and 34% of manufacturing employment." Hong Kong firms have gained a global presence through domestic exports, re-exports and control of manufacturing and exports in many countries. This global presence has been estimated to account for:

"20% of the \$US 100 billion world exports of clothing." (ibid)

The 1992 study identified major challenges to this dominance. The major markets are USA (46%), Germany (15%) and UK (11%). Large quota holdings for the US and Western European markets held by Hong Kong firms are a major strength. These quotas, however, require domestic manufacture. According to this study, cost effective manufacture in Hong Kong is becoming increasingly difficult due to:

- diminishing cost advantages due to escalating land and labour costs,
- shortage of skilled and experienced labour,
- emergence of lower cost competitors in developing countries who are able to manufacture at comparable levels of quality,

- increasing requirements of retailers in the major markets for short cycle times and rapid replenishment of products. Hong Kong's geographic isolation imposes a penalty. (ibid).

The textile industry is an integral part of Hong Kong's world leadership in clothing. It has four main groups: spinning, weaving, knit fabric manufacture and finishing. In 1990, textiles accounted for "7% of domestic exports, 11% of merchandise re-exports and 9% of manufacturing employment".

"When re-exports are included, Hong Kong is the world's third largest exporter of textiles, after West Germany and Italy." (ibid)

The textile industry is also a major supplier to the clothing industry in Hong Kong. Problems facing the textile industry are similar to those facing the clothing industry:

- cost structure of manufacturing in Hong Kong, particularly the rising costs of land, labour and meeting environmental regulations,
- competitor countries such as China subsidise cotton fibre prices,
- difficulty in attracting new labour to work in the industry.

These problems are not restricted to Hong Kong. Reports from other developing countries such as Pakistan and Malaysia identify intense price competition from cost-efficient producers in the international textile industry as being a major source of concern. (Reuter 1993, Agence France Presse 1993)

To illustrate the importance of labour costs in the clothing industry, Table 2.3 shows an international comparison with Hong Kong's relative position. All wage costs are in \$US / hour and include fringe benefits:

	Hong Kong	Taiwan	South Korea	Singapore	Malaysia	China	Philippines	Indonesia	Thailand	USA
Wage costs	2.90	3.50	3.00	2.80	0.95	0.25	0.70	0.25	0.65	8.32

Table 2.3. International comparison of labour costs in the clothing industry
(source: Kurt Salmon Associates, 1992 p A103 - A104)

Summary of manufacturing industries

Hong Kong's major manufacturing industries, particularly clothing and textiles, have shown they can compete successfully in the world market. However, manufacturing in Hong Kong is faced with declining levels of activity, due largely to high labour costs, shortage of skilled labour and subsequent high production costs.

The 1991 Industry Department report, in its discussion of the outlook of Hong Kong's manufacturing industries, concluded that the future,

"will depend on the ability of the manufacturing sector to improve its productivity and technology levels, upgrade its product quality and diversify into other markets." (HKGID, 1991).

Profile of Hong Kong's banking industries

While Hong Kong's position as one of the world's major trading economies has been historically due to its manufacturing industries, recently its role as a financial services centre has become of more importance. Hong Kong's financing, insurance, real estate and business services sector incorporates banking. The sector as a whole was the second largest sector in 1991 generating \$140,072 million which represented 23% of total GDP. The 160 licence^d banks held \$5,249,988 million in total assets, of which the 29 locally incorporated

licenced banks held \$1,582,207 million. (Witt 1993, KPMG 1992). Despite the downturn in the international economy, the banks saw a healthy increase in earnings. Listed banks reported profit growth in the range of 25% - 45% in 1992.

Geographically, Hong Kong is favorably situated to take advantage of the time zone gap between North America and Europe as well as able to act as a conduit for China and other South-East Asian countries. Excellent communications facilities, the absence of restrictions on capital flows in and out of the territory and low corporate tax rates have also contributed. In recognition of these benefits, in 1992, 79 of the top 100 banks in the world had operations in Hong Kong. (Carse, 1993). Much of their activity is international as Hong Kong is a centre for off-shore banking, although there is still a considerable presence in retail banking.

Retail banking is, by its nature, a locally oriented rather than an international activity. Comparative statistics on banking operations are available both from official sources, such as the Office of the Commissioner of Banking (in April 1993, the Office of the Commissioner of Banking was merged with the Office of the Exchange Fund to form the Hong Kong Monetary Authority) and from industry watchers, such as the annual Banking Survey Report published by the major consultancy, KPMG. These reports showed that in 1992, there were 29 locally incorporated licenced banks and more than 130 overseas incorporated licenced banks. (see Figure 2.1). Only licenced banks may operate current or savings accounts. At the end of 1992, licenced banks held 96% of deposits.

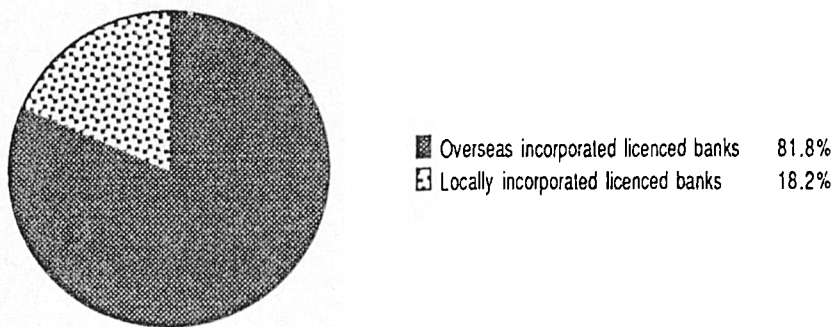


Figure 2.1: Hong Kong's licensed banks: overseas vs local incorporation. (Carse, 1993)

In addition to the 29 locally incorporated licenced banks there were 31 restricted licence banks and 155 deposit-taking companies, to make a total of 215 locally incorporated banking institutions. (Witt 1993, KPMG 1992). Figure 2.2 refers.

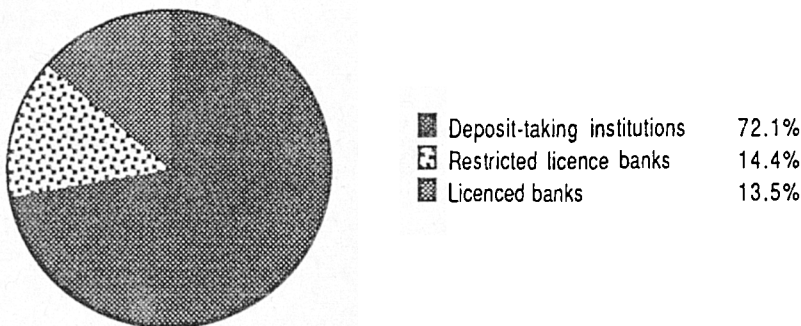


Figure 2.2: Composition of locally incorporated banking institutions. (Carse, 1993)

Within the financial services sector in Hong Kong, the three largest banks; Hongkong Bank (previously Hongkong and Shanghai Banking Corporation) Standard Chartered Bank and the Bank of China control the market. With the relocation of the Hongkong Bank holding company to the UK in 1993, these banks are all foreign owned. Consolidated statistics are not available since they

are foreign owned. At the end of 1991, while still locally incorporated, the Hongkong Bank and its subsidiary the Hang Seng Bank represented 75% of the total asset backing for locally incorporated licenced banks. The other 27 locally incorporated banks shared the remainder. The Bank of China group consists of 13 banks which are estimated to control 25% of the market operations. (Tyson, 1992). Of the 29 licenced banks, 14 are locally owned.

A total of 76,106 staff were employed in banking, with 69,803 employed in licenced banks. Of the 76,106 staff, 28,842 were employed in locally owned institutions. The 29 locally incorporated licenced banks employed 39,389 staff at an average of 1,360 staff each. (Carse, 1993). Note that in terms of staff employed, at least a quarter of the locally incorporated licenced banks are foreign owned. More precise details on ownership are not publicly available.

Hong Kong has no central bank. Government banking functions are met by the Government Secretariat. Bank notes are issued by the Hongkong Bank, the Standard Chartered Bank and, from 1994, the Bank of China. Regulation of the banks is vested in the Commissioner of Banking. Within a general government policy of minimal intervention in the market, the Commissioner of Banking establishes requirements from time to time which must be met by all banks. An example of a requirement is likely to be the establishment of a backup computer site for banking operations. These requirements are usually to be met in the medium to long term. Banks varied in their view of the importance of these requirements from imperative (major factor) to able to be incorporated into the bank's medium and long term plans, and therefore a minor factor. Doubtless the degree of importance given reflects the situation of each individual bank. For the purposes of comparison with other sectors, the Commissioner's pronouncements are seen as regulatory requirements which are incorporated into the business requirements of all companies.

Problems faced by the local banks

There is great competition from the large numbers of banks (more than 160 licenced banks in a population of 6 million) with barriers to entry being minimal. Due to the large number and profile of major international banks, products which are available in the most advanced international banking markets quickly make their competitive presence felt in Hong Kong. This reduces the possibility of niche product markets, and increases the necessity to constantly react to new competitive forces. Even among the locally incorporated banks, considerable equity is held by internationally owned banks, so home town advantages are limited. Finally, the local retail market is dominated by three huge international banks, leaving a small percentage for the remaining banks to contest.

The retail banking market in Hong Kong, however, is expanding while much of the world is in recession. In 1992, total deposits rose 9%, total loans rose 10% and reported profitability rose in the range from 25% - 45%. Net interest income continued to provide the main source of earnings growth with a consistent 5% margin between loans and savings rates. Personal banking services has seen strong growth with credit card lending rising by 45% for the second year running. Unfortunately, operating expenses rose faster than inflation, the growing demand for labour was not being filled and employee turnover increased to 22%. (Carse, 1993)

This picture of a strong banking market has not always been the case. In the early to mid 1980s, nine local banks required rescue. At that time a combination of poor bank management and lax banking regulation resulted in the Government taking over three banks and several others being acquired by private interests with government guarantees. The last of the three banks taken over by the

Government was sold to another local bank in July 1993. (Fung, 1993a). A lingering outcome of those times has been the difficulties experienced by researchers in their attempts to determine the ownership of local banks, since the rescued banks remained operating under their own names.

Traditionally, local Chinese banks are strong in retail banking, particularly in the provision of services to small local business. Since small businesses represent such a large part of local business, this should provide a market niche if the banks can provide good and flexible levels of service. (Li, 1987) A 1987 survey of the requirements of local manufacturing companies from banks identified operational efficiency, reputation, friendliness, experience and flexibility as being of most importance. (Ma and Chan, 1987).

Consequently, the way to the future for the small locally owned licenced banks appears to be to focus on the personal banking and small business markets, to continue to reduce transaction processing costs and to provide increased but flexible services in the most cost-effective manner. In the process they should also establish a strong customer image. These are not small tasks!

2.3 Industries and use of IT in Hong Kong

Review of the current level of use of IT by Hong Kong's manufacturing industries

There is a shortage of available, detailed and up to date information regarding the utilisation of IT by manufacturing industries in Hong Kong. Sources used include market research for vendors, studies conducted for Government and industry bodies, published academic research, published views of prominent

manufacturers and original research. Due to the varying aims and methods used in the research, confusing and apparently conflicting findings frequently arise. There is a great need for consistent, on-going studies to determine the changing requirements for, and technology utilisation by, firms in Hong Kong.

In a review of the state of utilisation of IT in 1988, John Lo, the general manager of one of Hong Kong's most technologically advanced manufacturing companies, declared that there was,

"no comprehensive picture available of the nature and extent of the penetration of computer related manufacturing technology into the manufacturing sector."

(Lo, 1988).

In the intervening years, glimpses of the picture have become available. There remain, however, large gaps in the knowledge and understanding of the nature and extent of utilisation of computers in all sectors, including manufacturing. In 1988 a study was conducted by the Federation of Hong Kong Industries and Graham Mead Research. This study was based on contacts made with 3,500 statistically representative manufacturing companies, and a subsequent survey of those using computers. The major findings of this study were:

- "The penetration of computers into manufacturing companies was greater than 10% only in the electrical and electronics industry and the scientific equipment industry.
- Computers were used primarily for office applications, much less for the manufacturing process *per se*.
- The main application areas were accounting, inventory control, invoicing, payroll and financial management.

- CAD/CAM was not very prevalent." (Graham Mead Research, 1988).

The IT utilisation levels for specific industries can be seen in Table 2.4.

Industry	No. of companies	% of companies using IT
Total manufacturing sector	48,623	5.9%
Electrical and Electronics	1,979	27.7%
Scientific Equipment	1,472	16.4%
Garments	9,722	4.5%
Textiles	5,049	6.1%

Table 2.4. GMR/FHKI study in 1988 of IT utilisation levels in the manufacturing sector.

The Committee on Electronic Data Processing Training of the Vocational Training Council conducted a survey in 1990 of 9,000 Hong Kong firms. The firms were a representative sample of all Hong Kong firms. The survey was conducted with assistance from the Census and Statistics Department and achieved a response rate of 91%. The Committee found that manufacturing firms had less than 1% of total staff in EDP, and had a ratio of PCs to total staff of approximately 2%. This was the lowest of all sectors. (Leung, 1990).

In mid 1992 a survey was undertaken to identify the nature and extent of the Hong Kong Personal Computer Market. Some 6,800 companies were surveyed. The survey found that only 25% of the companies used PCs. This was considered low by international comparison. It was noted that of all the economic sectors the manufacturing sector had the lowest rate of growth in use of PCs. (Graham Mead Research, 1992).

A separate 1992 study on the Textile and Garment Industries found that the level of use of IT in Hong Kong clothing firms was low. Hong Kong textile companies were also found to have a low utilisation of technology which should be increased in order to achieve "better quality and improved productivity through

automation and control." (Kurt Salmon Associates, 1992). In this study, the responses of 400 textile and clothing firms in Hong Kong in a survey of 5000 companies showed that 41% of respondents used computer information systems, 19% used computerised grading and marking, and 16% used knitting CAD/CAM. The utilisation rates were not uniform within the sector. Textile companies focusing on spinning and weaving showed lower levels of utilisation, at 26% for computer information systems, and 9% for knitting CAD/CAM.

These levels were considered low relative to other leading manufacturing countries. This low level of use of IT in manufacturing is of considerable concern in Hong Kong. Part of the Government's response was a commitment in 1993 of \$HK 200 million funding for applied research and development to increase the utilisation of technology. (O'Hara, 1993).

Potential benefits from IT for manufacturers

The 1991 Industry Department (HKGID) report on manufacturing industries looked for all firms to achieve a general technological level which would support high value-added and innovative merchandise, with emphasis on improvements in productivity. The 1992 KSA report on the Textile and Clothing industries considered that these firms would benefit from increased use of IT in order to:

- improve productivity,
- improve quality,
- reduce labour costs and overcome labour shortages,
- achieve stronger links with customers,
- support quick response systems required by retailers.

Note that these challenges facing textile and clothing firms are representative of the problem areas facing manufacturing companies as a whole. So, the problem areas are clear: manufacturing activities are declining, costs are high and escalating, quality and responsiveness improvements are required. The potential benefits of IT have been clearly stated in both general and industry specific reports as being applicable to these problem areas. But utilisation is low. We must ask then why is IT not more widely used? Why and how do local companies decide to use IT? Why and how do local companies decide not to use IT? Do local manufacturing companies see IT as just what they need to help them to survive, or is IT seen as being basically irrelevant but necessary in order to show the world that companies are modern and progressive? Faced with these questions, research into the use and management of IT by Hong Kong firms in order to assist firms considering the adoption of IT is both appropriate and timely.

Review of the current level of use of IT by Hong Kong's banks

It is sufficiently difficult to obtain information on banks and banking in Hong Kong, let alone on banking practices such as the use of IT by local banks. No comprehensive picture exists, and no publicly available studies have been identified. To determine the status of utilisation for the purposes of this research, use has been made of occasional published speeches from bank CEOs, press articles, and computer industry publications.

A 1987 press article identified that Citibank had been a driving force in the introduction of electronic banking services in Hong Kong. They had made it very difficult for competitors by not charging customers for these additional services. (Anon, 1987). This meant that competitors were forced to invest in IT to support the services in order to survive. At that time, Chase were reported to

have stated that they were using electronic banking to drive down costs while making it easy and efficient for customers to deal with them. (ibid).

Alice Lam, General Manager of Hang Seng Bank, part of the Hongkong Bank group, stated in 1991 that due to the high costs of property and labour, it was not cost effective for banks to compete in the domestic market by adding more branches. She added that,

"To survive in today's competitive environment, banks are making heavy investments in new technology in order to improve services without having to increase staff." (Lam, 1991).

Ms Lam considered that retail banking in the 1990s was increasingly dominated by new technologies and products since individual attention was no longer the main appeal in reaching new retail customers. The public demanded efficiency and convenience, which could only be provided cost-effectively by IT based innovative services. (ibid). The Hongkong Bank, the massively dominant force in the market has certainly pursued IT with vigor. Attributed particularly due to technology and systems, between 1988 and 1992 the bank's real costs per transaction were reported to have declined by nearly 15%, and the bank's operating costs were 25% lower than those of a comparable Western bank. (Martinsons 1992).

Faced with the extent of competition in the retail market, many of the smaller local banks in Hong Kong plus the Bank of China banded together to form JETCO Ltd. It is worthwhile examining JETCO's operations as it provides an insight into the friendly competitiveness of the smaller banks and shows how they will provide co-operative services in some areas while competing intensely at the same time. JETCO's formal purpose is to serve the customers of member banks

in their requirements for electronic banking through ATMs by providing interbank transaction switching. Transactions through ATMs include cash withdrawals, cash deposits, account enquiries, and electronic funds transfers between accounts. All transactions are made by access to accounts located in member banks. JETCO covers its costs by levying a fee for each transaction it processes.

JETCO was established in May 1982. The founding members were Bank of East Asia, Chekiang First Bank, Shanghai Commercial Bank, Wing Lung Bank and the Bank of China. These foundation members serve as members of the Board of JETCO. Operations commenced in August 1983 with the founders and 12 additional banks from the Bank of China group. Today there are 42 member banks with a card base of 3.3 million. The network includes 1100 ATMs located in Hong Kong, Macau and Shenzhen (China's closest province to Hong Kong). All ATMs are owned by member banks. Only interbank transactions are processed by JETCO, i.e., a customer of a member bank who uses their own ATMs will not have the transaction routed through the joint operation. Approximately 66% of total ATM transactions are interbank, and approximately 67% of ATM transactions are cash withdrawals. The average amount of a cash withdrawal is currently \$500 (\$US 65).

ATM daily transaction volumes are:

average	200,000
peak loading	350,000 (Christmas eve, Chinese New Year's eve)
average peak	300,000 (beginning or end of month)

Approximately 5% of JETCO transactions originate in EPSCO. EPSCO is a similar interbank joint venture to JETCO, which provides point of sale (POS) services. POS units are owned by EPSCO and placed in a retail outlet.

Since JETCO is the only interbank ATM organisation it could have been used by its founders to erect barriers to entry against new banks. Instead it elected to admit more members thereby strengthening the network and further reducing the individual cost to members. Any licenced bank in Hong Kong or Macau can apply to join with members each purchasing shares. The cost is currently \$8 million (approximately \$US 1 million) which reflects the asset base of the company. Shares cannot be redeemed, but can be sold to a new member (in case of mergers of banks) with Board approval. JETCO has a wholly owned subsidiary called JETCO Systems Ltd (JETS) which develops electronic banking products for purchase and operation by member banks. An example of their products is a telephone banking system. Member banks purchase these products to maintain base level competitive services with the major banks. If required the products may be enhanced, tailored or differentiated in some other manner by each of the member banks. (source: primary research). JETCO, EPSCO and JETS provide a good example of co-operative advantage available to smaller competitors through the sharing of high IT development and operations costs.

Conclusions on levels of use of IT in Hong Kong

The problem areas faced by local banks are clear and remarkably similar to those faced by local manufacturing firms: operating costs are high and escalating (also largely due to shortages of land and labour), with improvements in quality and responsiveness required to meet the forces of international competition. The potential benefits of IT have been clearly stated but in contrast to manufacturing, utilisation by local banks is high. While a comprehensive picture of IT utilisation by local Chinese banks is not available, it has been stated by an eminent banking industry representative that local retail banks cannot survive without IT. (Lam, 1991). A study of why and how these local banks decided to

use IT could be of significance to local companies in other sectors facing the same problems of increasing operating (particularly land and labour) costs with intense international competition.

2.4 Western SISP models

There is a plethora of Western SISP models which could have been considered in this work, however, the purpose of this research was not to provide conclusive support for a contention that all of these models were capable of application in developing countries. The objective was to show that a link between Western models and Eastern applications was possible, which could then be investigated further as required. Consistent with the purpose of this research the models selected were: current, significant, recognised and accepted; based on empirical rather than theoretical research; managerially rather than technically oriented; and capable of providing practical assistance to companies undertaking strategic IS planning.

Organisations faced with uncertainty about how to progress in their use of IT have sought assistance from an explanatory model showing the evolution of an organisation's computer usage in separate stages of growth from initiation, contagion, control to maturity. Observation of different organisations and their IT experience will confirm the generally satisfying nature of this model. The original model as developed by Gibson and Nolan (1974) had four stages. This was later extended into six stages, adding integration and data administration prior to maturity. (Nolan 1979).

Nolan identified four major elements which could be analysed to place an organisation in the stages of growth model:

- scope of applications, progressing from mainly financial systems through broader operational systems to MIS.
- focus of the DP department, progressing from centralised and inward looking to data resource management.
- focus of DP planning and control from internal focus in the first three stages to external focus in the last three stages.
- level of user awareness, progressing from being driven by the DP department in the initial stages, through driving DP to partnership in the final stages.

Nolan's model has been criticised on several grounds including: the difficulty in substantiating its claims to represent organisational reality (either in describing the phases of growth or as a means of predicting change, Benbasat et al 1984, King and Kraemer 1984, Gregoire and Lustman 1993); its reliance on database technology as an indicator (which serves to date the model); and the argument from Earl (1989) that organisations have different curves for different information technologies. In addition, Galliers (1991) recognises that different parts of an organisation may be at different stages of growth with the same information technology.

Despite these criticisms, the model has been used extensively in business and clearly is seen as being able to assist in the management of IT. By 1984 the model had been used in hundreds of studies in US firms and had been incorporated into IBM's IS planning consultancies. (Nolan, 1984). Nolan's model is considered seminal due to its influence on IS theory and practice. (Earl, 1989). The model has been further modified and developed by Earl (1983, 1987, 1988, 1989), Bhabuta (1988), Hirschheim et al (1988) and others. These modifications and developments primarily addressed the simplistic and subjective assumptions of the original model and provided a focus for improving the level

of assistance to management of IS. The concept of the original model has been applied to different areas, such as historical developments in computing, IS planning and IS management developments. Difficulty arises in the attempt to incorporate into the model sufficient indicators to enable practitioners to firstly place their organisation in a particular stage and secondly, to identify the key issues associated with development to subsequent stages.

The concept of stages of growth enroute to "maturity" is also not considered appropriate. Maturity implies that the end of a long and sometimes arduous road has been reached and that decline will be the next stage. Neither the concept of reaching the end of the road, nor of future decline is thought to be helpful for practising managers.

A recent revision attempts to provide greater assistance to organisations by integrating the evolution of IS functions with the organisational activities and structures needed to support this IS evolution. As the purpose of this research is to provide practical assistance to firms, the most recent and most integrated version of the stages of growth model will be considered for its applicability in developing countries.

Galliers and Sutherland's 7S Stages of Growth Model

This model, originally proposed in 1989 but further developed in 1991, comprises a matrix created through the application of McKinsey and Company's 7 'S' elements used in the analysis of organisational processes and management (Pascale and Athos, 1981) and the revised six stages of growth model. The 7'S' elements are shown in Table 2.5.

Element	Description
Strategy	Plan or course of action leading to the allocation of a firms' scarce resources, over time, to reach identified goals.
Structure	Characterisation of the organization chart (i.e., functional, decentralised etc.)
Systems	Procedural reports and routine processes such as meeting formats.
Staff	'Demographic' description of important personnel categories within the firm (i.e., engineers, entrepreneurs, MBAs etc). 'Staff' is not meant in line-staff terms.
Style	Characterization of how key managers behave in achieving the organization's goals; also the cultural style of the organization.
Skills	Distinctive capabilities of key personnel or the firm as a whole.
Superordinate goals	The significant meanings or guiding concepts that an organization imbues in its members. Superordinate goals can also be described as the shared values or culture of the organization.

Table 2.5. The Seven 'S's. (Pascale and Athos, 1981).

Some discrepancies between this model and organisations in developing countries are evident. The model makes assumptions about the environment in which it is applied. In the cultural elements of Style and Superordinate goals, a formal organisation structure and procedures are assumed. In the Staff element, 'demographic' qualities of staff are assumed instead of appointments consistent with family loyalties. Firms in developing countries have shown a reluctance to hire specialised staff. It has been noted that several of these elements will be different for SMEs in developed as well as developing countries. (Doukidis et al 1992, Zhao and Grimshaw 1991).

The 7S stages of growth (7S SOG) model (see Table 2.6) has been applied in companies in the UK and Australia and has been found to be effective in,

"not only clarifying the location of each organization in IT maturity terms, but also in providing insights into aspects of IS management and planning which appear to require particular attention." (Galliers and Sutherland, 1991).

The key contributions of the model are seen by the authors as:

- focusing management attention onto a broad range of issues associated with the planning and management of IS.
- surfacing assumptions and attitudes held by key executives about the role IT does and might play in achieving / supporting business objectives.
- providing an easily understood means of putting IS/IT management on the senior management agenda.

Elements	Stages					
	1	2	3	4	5	6
Strategy	Acquisition of hardware, software etc	IT audit Find out and meet user needs (reactive)	Top-down IS planning	Integration, coordination & control	Environmental scanning & opportunity seeking	Maintain comparative strategic advantage Monitor futures Interactive planning
Structure	None	Label of IS Often subordinate to accounting or finance	Data processing dept Centralised DP shop End-users running free at Stage 1	Information centres Library records, OA etc in same unit Information services	SBU coalition(s) (many but separate)	Centrally coordinated coalitions (corporate & SBU views concurrently)
Systems	<i>Ad hoc</i> unconnected Operational Multiple manual and IS Uncoordinated Concentration on financial systems Little maintenance	Many applications Many gaps Overlapping systems Centralized Operational Mainly financial systems Many areas unsatisfied Large backlog Heavy maintenance load	Still mostly centralized Uncontrolled end-user computing Most major business activities covered Database systems	Decentralised approach with some controls, but mostly lack of coordination Some DSS - <i>ad hoc</i> Integrated office technology systems	Decentralised systems but central control and coordination Added value systems (more marketing oriented) More DSS - internal, less <i>ad hoc</i> Some strategic systems (using external data) Lack of external and internal data integration Integration of communications technologies with computing	Inter-organisational systems (supplier, customer, government links) New IS based products External / internal data integration
Staff	Programmers / contractors	Systems analysts DP Manager	IS planners IS manager Data base administrator Data administrator Data analysts	Business analysts Information resources manager (Chief Information Officer)	Corporate / business / IS planners (one role)	IS director / member of board of directors
Style	Unaware	Don't bother me (I'm too busy)	Abrogation / delegation	Democratic dialectic	Individualistic (product champion) IS manager - member of senior executive team Knowledgeable users in some IS areas Entrepreneurial marketing skills	Business team
Skills	Technical (very low level), individual expertise	Systems development methodology	IS believes it knows what the business needs Project management	Organisational integration IS knows how the business works Users know how IS works (for their area) Business management (for IS staff)	Opportunistic Entrepreneurial Intrapreneurial	All senior management understand IS and its potentialities
Superordinate goals	Obfuscation	Confusion	Senior management concern DP defence	Co-operation	Opportunistic Entrepreneurial Intrapreneurial	Interactive planning

Table 2.6. 7S stages of growth model. (Galliers and Sutherland, 1991).

The model can be used to assist senior and IT management in different organisations to determine how IS/IT can best support their corporate objectives by identifying potential directions and opportunities for IS/IT which are appropriate to their organisation.

Difficulties with the 7S SOG model

While recognising the contribution of the model in providing a focus on a broad range of IS planning and management issues, some difficulties with application of the model have been identified. These difficulties can be classified into two groups: general and those potentially specific to developing countries. General difficulties are:

1. The model appears to have been developed from the perspective of organisations in the middle stages. The indicators for progression are written in positive terms for the later stages, i.e., the directions where the organisations are aiming represent the best features in current practice. The authors acknowledge that the early stages appear negatively and present:

"an uninviting and somewhat derogatory picture of IT utilization and management."

This consistently negative view is not considered representative of organisations at those stages. An often rapidly changing succession of optimism and pessimism is thought to be more characteristic. In stage 1, DP personnel in particular are criticized for being,

"not capable of formulating well constructed superordinate goals",
while systems are criticized for being,

"ad hoc", "unconnected", "uncoordinated", "inconsistent",
"operational", "financial" and "limited" in function.

A less negative view could see the same systems as being developed and / or implemented to address specific, urgent, but often isolated operational problem areas or to gain organisational experience with computerisation. Most frequently, little or no attempt is made to develop an overall plan for IT development. IT staff are employed for specific functions. The organisation's orientation is towards the technology rather than Information Management processes, which occur at a subsequent stage of development. The model would be of more practical use if the indicators more closely represented the actual situation and incorporated the more positive manner in which organisations enter into their initial IT experiences.

2. In Systems stage 1, IS are manual and IT based, as well as both.
3. While the purpose of the model is to help managers, some of the terms are not especially helpful, e.g., obfuscation and democratic dialectic. Simpler language is thought to be more appropriate.
4. Large gaps in the indicators for stages 3 and 4 provide limited assistance on issues and directions in these middle stages.
5. Database systems are no longer a sign of sophisticated systems. Perhaps non-PC databases would be more significant.
6. The model appears to have been developed for larger companies having multiple SBUs.
7. The model does not represent current practice, e.g., EDI systems are set at stage 6, but EDI may be just the way business is conducted in some sectors. EDI can be operated via fax and commonly is for small companies! Business process re-design or re-engineering is a current focus which should be incorporated into the model in the later stages.

8. The model presumes in-house development. In these days of purchasing packages, there may be integration of many systems accompanied by a low level of sophistication in use.
9. The generality of the model inhibits application, for example, the descriptions of the elements Style and Superordinate goals both include 'culture of the organisation'. It may be difficult to adequately describe the model to managers in order to make meaningful allocations to specific stages.
10. Inconsistencies are present in the development of some of the elements. Strategy, for example, includes a mixture of strategic issues, policies and activities - IT audit, maintain strategic competitive advantage and top-down IS planning - rather than strategies.

Potential problems specific to developing countries, based on the general characteristics of developing countries and the specific characteristics of Hong Kong (outlined in sections 2.1 and 2.2 above), are:

1. The model of IS /IT as an independent functional group is not consistent with most indigenous companies, and perhaps is not consistent with most smaller owner-managed companies anywhere. Centralised decision-making and autocratic leadership means everyone is part of the business team or they are out!
2. Decentralised systems are not as important in highly centralised companies, therefore, decentralisation should not be seen as an indicator.
3. Environmental scanning and opportunity seeking is the norm for the entrepreneurial companies in Hong Kong. Perhaps it should be seeking competitive or co-operative advantage.
4. Local companies tend not to use specialist staff so planning as a staff function is not a relevant indicator.

5. Titles and formal organisation structures are not as significant in local companies as in Western companies.
6. Top down planning is a Standard Operating Procedure for indigenous organisations, not a stage in development.
7. Use of Office Automation is not a measure of the development of use of IT in a local company where internal communications are hand written in the local language, which is frequently not supported by OA systems.
8. Management style is different in different cultures. Entrepreneurialism as a style may occur from the earliest stages of the model. (Doukidis et al, 1992).

These difficulties will be reviewed to determine their relevance and importance in developing countries following the interview cycles.

Earl's Sectoral Model

The second Western SISP model to be considered allocates firms to separate sectors as a means of identifying management strategies and actions relating to IT. This model also recognises that there are few universal solutions to management problems and that information management practices must suit the circumstances of the organisation.

		Strategic impact of application development portfolio	
		<i>low</i>	<i>high</i>
Strategic impact of existing operating systems	<i>low</i>	Support	Turnaround
	<i>high</i>	Factory	Strategic

Table 2.7. McFarlan and McKenny's Strategic Grid (1983).

McFarlan and McKenney (1983) developed a strategic grid to position firms according to the present or anticipated future impact of IS / IT. The relative level of investment in IT could then be determined according to the level of its strategic importance. The original grid showed four quadrants, as can be seen in Table 2.7.

Activity	Indicators
Support	<ul style="list-style-type: none"> • IS has little impact in present or future. • Some administration systems to help improve efficiency. • Islands of specialist technology in production processes.
Factory	<p>e.g., a cement works</p> <ul style="list-style-type: none"> • IS crucial to current operations but not at heart of firm's strategic development. • Advanced production systems in place for fundamental processes. • Future applications not strategic.
Turnaround	<p>e.g., a steel works</p> <ul style="list-style-type: none"> • IT becoming strategic. • New competitor systems planned which will be critical to organisational survival and growth. • In the past, IT may have had lower profile. • IT budget rapidly increasing. • Leadership coming from board. • Top IT executive appointed. • Education programmes on information management for top management.
Strategic	<p>e.g., a retail chain.</p> <ul style="list-style-type: none"> • IS always crucial to organisation and future is dependent on IT. • Business operation not feasible without computers. • New products and services computer based. • IT investments dominate firm's capital budget. • IT director on or near board. • All managers need to have sound business understanding of IT. <p>e.g., a credit card company.</p>

Table 2.8. Indicators for each activity in McFarlan and McKenny's Strategic Grid .
(Derived from Earl, 1989).

Firms are not embedded in the grid, but may be driven from quadrant to quadrant by the degree of match between the firm's activities and its potential for utilising IT; the strategic decisions made on IT; and by changes in the competitive environment. Placement in the grid is determined by identification with a series of indicators. These indicators, from Earl (1989) are shown in Table 2.8.

Earl (1989) sought to extend the utility of the strategic grid by deducing the most appropriate planning, organising and controlling activities within each quadrant. Likely technology management policies could then be suggested. The result was the strategic grid with information management parameters shown in Table 2.9.

	Support	Factory	Turnaround	Strategic
Planning	Ad hoc	Resource	Directional	Strategic
Organisation	Back room	Department	Function	Complex
Control	Project	Budget	Programme	Mixed
Technology	Eclectic	Conventional	Rethink	Architectural

Table 2.9. Earl's information management by strategic grid. (1989).

At this level of development, the information management strategic grid is interesting as a seminar ice-breaker or discussion tool, but is limited in its utility without more specific details. Earl subsequently developed a four sector framework for IT. This framework illustrates that the nature and relative importance of IT use varies from sector to sector in a similar manner to the strategic grid. Table 2.10 refers.

Strategic context	Characteristic	Metaphor
IT is the means of delivering goods and services in the sector	Computer based transaction processing critical for business operations.	Delivery
Business strategies increasingly depend on IT	Business strategies enabled by major automation, information and communication technologies.	Dependent
IT has potential for new strategies	Internal change and new business opportunities exploit specific IT applications and technologies.	Drive
IT has no strategic impact	Opportunities or threats from IT are not apparent or perceived.	Delayed

Table 2.10. Earl's Sector (Quadrant) framework for IT. (1989).

The four types of characteristics nominated appear to encompass the range of IT management situations. The sectors proposed are not industrial or economic sectors but are classifications by IT attributes. There is considerable confusion

due to use of the term 'sectors' in various contexts, alternatively referring to grid, industrial or economic sectors. This is compounded by Earl's allocation of industrial sectors to grid sectors, such as: "In some sectors, e.g. financial services, airlines and, increasingly, retailing, IT has become the means of delivering the goods and services in the sector. ... This sector is called the delivery sector." (Earl 1989, p 34). To overcome this confusion, the four divisions of a grid have been referred to in this work as quadrants.

A further refinement by Earl identified specific management practices by quadrant. This model as shown in Table 2.11 is potentially of most significance to the propositions in this research, as it can provide practical assistance to organisations. The suggested management practices can be also used as a basis for comparison of management practices in developed and developing countries.

	Delivery	Dependent	Drive	Delayed
Planning	Integral	Derived	IT-push	Default
Organisation	Corporate	Business unit	Line	IT
Control	Tight-loose	Loose-tight	Loose	Tight
Technology	Architectural	Pragmatic	Enabling	Ad hoc

Table 2.11. Earl's Sector (Quadrant) information management framework. (1989).

Difficulties with Earl's frameworks.

The level of business interest in a practical framework is apparent, and the approach is appropriate. There are, however, a number of potential difficulties inherent:

1. The models are based on work published prior to 1989 with several areas being based on work undertaken much earlier, such as the key concerns of management which date from 1982 - 85. There is a potential problem that the models have become outdated due to changing circumstances since

1985. Studies reported in 1991 by Watson and Brancheau considered key issues in information management in Australia, Europe, Singapore and USA. The source research was conducted during the years 1982 to 1989 and was generally consistent with the issues considered by Earl. The most recent survey, by Galliers et al (1994), considered the key IS management issues in the UK. Allowing for some variation in survey approach and in relative priority of issues over time, the list of issues was sufficiently consistent with those on which Earl based his work that modification for this reason was not seen to be necessary at this time.

2. A related criticism is that the models are based on work in Western organisations which may not be suitable for application in non-Western environments. Rao et al (1987) tentatively identify substantial differences between key issues reported by Singapore executives and those reported in Western countries. Saxena and Gulati (1990) appear to negate the differences to a large degree when considering issues in Hong Kong. Consideration of the results of this research will clarify the extent to which this area is seen as an actual difficulty.
3. Generalisations on applications and strategies for IT are, rightly, accepted by Earl as being inappropriate due to sectoral differences. Unfortunately, generalisations within the model create problems in allocation of a firm to a specific quadrant. The provision of insufficient detail and the absence of absolute measures prevents confident and consistent allocation of an organisation to a specific quadrant. The framework was developed in a seminar environment where the seminar leaders could provide comparitors for positioning firms. In the absence of this level of personal guidance, the model is found to be lacking. (The 7S SOG model also suffers from limitations due to a lack of precision, even though that

model provides considerably more detail than Earl's. Perhaps lack of precision is endemic to general models.)

4. The lack of detail also limits the utility of the model, even if an organisation was successfully allocated. As the model stands it would be of limited use to a harassed executive seeking guidance and assistance on IT investment.
5. The model was developed from analysis of large companies (Earl 1989, p 80), although the significance of its roots is only mentioned in passing. Researchers have found practices to vary between organisations according to size, and that 'a small business is not a little big business'. (Welsh and White, 1981). This is significant as Lu and Farrell (1990) identify that developing countries have a large proportion of small companies and Yavas et al (1985) find that smaller family owned businesses with less formal procedures are less likely to utilise computers.
6. Many frameworks (more than 15!) have been presented by Earl. A lack of consistency between frameworks leads to difficulty in synthesizing strategies into a coherent management approach. For example, refer to the information management by strategic grid (Table 2.9 above) and the sector (quadrant) information management framework (Table 2.11 above). *Strategic* and *delivery* quadrants can be equated, as can *support* and *delayed*. *Factory* and *turnaround*, however, cannot be equated to either *dependent* or *drive*. This lack of consistency reduces the practical utility of the model.

Adoption of IT (Western experiences)

The final SISP area to be considered is an overview of Western factor and process models in the adoption of IT. There are limited models available, especially relating to decision-making factors. A review of IT decision practices in 80 large companies in USA, UK, Australia and New Zealand was undertaken in 1990. The survey found that the most important factors in decisions to invest in IT were to support business objectives and to meet financial criteria, in that order. (Bacon, 1992). This empirical finding illustrates the current alignment of business practice with IS academic thinking that IT should pay its way by directly supporting the business rather than being carried as a 'necessary' cost. (Earl, 1992).

There is a larger body of knowledge in the area of processes. Rockart and Crescenzi (1984) provide an overview of the critical processes in IT decision-making. They identify three main areas of processes: the link between IS and the management needs of the business; prioritisation; and prototyping / trailing.

Huff and Munro (1985) give details of a field study into the assessment and adoption of IT. The authors had assumed that the processes involved in IT decision-making would be documented in IS literature, but found this assumption to be invalid. Literature in other disciplines such as organisational buying, diffusion of innovations and management of research and development was reviewed to provide some grounding. Their subsequent purpose became the generation of theory. Following field studies in 10 very large Canadian corporations, Huff and Munro developed four separate models of the IT assessment and adoption process. The models were dependent on the relative emphasis given by firms to technology and to business issues. Technology emphasis is in essence a bottom-up process which is driven by the identification

of an interesting technology. Conversely, issues emphasis is a top-down process where the issues have been determined by top management on the basis of business need through a formal planning process. Table 2.12 shows the different models.

		Issues emphasis	
		<i>High</i>	<i>Low</i>
Technology emphasis	<i>High</i>	Normative Ideal	Technology Driven
	<i>Low</i>	Issue Driven	Opportunistic

Table 2.12. Huff and Munro's Four Models of the processes in IT assessment and adoption. (1985).

The normative ideal model represents the approach that fully rational firms with few resource restrictions should follow, i.e., it is the ideal. Processes in this model are:

- assessment of current IS environment
- assessment of future goals of organisation
- assessment of current and future IS applications
- forecasts of the availability of new technology
- mapping of technology assessments to organisational needs

Parker et al (1989) find the starting point for decision-making and planning processes to be a common business and technology vision. The authors explain that most publications in this area focus either on the vision - ideas or the planning - execution phases, but do not consider the processes as a whole. They expect that the specific processes will vary from company to company, but will all cover the vision - ideas - planning - execution phases. Western firms show great diversity in decision-making processes, but uniformity in purpose. The particular processes may be formal (e.g., establishment of a special planning

group with a fixed agenda) or informal (e.g., interaction over time between the concerned management).

Decision processes are:

1. project oriented, not monolithic. Each project is assessed according to estimated value to the organisation compared with the resources required.
2. recurrent with cyclical planning processes.
3. limited resources in the organisation require prioritisation of projects.
4. quantifiable decision-making criteria. The criteria need not be totally quantifiable, but quantifiability aids decision-making. (Parker et al, 1989)

Planning processes:

1. drive to consensus among differing management functions.
2. drive to consensus across management groups.
3. utilise key planning techniques which are based on business not technology.

The diversity in decision-making processes in Western firms is confirmed by empirical studies of US and UK firms. (Galliers 1987, Wilson 1989, Premkumar and King 1991, Farbey et al 1992, Earl 1993). While the earlier studies found widespread use of some form of IS strategic planning, Farbey and colleagues' (1992) study of IT investment decision-making in 16 UK organisations found that about half of the organisations had no IT strategy and required no quantification of benefits. This paradox requires further research to explain the apparent change in behaviour or reporting. Most UK organisations were found to have circumvented their formal justification procedure for IT decisions, frequently because, while the project did not fit in to the 'usual' pattern of investment proposals it was required for strategic or competitive reasons. (ibid). Most of the studies do not report the size of the organisations, but the findings of Farbey and

colleagues appear to be more in line with the informality of procedures in smaller indigenous firms outlined in section 2.1 above. Earl's study (1993) of very large UK firms, conducted in 1988-9, showed a wide variety of mainly formal SISP practices. Further study of research results may indicate some correlation between organisational size and formality of SISP practices.

As seen in section 2.1 above, few details are available on the processes utilised by firms in developing countries. Yap et al (1992) identify some processes in a paper examining success factors in Singapore's small businesses. These processes in the planning to execution phase include: use of a consultant, vendor assistance, CEO involvement in decision processes, user involvement in decision processes.

A major part of any decision to adopt IT is an assessment of its potential benefits, which is frequently based on prior experience with IT. Assessment is also a major topic within IS research. An IFIP conference was held in 1986 on this topic in an attempt to resolve some of the difficulties presented in attempts to assess the benefits of IT. These difficulties relate to the purpose of assessment, the types of assessment, various proposals for undertaking assessment and definitions of what is or should be assessed. At this conference, Hawgood and Land (1988) identify three fundamentals which contributed to these difficulties:

- the subjective nature of assessment,
- the range of possible types of information systems which have a range of goals,
- inability to isolate IS to enable evaluations of situations with and without the use of IT.

The authors make suggestions to address the first two, but are unable to contribute to the third. The subjective nature of assessment was highlighted by their statement:

"Effectiveness is itself difficult to measure because it is a subjective concept, seen differently by different people." (ibid)

Hawgood and Land suggest reducing subjectivity by each of the systems' stakeholders separately determining their expectations and views of effectiveness. Systems that are located on the value chain should be ultimately evaluated by the CEO, with input from minor stakeholders. Systems which are not on the value chain are assessed by the department head. Their proposal is that IS effectiveness should be treated as:

"a multi-valued function of IS attributes and stakeholder viewpoints",

and by consideration of the system in relation to the value chain. (ibid). This proposal would be difficult to apply in a typical Chinese organisation. In Chinese companies with large power distance, the only important view is that of the head of the hierarchy. Other stakeholders may not formulate an opinion, let alone express it.

Hawgood and Land's proposal appears not to have been implemented by Western practitioners. Weill and Olson reviewed the practice of assessment in 1989, concluding that:

"While firms acknowledge the importance of IT investment in organizational performance, they do not have a satisfactory way of assessing the relationship."

The authors recommend a process of defining the area and then measuring and tracking IT expenditure over time. They categorise the objectives of the business in making IT investments as strategic, informational and transactional, with a fourth type relating to the industry, termed threshold IT investment. Threshold IT investments are those necessary to overcome barriers to entry in the industry. Their proposal for measurement of performance is that:

"The performance measures used in the assessment of the impact of IT investment must be chosen to reflect the business objectives of the IT investment." (Weill and Olson 1989, Weill 1992)

This corporate level approach appears to address major criticisms by Hirschheim and Smithson (1988) that evaluation typically ignores the social context and focuses on the technical aspects of systems. Following investigation of IT investment decision-making in 16 U.K. organisations, Farbey et al (1992) suggest that the evaluation techniques adopted were dependent on several factors which included the role of the evaluation, the decision environment, the characteristics of the organisation and the potential impact of the system.

The practical importance of assessment of IS/IT effectiveness is clear from this issue's consistent ranking in the top 10 list of management concerns in the USA for much of the 1980s. (Niederman et al, 1991). A 1989 survey, however, finds the issue to have dropped in importance. (ibid). The 1992 study of Farbey and colleagues reported that despite the range of evaluation techniques available, very few had been used in practice. Noting the drop of importance of this issue, the authors speculate that the reason might be the lack of satisfactory techniques.

As has been seen, the current state of IS thinking on assessment remains quite fluid. Managers have consistently identified evaluation and measurement as important issues. No measure other than financial return has been universally applied and, as has been shown by empirical studies, financial return is frequently ignored in IT decision-making.

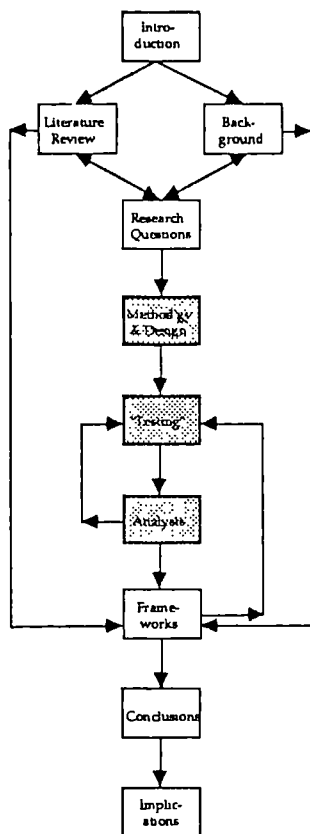
2.5 Summary

Chapter 2 establishes the background for this work, grounding it in the mainstream of current IS research as well as in current research on IS in developing countries. Cultural differences between East and West have been argued by many researchers to be a major factor resulting in low levels of IT utilisation in developing countries. Other researchers remain unconvinced, with the research findings of specialists in comparative cultural issues being inconclusive. Due to uncertainty about the dynamics of SISP decision-making by indigenous enterprises this research is anticipated to make a significant contribution to IS researchers' knowledge of decision-making factors and processes.

A taxonomy of differences between developed and developing countries in general, with particular attention to Hong Kong, has been presented. An outline profile of Hong Kong's manufacturing and banking industries has been constructed with consideration of the differences and similarities between each sector's operation and use of IS/IT. Western SISP models have been examined in light of the taxonomy to make an initial determination of their applicability in environments other than those for which they were developed. As a result of this examination, areas were identified which could present potential problems in the application of these SISP models.

Chapter 4 reports proposed revisions of the Western SISP models to overcome these potential problem areas and also the outcomes of application of the revised models, but first, chapter 3 develops the framework within which this research has been conducted.

3. Research Methodology and Design



Chapter 3 establishes the commitment to rigour in this research and the foundation for generalisability of research outcomes through adherence to Yin's (1989) research model. There are four major parts to this chapter: a review of the range of alternative IS research frameworks; a determination of the research approach to be used (including measures of its validity); a presentation of the research design (including criteria by which its quality could be judged) and an overview of how the research was conducted. Experiences with the implementation of Yin's model are detailed.

3.1 IS Research Frameworks

Potential Research Strategies

A review of Information Systems research literature has been conducted to determine the most appropriate potential research strategy for the research questions and propositions. Practices in information systems research have been subject to criticism by many researchers, including McFarlan (1985), Benbasat (1985), Vitalari (1985), Franz and Robey (1987), Straub (1989), Galliers (1985, 1991), and Kraemer and Dutton (1991). The criticisms have consistently focused on lack of rigor, application of a limited range of methodologies, and inappropriate application of methodologies. Subsequent reviews of published IS research by Grover et al (1993) and Cheon et al (1993) have supported these judgements.

Due to these severe criticisms of past information systems research practices and also to the broad based and multi-disciplinary nature of this research, it has been considered necessary to document clearly the current state of recommended practices in the various research strategies and to detail the logic for selecting an appropriate research methodology. Proposals have been made for improving research practices so as to support more 'scientific' work, even though researchers have been criticised for restricting their research to the use of a positivist or scientific methodology. (Lee 1989, Orlikowski and Baroudi 1991). The question of selection of research methodology is dealt with later in this section. The term 'scientific' as used here refers to a methodology which incorporates the capability for deductive testing of alternative theories through comparison with empirical evidence. (ibid). The range of potential 'scientific' strategies has been categorised by Galliers (1991) to include laboratory and field experiments, survey research, case studies, theorem proof, forecasting and simulation. In contrast to the scientific approach, the 'interpretivist' approach

seeks to investigate systems as a social process and therefore includes strategies such as action research, futures research and role / game playing. (ibid). While accepting this general categorisation, it must be noted that allocation of a strategy to, for example, a scientific approach should not preclude its use in an interpretative study. This situation could arise particularly with case studies which are frequently conducted in order to capture the rich contextual detail of processes. (Smithson, 1991).

Each of these strategies represents a different way of collecting and subsequently analysing empirical data. Each strategy has its own strengths and weaknesses. Reviews of alternative research methods are common in the context of a reviewer promoting a particular strategy, (e.g., Yin 1989, Benbasat et al 1987). A more impartial view, however, is available in Benbasat (1985), Lee (1989) and Galliers (1991). A review of each research strategy based on the two most recent references follows:

Experiments

Experiments investigate relationships between variables in a controlled environment, normally a laboratory. The results of the experiment are analysed, typically using quantitative techniques to enable generalisations applicable to the world at large. The major strength is the ability to isolate, control and investigate a limited number of variables. A major weakness is that in isolating variables it is necessary to simplify real life situations to such an extent that the ability to make generalisations is severely curtailed. An example of IS experimentation may be efficiency considerations in human-computer interfaces.

Survey research

Survey research takes a view of particular practices or situations at a specific point in time, mainly through the use of questionnaires or structured

interviews. Real world situations can be examined from a range of viewpoints and through a greater number of variables than with experiments. Using large sample sizes and quantitative analysis techniques, generalisations may be made. Survey research suffers from the potential for lack of insight into the causes of phenomena, bias by the researcher and/or respondents, and uncertainty as to the degree to which the specific point of time is representative. Examples of IS survey research may be the determination of characteristics of users or the testing of organisational factors relating to the adoption of IT.

Theorem proof

This strategy includes the development and testing of theorems. Galliers (1991) considers this to be a positivist approach which is most appropriate for technical and computer science theories since the elements of proof will derive from repeatability, reductionism and refutability (Checkland, 1981). Consequently, it is not recommended for more socially-oriented investigation. An example may be investigation of the viability of technical theories in telecommunications applications.

Forecasting and simulation

In the context of scientific research, forecasting involves the use of techniques such as time-series and regression analyses to extrapolate likely future occurrences from historical data. The strength of this strategy is its potential to provide insights into future events. The accuracy of the forecasts is dependent on the completeness and accuracy of the data, the skill of the forecaster and the relative influence of past data on the future.

Simulation focuses on replication of the behaviour of a system through the generation of an appropriate set of random variables. Simulation can be used to solve problems which are difficult to solve analytically, and to help determine

causes and effects of observed phenomena. The weakness of this strategy, as with experiments, is the difficulties in devising a simulation which is a meaningful representation of a real life situation. Examples of IS research in these areas may be the forecasting and simulated impact / recovery of transaction failures in an electronic funds transfer / point of sale system.

Case study research

The definition of case study adopted is:

"A case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities (people, groups or organisations)". (Benbasat et al, 1987).

There has been some contention, now largely historical, that case study research is not capable of supporting sufficiently rigorous, or scientific, research. These arguments have been laid to rest by improvements in the principles for application of case studies. Benbasat et al (1987), Lee (1989), and Yin (1989) have shown how this strategy can be conducted in a suitable manner. The strength of case studies is the ability to capture a greater number of variables than is possible with any of the other strategies. Further, it is possible through this strategy to follow up areas of interest which emerge in the course of the research which have significance to the research propositions. Historical weaknesses included the problems associated with making generalisations from limited cases; difficulties in distinguishing cause from effect (although longitudinal studies help to circumvent this problem); difficulties in allowing for replicability to enable verification by independent researchers; and the differing interpretations which can be placed on observations and other research outcomes by different researchers. An example of IS case study research may be investigation of resistance to the implementation of an MIS system in a single organisation.

The following strategies are considered interpretivist: Action research, Futures research, and Role / Game playing.

Action Research

The essential difference between case study or field experiment and action research strategies is the role of the researcher. In action research, the researcher's involvement will have an impact on the practical outcomes of the situation that they are researching for theoretical knowledge. At times the roles of researcher and subject will be difficult to separate. The strengths are the additional practical outcomes. Since the researcher is an integral part of the situation, any biases will be made clear to other participants of the project, although they may not be as clear in written reports on the research.

Weaknesses are generally similar to case studies, with an added complication relating to personal involvement in the dynamics of any group. Ethical considerations and professional detachment may be key concerns. There will be a need for an independent review to provide an impartial evaluation of research outcomes. An example of IS action research may be evaluation of the effectiveness of systems development tools in a series of development projects.

Futures Research

In the context of Information Systems, this strategy is concerned largely with the development of new social forms and behaviours as a result of the impact of IT. Futures research consists of the proposal of different future scenarios and considers the different aspects of IT in these scenarios through the use of techniques such as Delphi method and change analysis. It is particularly relevant strategy for determining social impacts, both within organisations and within society at large. Weaknesses of this strategy are similar to those faced by Forecasting. In addition, there is the potential for self fulfilling prophecies when

dealing with the prediction of future social systems where the prediction may unduly influence the outcome. An example of IS futures research may be the impact of office automation in a government department.

Role / Game playing

In the Information Systems context, this strategy is concerned largely with the development of hypotheses which can be subsequently tested in real life situations. Strengths and weaknesses are similar to Simulation, i.e. it provides an opportunity to study situations which might otherwise be difficult to analyse, but it is difficult to devise a situation which is a meaningful representation of real life. An example of IS role / game playing research may be the development of a change management framework for implementation of hand-held order entry devices for van salesmen who are members of a union known to resist change.

Process of selection of most appropriate strategy

In his consideration of research into Management Support Systems, Benbasat (1985, pp. 52 - 53) identifies three ways to select research strategies. The first approach is to assess the methodologies independently, that is without reference to the research problem. In this approach, case studies, for example, could be selected as being appropriate for hypothesis building, whereas field studies could be selected for testing models. Unfortunately, as we have seen above, all research strategies have strengths and weaknesses. This approach does not permit the researcher to consider how trade-offs between strategies could be made to strengthen the research.

The second approach is to use a number of complementary research methodologies to overcome the limitations of any individual methodology.

There is considerable merit in this approach, although it carries significant overheads. The third approach is to select the strategy according to the nature of the research problem. In this way the strengths and weaknesses of individual strategies can be carefully considered to strengthen the research. Although Benbasat directed his comments to MSS research, which would normally require some consideration and interpretation if to be applied to Information Systems research in general, it is contended that in this case the process of selection of a research strategy is not limited to the target domain. Benbasat (1985) also provides a matrix of research areas and recommended research strategies for each area.

Weick (1985) considers the question of selection of the most appropriate strategy with regard to research into the impact of technology, and argues for a "broader approach" to research which would enable researchers to examine a subject more clearly. He found that researchers had a natural tendency to see what they expected, so insists that research strategies be selected which would enable the widest feasible collection of data. This argument also does not appear bounded to the domain. In a further paper on this topic, Benbasat and colleagues (1987) suggest the researcher selects a strategy as being most appropriate based on the goals of the researcher and the nature of the research topic.

Yin (1989) identifies five major research strategies and three conditions which can be used to determine the most appropriate research strategy for situation. The strategies are experiment, survey, archival analysis, history and case study. The conditions are:

- the type of research question asked,
- the extent of control over actual behavioural events exercised by the researcher,

- the degree of focus on current as opposed to historical events.

Strategy	Form of Research Question	Requires control	Focus on current events
Experiment	how, why	yes	yes
Survey	who, what, where. how many, how much	no	yes
Archival analysis	who, what, where, how many, how much	no	yes/no
History	how, why	no	no
Case study	how, why	no	yes

Table 3.1. Relevant situations for research strategies (from Yin , 1989).

Table 3.1 illustrates the relevant situations for each the strategy. Yin considers "what" questions to pertain to all five strategies, when used in exploratory research. While Yin (1989) is of great assistance for case study researchers, his argument for the use of questions as a means of distinguishing between the various strategies is not compelling. As *why* and *how* questions can be used for different strategies, there is insufficient distinction between the categories to be of assistance. Further, it is too easy for an inexperienced researcher to change the verb of the research question to fit in with a previously selected strategy. Yin has taken the focus on research questions and the nature of research beyond the level of practical assistance and rigour.

Attewell and Rule (1991) support the use of a carefully chosen multiple method approach as being most effective. The range of strategies should be selected to meet the requirements of discovery and verification, and to facilitate analysis of the results. Their focus is to address the research problem.

An important issue which is not generally emphasised in the determination of an appropriate research strategy is the interests, experience and ability of the researcher. Researchers with a statistical orientation, not unreasonably, will be

drawn more to quantitative research. Researchers lacking confidence in their ability to deal closely with senior management over time would be prudent to avoid a research strategy which required qualitative research with managing directors. Consequently, researchers are well advised to select both research questions and designs which are consistent with their capabilities.

Consolidation of this accumulated wisdom into determination of the most appropriate research strategy leads to a strategy incorporating multiple methods (triangulation) of data collection, which have been carefully designed to meet the requirements of the research problem in a manner which will recognise and overcome the weaknesses of individual methods while utilising their strengths to enhance the research. Also, the strategy must be consistent with the capabilities of the researcher(s).

Frequency of research: single shot vs. longitudinal studies

Longitudinal research design is concerned with observing and measuring phenomena at a number of points in time over a finite period of time. Most IS field research takes the form of single, one shot studies. The fundamental problem with the latter is that IS research is largely concerned with issues relating to the use of IT in organisations. This inter-relationship is complex and highly volatile, but single shot studies of a situation are seldom capable of capturing the complexities. (Vitalari, 1985). Consequently, the research outcomes of single studies are seldom immediately applicable in organisations.

The major advantage of longitudinal studies is the opportunity to explore appropriate IS research issues in greater depth and complexity over time. The pay-off to organisations and to researchers is the potential for practical outcomes which can be applied in these organisations. Longitudinal research has some major disadvantages: it is costly, time consuming and risky. The level of risk is

due to the possibility of the phenomenon becoming obsolete as a result of developments during the course of the research and also due to possible attrition of participating organisations over the period. In addition, longitudinal research may be unrewarding in the short term as publication of results can be delayed. These disadvantages possibly explain why there are many calls for longitudinal research, but fewer implementations. (Pettigrew 1985, Franz and Robey 1987).

Franz and Robey (1987) make an additional argument for longitudinal studies. Research strategies for the purpose of discovery can observe the current state and lead to generation of factor theories. Multiple periods, however, are required to enable observation of on-going processes, which is required to generate process theories.

Single case versus multiple-case design

Arguments for and against multiple-case design were also considered in the context of this research. Yin (1989) argues that greater certainty lies with a larger number of cases, and if external conditions are thought to produce much variation you should do more cases. Benbasat et al (1987) consider single case study projects to be most useful at the outset of theory generation and at an advanced stage in theory testing. Multiple-case designs are desirable when the intent of the research is description, theory building, or theory testing, and multiple cases allow for cross-case analyses and extension of theory. Of course multiple cases yield more general research results. (Benbasat et al, 1987).

Yin (1989) argues for single case case-studies when:

- it represents the critical case for testing a well-formulated theory,
- it represents an extreme or unique case,

- it may be a revelatory case which provides an opportunity to uncover some prevalent phenomenon previously inaccessible to scientists.

While single case designs require careful investigation of the potential case to minimise the chances of misrepresentation and to maximize the access needed to collect the case study's evidence. Evidence from multiple cases is often considered more compelling, and a multi-case study is regarded as more robust than a single. Multiple cases, however, require extensive resources and time. Multiple cases should be considered as multiple experiments, i.e. replications. Replications can be of two types:

- literal replication, which predict similar results between cases, and
- theoretical replication, which produces contrary results for predictable reasons.

Validity and reliability

Yin (1989) considers three tests of validity, in addition to a test of reliability. The tests are:

- Construct validity. This test seeks to avoid subjective judgements being used in the collection of data. Three tactics are suggested to increase construct validity: use of multiple sources of evidence; establishment of a chain of evidence which would enable an external observer to follow the derivation of any data or evidence from initial research questions to ultimate conclusions of the case study; and review of the draft report by key respondents.
- Internal validity, which is appropriate for explanatory but not exploratory research, seeks to ensure that the research design allows for the possibility of unexpected causal relationships emerging from the data collected.

- External validity relates to the capability of the findings to be generalisable beyond the immediate cases. Case study research relies on analytical generalisation which can be tested through replications.
- A test of reliability is designed to minimise errors and biases in a study . The use of a case study protocol and a case study database are tactics which can increase reliability.

Subsequent to Yin (1989) other authors have contributed to the area of research validity. Easterby-Smith et al (1991) consider that:

"to be regarded as valid, research needs to have been placed in the public domain so it can be debated and defended."

They identified specific ways to ensure the validity of qualitative research:

- obtain feedback on conclusions from respondents,
- spell out the settings and relationships in which interviews and observations took place. The degree of collaboration is also relevant.
- ensure that any limitations of the research or process are highlighted. Honesty about limitations will enhance confidence in the positive results.
- Declare and explain personal preferences or potential biases if likely to impact the research.

Validation of instruments is a separate validity requirement. Straub (1989) contends that

"confirmatory empirical findings will be strengthened when instrument validation precedes both internal and statistical conclusion validity."

Straub argues for increased rigour in MIS research methodologies to enable increased confidence in the measurement of responses and in the relationships drawn between research findings. Techniques which can be adopted to achieve these ends include pretesting, pilot testing, formal validation procedures and the use of previously validated instruments. Pretesting can be used to qualitatively establish construct and content validity and the reliability of measures. Pilot tests establish reliability and construct validity as well as aiding in the prediction and resolution of scaling and administration problems. Formal validation uses techniques such as factor analysis to establish reliability and internal validity. Close imitation of previously validated instruments can serve to relieve the necessity to validate (provided the instruments are applied appropriately) and to ground the research.

Criteria for judging the quality of research designs

Consistent with the application of Yin's framework for case study research is his criteria for judging the quality of research designs. Yin (1989) suggests a structure of five components for the Research Design:

- study questions,
- propositions,
- units of analysis,
- logic linking data to propositions,
- criteria for interpreting the findings.

Criteria for judging the quality of research designs should include consideration of each component and its consistency with the other components. The research design should not only identify the data to be collected, but also state what is to be done with the collected data, (i.e., analysed with respect to the propositions and

criteria for interpretation). In addition, consideration needs to be given to the validity and reliability of the research design.

3.2 Research Methodology

Methodological considerations

Details of the processes undertaken in the determination of research strategies and the state of the art in IS research have been included for two major reasons. The first reason was professional. There had been recent developments in research practices (primarily from Yin, 1989) which presented an opportunity to apply new techniques to enhance the level of professionalism of IS case study research. Professional conceit demanded that if the work was to be done then research of high quality would be the outcome, so with criticisms of earlier IS research in mind, Yin's approach was adopted. The second reason was that during the investigation process, it became apparent that researchers into the use of IT in developing countries were experiencing difficulties which had been addressed in mainstream IS research.

Research into SISP in developing countries is problematic as there are limited precedents and difficulties arise in obtaining accurate details on the subject area, numbers and types of organisations being examined. Additional difficulties arise in applying research methodologies due to limited access to tools of research considered the norm in Western environments (e.g. listings of abstracts and cross-reference listings on publications); very limited prior research and an even more limited number of researchers which severely reduces models of research to be observed or avoided; more limited access to Western publications due to distance; reduced opportunities for inter-institutional loan; and increased costs of publications for overseas subscribers.

For these reasons, it was considered important for this research to document an attempt to apply the current state of mainstream IS research methodologies to research in developing countries. In section 2.5 above, the key to selection of the most appropriate research strategy was determined. This key was to identify a research strategy which:

- incorporated multiple methods (triangulation) of data collection;
- had been carefully designed to meet the requirements of the research problem in a manner which would recognise and overcome the weaknesses of individual methods while utilising their strengths to enhance the research; and
- was compatible with the capabilities and experience of the researcher.

Following application of this process, the most appropriate strategy appears to be case study with triangulation of interview, observation and documentation. The remaining strategies were considered and set aside as the variables could not be isolated or controlled (Experiments); the necessity to obtain insight into causes of the observable phenomena which were the purpose of this research excluded Survey Research; the Research Questions did not include any theorems to be proven (Theorem Proof); and the Research Questions are contemporary and historical (thus not requiring Forecasting and Futures Research). An Action Research approach was seen as being not appropriate since the practical benefit of the research was directed at organisations other than those being investigated. A potential for overlap between case study and action research was accepted with feedback of the results of the investigations to organisations, and by virtue of the presence of the researcher investigating these issues. Role / Game playing was not seen to support the Research Objectives of determining how indigenous companies planned for, used and managed Information Technology. Descriptive

/ interpretative research activities were limited to literature reviews of past research and approaches. While Benbasat (1985), in his matrix of research areas and recommended research strategies, finds laboratory experiments to be the most appropriate strategy for researching decision-making processes, this is not pursued as he appears to be focusing on the specific instance of systems support for decision-making (i.e., DSS) rather than the strategic decision-making in this case.

While the most appropriate strategy was apparently case study, further and more detailed investigation of this research strategy was made prior to final commitment. The advantages of case studies were reviewed. Yin identifies that, "case study is preferred in examining contemporary events but when the relevant behaviour cannot be manipulated" (Yin, 1989 p 19). As there is no requirement in this case for manipulation of behaviour to resolve the Research Questions, as for example would be required for re-creation of a prior event in simulation or role / game playing, case study is again indicated.

While acknowledging the limitations of Yin's selection of research strategy by verb (e.g. what, how etc.) his categorisation of research questions into explanatory and exploratory is of significance. Explanatory research questions deal with operational activities, not merely frequencies or incidence. Case studies are an appropriate approach for explanatory research as they are able to capture a greater depth and breadth of details on the operational activities. Most, if not all, of the potential strategies have been used in some form for exploratory research. A case study approach is at least as appropriate as other strategies. A case study strategy is indicated for two reasons: the primary results sought are not quantifiable or numerable (hence surveys and questionnaires are not as appropriate) and also to maintain consistency in data collection with the explanatory research questions.

Other factors considered in the decision on research strategy have been the necessary extent of control over, and access to, actual behavioural events by the researcher. As the Research Questions require access but not control, a case study strategy is indicated. Benbasat et al (1987) consider that a case study is particularly appropriate for early formative stages of research and, "sticky, practice based problems where experiences and context are critical", and that case studies are "well suited to capturing of knowledge of practitioners and development of theories". In determining the appropriateness of case studies, Benbasat and colleagues (1987) suggest four questions should be asked:

- can the phenomenon of interest be studied outside its natural setting?
- must the study focus on contemporary events?
- is control or manipulation of subjects or events necessary?
- does the phenomenon of interest enjoy an established theoretical base?

Three reasons for using case studies are identified by Benbasat et al (1987):

- study IS in a natural setting, learn about state of the art and generate theories from practice,
- ask "how" and "why" questions to understand the nature and complexity of processes,
- research an area in which few previous studies have taken place.

Galliers (1991) identifies the strengths of case studies as the ability to capture greater detail including interrelationships, and weaknesses of restriction to a single event / organisation; problems of making generalisations; and difficulties in distinguishing between cause and effect.

Disadvantages of case studies include:

- lack of rigour in case research - too many sloppy case studies,
- little basis for scientific generalisations (not a sample),
- takes too long and generates massive, unreadable documents,
- difficult to make controlled observations,
- difficult to make controlled deductions,
- difficult to allow for replicability. (Yin 1989, Lee 1989).

After consideration of traditional prejudices against case studies and the other disadvantages listed, what we are left with is a view that case studies can be a most appropriate form of research, but that good case studies are very difficult to do. While guidelines such as Yin's book help, the skills for doing good case studies have not as yet been fully defined. Yin's list of commonly required, mostly personal, skills to conduct a case study includes the capabilities of the researcher to:

- ask good questions, and interpret answers,
- be a good listener, and not get trapped by preconceptions,
- be adaptive and flexible,
- have a firm grasp of issues being studied,
- be unbiased by preconceived notions,
- be honest in assessing their capabilities.

McFarlan (1985) suggests that one of the major barriers to research in Information Systems is the background of the majority of researchers. He lists mainly professional skills as being required:

- interest and proficiency in managing data processing technology,
- insights on new developments in IS technology and their economies,

- comfort with the technology.

He contends, however, that while these assets are absolutely essential, they are not sufficient. Researchers also require knowledge of research in business policy, competitive strategy, organisational behaviour, organisational learning and the management of technology. Following careful consideration of these points, it was felt that this researcher meets sufficient of the requirements to support adequate application of the research methodology. Another critical requirement for the conducting of case studies was raised by Benbasat et al (1987). This is the overall assumption in case study research methodology of the willingness of business to participate candidly. This requirement became of major concern at times in this particular research.

Tactics were employed in the research design in order to overcome the remaining potential weaknesses: multiple organisations would be investigated in cross-sectional research; rigorous research design would address the problems of making generalisations; and longitudinally oriented case study research would be undertaken to distinguish between cause and effect, and to identify processes over time, albeit over the relatively short period of time: 1992 - 1993. (Pettigrew, 1985, 1989).

As a consequence, the research strategy is predominantly to use a case study approach to resolve the Research Questions and Study Propositions. The Research Instruments were piloted and refined prior to use. In addition, feedback was provided to CEOs after the interviews seeking confirmation of details and interpretations. In addition, papers based on this research were circulated to interviewees for their response prior to publication.

Validity measures

Validity measures applied were consistent with Yin's (1989) proposals for tests of validity and reliability outlined in 2.5 above. For the purpose of construct validity, a triangulation of multiple sources of data was used in the case study: documents (including published third party data on the sites e.g. membership entries in the Federation of Hong Kong Industries directory, industry studies, government information, articles, and documents collected during site visits such as organisation charts, computer configurations, software information, annual reports etc.); open-ended but focused interviews; and observations. Observations sought to confirm data, (e.g. numbers of staff, level of use of IT); to gather data (e.g. number of subsidiaries listed in front office); and to assess the situation, (e.g. of the level of professionalism and / or sophistication displayed in computing facilities).

A chain of evidence was established to enable an external observer to follow the derivation of any data or evidence from initial research questions to ultimate conclusions of the case study. All respondents reviewed and confirmed details and interpretations after each round of interviews. All respondents also reviewed draft reports.

A test of internal validity proposed by Yin (1989) was found to be not appropriate for exploratory research, so was not utilised. External validity was established by propositions to support analytical generalisation which were tested through replications. To support the test of reliability, a case study protocol and a case study database were both utilised.

3.3 Research Design

Design issues

Case study research was designed in two iterations in order to maximise the knowledge and understanding of the use and management of IT over time. In order to support generalisations from the case studies, the research was conducted with adherence to formal processes for rigorous case study research, as proposed by Yin (1989). Yin requires five components of a research design: the questions, propositions, units of analysis, logic linking data to propositions and criteria for interpreting findings. The questions and propositions have been detailed in section 1.4 above, the remaining design issues follow. The linkage of data to propositions is considered in separate sections which deal with, in order, the data to be collected, phases in data collection, instruments, validation of instruments and analysis and presentation of data.

Units of Analysis

A single unit of analysis has been determined through examination of the research questions and consideration of the outcomes sought from the research. As the Research Questions are directed at an organisational level, a single organisation is the unit of analysis. Within this unit of analysis, details will be sought from individuals with responsibility for the whole organisation (CEO) or Strategic Business Unit, as appropriate, and for IT at a functional level (IT Manager). The Research Questions require investigation of multiple organisations. While it was thought unlikely that universal factors and processes will be identified, it was anticipated that groupings of common factors and processes may occur. These groupings were expected, for example, by economic sector or by size of organisation across economic sectors.

What data to collect and how to collect it?

Data (as outlined in Table 3.2 below) is to be collected in this case study research through documents, open-ended but focused interviews, and observations.

Observations will seek to confirm data (e.g. numbers of staff, level of use of IT); to gather data (e.g. inter-organisational structure from the number of subsidiaries listed in front office); and to assess the situation (e.g. of the level of professionalism and / or sophistication displayed in computing facilities).

Yin (1989), and others (e.g., Pettigrew, 1985) consider time to be an important element in setting the boundaries of what data to collect. The time anticipated for the research should be sufficient for resolution of the research questions. A particularly important issue is the boundaries of the research. Time boundaries should be set according to natural boundaries in the research rather than stopping the research when the researcher runs out of time according to an externally set deadline. Time boundaries adopted in this research for factors are:

- beginning - formal decision meeting(s).
- end - end of meeting(s) when a decision is made.

Factors may be formal (openly presented during decision process) or informal (not openly presented during decision process). For the purposes of this study, both types of factors would be sought and recorded. Time boundaries adopted for processes are:

- beginning - all processes directly related to and influencing the decision.
- end - once decision has been made.

For the purposes of this study, a formal decision meeting is deemed to have occurred at any point in which consideration of the decision to utilise IT or not takes place. Potentially, this could be consideration by the CEO in isolation.

A chain of evidence was established to enable an external observer to follow the derivation of any data or evidence from initial research questions and propositions to ultimate conclusions of the case study. All respondents reviewed and confirmed details and interpretations after each round of interviews. Respondents also reviewed publications developed from the research. Data collection practices were consistent with those nominated by Yin (1989) and Benbasat et al (1987).

Phases in data collection

The processes of background, preparation, data collection, and analysis have been divided into 10 phases.

Phase 1 Literature Review.

Phase 2 Preparation.

Phase 3 Pilot Study.

Phase 4 Case Study - round 1. The objective was to establish company background and profile, establish factors, identify processes.

Phase 5 Feedback. Dual objectives were: a) to provide feedback to CEOs based on Phase 1; and b) obtain feedback on their opinions.

Feedback from the CEOs' was to include confirmation, denial or correction of facts, factors and processes from CEOs viewpoint and identification of hidden factors or processes. It was anticipated that this feedback loop would stimulate responses into being more revealing, and would also maintain the interest and goodwill of

the company during the second round by providing some benefit from the first phase of interviews.

Phase 6 Analysis.

Phase 7 Case Study - round 2. The objective was to establish company profile at this time, confirm previous factors, confirm previous processes, identify new factors and processes and to finalise research questions.

Phase 8 Feedback from the CEOs had the same objectives as in Phase 5. This feedback phase also presented the companies with their final opportunity to identify confidential areas and to correct details. Each company was specifically cautioned that failure to respond with corrections would be considered approval for publication.

Phase 9 Analysis.

Phase 10 Review / revision of Western SISP models.

A case study protocol was utilised to increase reliability during these research phases in ten different sites over a period of nearly two years.

Research instruments

The major areas in the research instruments are shown in Table 3.2 below. For more complete details of research instruments, please refer to Appendix 3.

Validation of Instruments

While Straub (1989) focuses on ways to strengthen "confirmatory empirical findings" and this research is not engaged in that objective, his goal of increased rigour in MIS research methodologies to enable increased confidence in the measurement of responses and in the relationships drawn between research findings, is most appropriate for this research. A review of the techniques suggested shows that some of the techniques are suitable for this research.

Area	Topic
Round 1 interviews	
Context	<ul style="list-style-type: none"> • Background information on organisation, staff and business environment.
Systems	<ul style="list-style-type: none"> • Experience with IT (office and production systems). • Current status.
Decision-making	<ul style="list-style-type: none"> • Factors and processes in decisions to utilise or not to utilise IT.
Evaluation	<ul style="list-style-type: none"> • Evaluation of IT investments. • Perceived impact of IT on the organisation.
Management	<ul style="list-style-type: none"> • Strategies for use of IT.
Round 2 interviews	
Context	<ul style="list-style-type: none"> • Any changes to background details on company or environment.
Systems	<ul style="list-style-type: none"> • Changes in IT since last interview.
Decision-making	<ul style="list-style-type: none"> • Factors and processes in decisions to utilise or not to utilise IT. • Declining to invest in computing and IT.
Evaluation	<ul style="list-style-type: none"> • Evaluation of IT investments. • Measures of investments in computing and IT. • Perceived impact of IT on the organisation.
Management	<ul style="list-style-type: none"> • Changes in IT Department and Strategies.

Table 3.2. Major interview areas in research instruments.

As the case study research was not limited to questionnaires, but focused on open ended questioning, the necessity for rigid review of the instruments was not as great nor as necessary. A form of pretesting was used to establish *prima facie* construct and content validity as well as the reliability of measures by presenting to and discussing the research instruments with peers and research supervisors. Reliability has been used in the sense of the stability of the qualitative research process, particularly the interview questions. Would the process yield the same result if administered to the same individual on more than one occasion? Validity has been used in the sense of the capability of the qualitative process to return plausible results based on anticipated responses and results from similar or related research. (Easterby-Smith et al, 1991 p 121). Pretesting was also used to ensure the initial letter and areas of questions were easily understood and correctly interpreted without cultural difficulties.

Pilot testing was utilised to aid in the prediction and resolution of scaling and administration problems. Pilot testing also assisted in the establishment of reliability and construct validity, however, the factorial and statistical analyses as outlined by Straub were not utilised as these techniques are more appropriate for quantitative research. The exploratory nature of this research precluded the use of previously validated instruments, and the research instruments were grounded through the research questions, the research propositions and comparison with the selected Western models.

Critical incident techniques (such as recounting the events leading to the initial implementation of IT) were utilised where appropriate in the interviews to identify factors, processes and motives in decisions to adopt, reject and utilise IT.

Data analysis and presentation

The research was designed to support movement from objectives and questions to assumptions and design choices, to specific data uncovered and finally to results and conclusions. The process aimed to retain the contextual and data richness of case studies with analysis which treated the evidence fairly, to produce compelling analytic conclusions and to rule out, as far as possible, alternative interpretations. (Yin 1989). Yin also suggested that analysis of case study evidence is one of the least developed and most difficult aspects of case study research. He proposes two strategies, with the preferred strategy being to rely on the theoretical propositions that led to the case study to provide a reference and focus for analysis of data. This strategy has been adopted.

Data analysis consists of examining, categorising, tabulating or otherwise recombining the evidence to address the initial propositions. Within the data analysis strategy, Yin recommends three major techniques: pattern matching, explanation building and time-series analyses.

- Pattern matching - compares findings with predicted or alternate or rival propositions. This strengthens the internal validity.
- Explanation building - specifically for explanatory case studies, this technique builds up explanations through iterations of cases.
- Time-series analysis - seeks a match between the trend of data over time compared to a theoretically significant trend specified before the investigation, versus a rival trend also specified before investigation.

All three techniques were utilised to link data to propositions. Easterby-Smith et al (1991) caution researchers against attempting to quantify qualitative data in order to exploit the persuasiveness of quantitative data. Reducing qualitative data to numerical presentations reduces the richness of the interview process and often removes the 'holistic' view of the research findings. The maintenance of the qualitative view, in which the researcher aims to produce common or contradictory themes and patterns from the data, has been labeled 'grounded theory'. (ibid, p 105). In grounded theory, data and observations based on the data are kept in context. This proposal is generally consistent with Yin (1989).

Criteria for interpreting findings

Yin (1989) suggests that currently there is no precise way of setting the criteria for interpreting the findings of case studies. It is hoped that research data collected would be sufficiently contrasting to support its interpretation through comparison of rival propositions. The most common form of generalisation in research is statistical generalisation (e.g.. an inference is made about a population on the basis of empirical data collected about a sample), however, for case study research Yin proposes that analytic generalisation be used. In analytic generalisation, a previously developed theory or proposition is used as a template with which to compare the empirical results of the case study. If two or

more cases are shown to support the same theory, replication may be claimed. It would seem that research findings, in the first instance, should be interpreted also according to the research questions. In this research, the criteria for interpreting findings was both research questions and comparison of rival propositions.

Criteria for judging the quality of research design

As outlined in section 2.5 above, Yin's (1989) model proposes five components of Research Design. Each of these components has been included in this research design. In order to confirm the research design, Yin proposes four tests: construct validity, internal validity, external validity and reliability. Apart from internal validity, which is not proposed for exploratory research, all tests have been addressed. External validity in particular was addressed through the potential for replications in multiple sites of different sizes in different economic sectors. Reliability measures include documentation of the procedures followed, utilisation of a case study protocol and development of a case study data base.

Yin (1989) proposes five characteristics for an exemplary case study:

1. The case study area must be significant, the cases unusual, and/or the issues are of national importance.
2. The case study must be complete, i.e., boundaries of the case are logically appropriate to the case study, all relevant evidence should be collected, and there should be an absence of artifactual conditions, (e.g. no suggestion of lack of time to complete the study).
3. The case study considers alternative perspectives, (e.g. of different players and rival propositions neutrally) with both supporting and challenging data, i.e., no evident bias.

4. The case study must display sufficient evidence, i.e. the most compelling evidence should be presented in a manner which will enable the reader to reach an independent judgment on the merits of the analysis
5. The case study to be composed in an engaging manner, i.e., clear writing style which shows the enthusiasm of investigator.

While it is not appropriate for the author of a case study report to determine its success in meeting these characteristics, it can be stated that they were used as guidelines which this study attempted to follow.

3.4 Research Process

Overview

Longitudinally oriented cross-section case study research was undertaken in 1992 and 1993 into the practices of indigenous companies in their adoption and utilisation of information technology and information systems in both the manufacturing and financial sectors in Hong Kong. While this research is limited in the depth and breadth which can be examined during this period, the research can be placed in the context of both wider and longer term research into the experiences of indigenous firms with IT and the development of models and frameworks to assist in their utilisation of IT.

The initial phase of research was to conduct literature reviews to establish the current state of theory and practice. Literature reviews quickly demonstrated the green field nature of this research. Difficulties were experienced in obtaining usable research data, particularly in analyses of the level of use of IT in Hong Kong. One of the few full reports on the state of use of IT in Hong Kong was conducted for the government Trade and Industry Department. Following a

personal request, a copy of this full report was supplied on the strict condition that it be treated in its entirety as confidential.

Full data on the Hong Kong market was simply not available. The local subsidiaries of market research companies which have willingly assisted my earlier research overseas were not able to provide any information without charge. Even with payment, the nature of the research and limited focus precluded wider use. Published materials on developing countries are in general not abstracted nor accessible through on-line searches. Eventually, persistence was rewarded with sufficient limited studies to be able to construct an adequate picture. It must be stated, however, that the limited availability of literature contributes substantially to difficulties in research and consequently to the development of practical assistance to organisations using IT in developing countries.

Prior to commencing interviews the research question areas were reviewed with a pilot site. Considerable background information on the industries was obtained from the pilot site and from senior management and staff of the Hong Kong Productivity Council, the Federation of Hong Kong Industries and the Chairman and staff of the Chinese Banks' Association. Letters provided by these organisations expressing strong support for the research project and goals were included with the materials sent to each prospective interview site. The preparation phase included site selection and commitment. This process was problematic for the manufacturing sites (as outlined in the section on site selection below) but, doubtless due to the experience gained, was more straightforward for the banks.

Interviews with each company were conducted on site in two rounds. The purpose of the iterative research was to obtain details on each company over

time. Interviews were semi-structured. The range of interview areas was provided to interviewees in advance in order to facilitate a considered response about historical events, not just to gain initial reactions. Consequentially, the potential for accuracy was improved. Reduction in spontaneity was not considered a problem in this case as spontaneity was not an element under investigation. Subsequent to each round of interviews, transcripts were returned to the sites for approval of details and their interpretation. All interviews and observations were conducted by the same researcher to minimise investigator bias. Interviews were conducted with different levels of managers in the manufacturing and banking sites.

In the manufacturing companies, interviews were held primarily with the individual responsible for the operations of the company. Titles of the manager varied, especially in companies which formed part of a larger group with non-manufacturing interests, but included Managing Director, Director and Manufacturing Manager. In the case of the Manufacturing Manager, discussions were held also with the group MD. In addition, interviews were held with the person responsible within the company for computing, if one had been appointed. At each site, the computer installation was visited. Office and production systems were demonstrated and observed.

In the banks, interviews were sought with the manager of a strategic business unit as well as the manager responsible for EDP. Of the four banks, the strategic business unit (SBU) manager in two sites was an executive director of the bank. In the other two sites, one manager was responsible for retail banking operations, and the other was the bank's corporate secretary. Consequently, both EDP and strategic management perspectives were obtained. At each site, the computer installation was visited.

Primary research findings were based on triangulation of longitudinal interviews, observation and documentation. Documentation made available varied between sites. Some provided annual reports, background details, organisation charts, computer profiles, etc. Other sites were unable or unwilling to provide much documentation at all. Where these details were not able to be documented, the interviews covered the areas in more depth and other sources of confirmation (such as observation and / or newspaper articles) were sought. Construct validity was established by triangulation, chain of evidence and formal review by the interviewees for verification.

The feedback / verification phase was most important, not only for establishing the accuracy of recording and interpretation but also as part of the process of developing rapport with the interviewees. By the second round of interviews, most of the managers had become very open to the point where maintaining confidentiality became of concern to the interviewer. In the second round of feedback, all sites were given a final opportunity to identify confidentiality prior to publication. All interview details included in this dissertation have been approved for publication.

A case study protocol (see below) was utilised to support the objective of reliability. Analysis of research findings did not commence until all interviews were concluded. Difficulties with data analysis were experienced, but these were considered generic to case studies. Interviews returned so much detail, much of it particular to the site, that it was at times difficult to extract the common factors without reading details into the responses. For this reason it was of critical importance that all sites received feedback on the interviews and confirmed the details and interpretations. Part of the problem was open ended questioning. (Closed-question questionnaires appear to be so much easier to analyse as the interviewer can obtain a specific answer to a question. There are, however,

major problems with questionnaires, which include: asking the right question, ensuring sites understand the question and ensuring you understand the implications for each site of the answer. That is, the question may be viewed in a particular light due to the site's circumstances which may be totally different from the circumstances anticipated. A danger with questionnaires is that the researcher may never find this out!)

Case Study Protocol

The purpose of a case study protocol is to increase the reliability of the research, (i.e., to reduce the errors and biases in the study). In essence, the protocol becomes a planning document to keep the research focus in multiple sites over extended periods of time. It may be argued that this level of detail is unnecessary for a sole researcher as it is particularly aimed at ensuring each member of a larger research team is completely focused on the research goals and objectives. In this particular case, perhaps due to the years of experience in formally planned computer systems development projects, this researcher found the planning document to be of great assistance in establishing and maintaining focus when faced with a substantial amount of detail gathered from multiple sites over an extended period of time.

Consistent with Yin (1989) the case study protocol included research aims, objectives, sponsors of the project, person conducting research, details of site selection, proposed interview areas, structure and arrangements. Open ended case study questions were documented and provided to sites in advance. The purpose of documenting the questions was three fold: to ensure sites agreeing to participate in the research were fully aware of the nature of the research areas, to enable the interviewees to prepare for the types of questions (some of which were historical or may have required other investigation) and to maintain the

interviewer's focus during the interview phases. The structure imposed on the interviews by documenting the questions also assisted in recording and analysing the details. Prior to commencement of the research, as part of the research proposal, consideration was given to the means of analysis of the research findings and the structure of the final report. This also assisted in maintaining focus on the details gathered and analysed.

Pilot study

The pilot site is recognised in Hong Kong as one of the most experienced and enthusiastic users of IT. The company developed its own sophisticated production systems, which it has sold to other companies. The pilot study was used to pretest research approaches, questions and procedures, and to acquire more practical knowledge about the business, its constraints and the potential use of IT. This information gathering and pretest opportunity was particularly important for a Westerner with limited experience in manufacturing about to undertake iterative research in local Chinese manufacturing firms. Senior management in the pilot site was known by me professionally prior to the research. As a result of the pilot study revisions were made in the approach, and certain of the questions and procedures, but the research design and theoretical issues remained unchanged.

Yin (1989) suggests that the pilot study should not be used merely as a pretest or dress rehearsal for the full set of interviews. The opportunity should be taken to use the pilot more formatively by assisting an investigator to develop relevant lines of questions. In this case, however, the research purpose, aims, questions and propositions had been established well in advance of the pilot study. This is not necessarily inconsistent with the rigour of Yin's procedure, in that the research questions were in areas in which little prior research¹ had been

undertaken. The purpose of the research was not to determine the range of possible questions.

Site selection

Great care was taken to select the firms being examined so as to support generalisations by theory. The objectives in site selection, in order of importance and application, were to:

1. support literal replication,
2. support theoretical generalisations by avoiding opportunistic selection, and
3. support the research purpose by selecting organisations which would be appropriate as role models for other companies. (Yin 1989, Pettigrew 1989).

Literal replication was sought from selection of local companies in the same sector, of varying size. Replication was sought within economic sectors as a minimum, and between sectors as an ideal. An alternative sought was replication by size of firm between sectors. Comparisons between sectors were enabled through the selection of companies from two of the most important economic sectors in Hong Kong, manufacturing and financial services - banking. Similar results were expected. Due to the focus on indigenous ownership, companies with foreign ownership, or with Western representatives included in the list of directors, were excluded.

An opportunistic approach was avoided. In a small compact economy, such as Hong Kong, as well as in larger diverse economies there is the temptation to use opportunistic means to select organisations for research. In this way organisations are selected on the basis of personal or professional contact with

member(s) of the organisations, rather than selecting organisations for their capability to enable generalisations to be made. There was considerable temptation to rely, for example, on the Hong Kong Productivity Council (HKPC) for assistance in selecting target organisations. The HKPC is a statutory body established in 1967 to promote increased productivity in industry in Hong Kong. The HKPC is highly regarded in Hong Kong, and its senior staff expressed strong support for the research plan.

This industry body, however, was not utilised in the selection of firms to be examined as the selection still would have been opportunistic, even if they were once removed from the researcher, in that the basis of selection could not be shown to have been appropriate for generalisation. Furthermore, it would have severely reduced the ability to replicate the research in other countries.

Selection of manufacturing sector sites

The companies selected were to be considered 'role models' for other companies in the sector. Research in Hong Kong (in common with many developing countries) suffers from a lack of availability of information on individual companies. It is, therefore, very difficult to identify companies likely to be most suitable. It was considered that the greatest benefit for Hong Kong companies would be derived from an analysis of the activities of prominent companies, rather than companies that were unknown. In other environments, market leading companies would be the apparent choice when seeking to identify role models for other companies. In the Hong Kong environment, however, market leaders were not selected due to:

- no statistics being available on market leaders in manufacturing companies in Hong Kong,
- Hong Kong's manufacturers predominantly export their products.

Therefore, any assessment of market leadership in Hong Kong would have been unrepresentative, even if such statistics had been available. Other measures of prominence were considered, such as export award winners (not given in this industry) and peer recognition, such as awards for manufacturer of the year. The MD of one selected company was a previous winner of the Young Industrialist of the Year award. Unfortunately, this criterion could not be used as only one award has been made in the textile and clothing industries.

Consequently, selection of target organisations for the manufacturing sector was made by the identification of prominent companies from the Textile and Garment Groups of the Federation of Hong Kong Industries (FHKI).

Prominence was established by firms nominated and elected as representatives of particular industries on the General Committee of the Federation for 1991 - 1992. Selections were then made from the group of prominent firms according to size and industry grouping. Size was determined from membership details (annual revenue and numbers of staff) published by FHKI. Industry selection was facilitated by the range of industry and sub-industry groupings for which representatives were elected.

Essential factors sought in selection of manufacturers were: textile and garment sector; prominence (to support role models); indigenous ownership and board of directors (to avoid potential reduction in generalisability due to unknown influences); and publicly available characteristics permitting evaluation of size, e.g., turnover and / or number of employees. A desirable factor was a range of sizes, small, medium and large. All the essential factors were met. The initial intention was to interview sites in each of the size categories: small, medium and large, to enable comparisons by a range of sizes as well as by economic sector. This did not eventuate. Two companies classified as prominent reported less

than 50 employees. Despite several requests, one declined to participate in the research. The second was prepared to participate but was no longer active in this sector.

The Hong Kong Government Industry Department does not classify companies according to the categories small, medium or large. Their classifications include ranges of numbers of employees. In any event, classification of the firms into the categories small, medium and large is problematic. Definitions of small / medium enterprises based on numbers of employees vary, as can be seen in Table 3.3. Doubtless there are valid national reasons for these variances, however, in the interests of clarity in this paper such classifications have been avoided. Based on details reported by the companies to the FHKI, the two selected garment industry companies had more than 600 employees. The two selected knitting industry companies had more than 300 employees. The selected textile company reported more than 240 employees.

Maximum numbers of employees	Additional financial criteria?	Source of definition
500		European Economic Community, France, Germany and Italy
300	Yes	U.S.A.
200		U.K.
100	Yes	Greece, Singapore
100		Ireland
50		Belgium, Denmark
300	Yes	Japan (manufacturing industry).
50	Yes	Japan (retailing industry).

Table 3.3. Varying definitions of small / medium enterprises.
(Sources: DeLone 1988, Ho 1988, Doukidis and Smithson 1992, Soh et al 1992).

In 1991 the value of domestic exports of the Clothing Industry by product group showed two major groups: woven products (cut and sewn) at 50% of exports, and knitted garments at 43% of exports. The four selected Clothing Industry sites represented prominent locally owned companies in the two largest product

groups of the Clothing Industry. (HKGID, 1992). The fifth selected site represented the Spinning (wool) Group of the Textile Industry.

Five firms from the Textile Industry met the selection criteria. Four of these five firms declined to participate even after appeals. The major reason given was that they were too busy. Rather than vary the selection criteria, it was decided to proceed with the four clothing and one textile manufacturing firms as representatives of three major groups in the clothing and textile industries. This selection met the research requirements for inter- and intra-sectoral comparisons.

Selection of banking sector sites

Comparative statistics on banking operations are available both from official sources, such as the Office of the Commissioner of Banking, and from industry watchers, such as the annual Banking Survey Report published by the major consultancy, KPMG. (Carse 1993, KPMG 1992). These reports showed that, in 1992, there were 29 licenced banks, 31 restricted licenced banks, and 155 deposit-taking companies. Of these 215 locally incorporated institutions, four were selected for interview.

The selection process discarded two categories (i.e.; restricted licence banks and deposit-taking companies) as the research intended to support international application of the research findings. The use of special categories of banking institutions which are not present in other countries would reduce the utility of the results. The 29 licenced banks were reduced to 14 locally-incorporated locally-owned licenced banks, as the research was directed at indigenous companies. Several of the remaining 14 are owned by other banks, which would prevent a clear picture of their decision-making factors and processes.

In the final selection of banking sites, two issues emerged as being of importance. Firstly, how to identify the locally-incorporated locally-owned licenced banks from the locally-incorporated foreign-owned banks, and secondly, how to determine the relative sizes of the banks. The Office of the Banking Commissioner was approached, but was not prepared to advise on the issue of ultimate ownership as this information was considered confidential. Advice was taken from the interviewees at the first bank site. The CEO of this bank is very prominent in Hong Kong, and it is public knowledge that the bank is owned by his family. This public knowledge was confirmed from the bank's annual report.

The second issue was how to determine size. Manufacturing companies were ranked by annual revenue and numbers of staff. Annual revenue is not an indicator used frequently in the banking sector. Staff numbers are a reasonable indicator, but are not publicly available. The Office of the Banking Commissioner was consulted on this issue. Their ranking is based on the size of the bank's reserves. The 1991 Annual Reports of the 14 locally incorporated licenced banks were analysed and showed that four banks did not report their reserves. These reserves were their public reserves, as opposed to their 'hidden' reserves, which are known to the Office of the Banking Commissioner but have been a fiercely guarded secret. Consultation with contacts in the banking world suggested the most appropriate indicator was total assets, with growth being indicated by the percentage of growth in total assets over the previous year. This indicator was utilised in the selection of banks by size.

Essential factors sought in site selection of banks were: independent banking institution of a category capable of international comparison; prominence (to support role models); indigenous ownership and board of directors (to avoid potential reduction in generalisability due to unknown influences); and publicly

available characteristics permitting evaluation of size, i.e., total assets. A desirable factor was a range of sizes, small, medium and large. All the essential factors were met except that during interviews it emerged that two of the banks had minority shareholdings and subsequent board representation from foreign banks. Minor shareholdings may have been sought to strengthen their intra-regional operations. Staff were questioned to determine the amount of influence of the foreign ownership on IT decisions. All responded (some emphatically) that little to no influence on any part of the local operations of the bank was exerted. In one case the foreign ownership was 25%, in the other it was 10%.

It was not possible to establish prominence on the same basis as the manufacturing sites, (i.e., representation of particular sub-industry groups or office bearers in an industry representative body). Locally incorporated licenced banks do not have sub-industry groupings and the Chinese Bank's Association does not have formal office bearers except for the Chairman. The Chairman is the CEO of one of the selected sites. Therefore, prominence within the financial sector was seen as the most appropriate selection factor. Licenced banks were all deemed to be prominent due to their relative strength within the financial sector and their high public profile resulting from their branch networks throughout the territory. All sites met this requirement.

In comparison with the manufacturing sector, even the smallest bank was considered large in terms of staff numbers. Unfortunately, this limited inter-sectoral comparisons. The sites selected represent a range of sizes from assets at the end of 1991 of \$US 7.8 billion (\$HK 61,000 million) and staff of 2,500 to assets of \$US 1.6 billion (\$HK 13,000 million) and staff of 850 within the sector. Apart from the Hongkong Bank and its subsidiary the Hang Seng Bank which together, in 1991, comprised 74.8% of the market by total assets, the selected sites represent middle to larger sized locally incorporated banks.

Difficulties arising from site selection

A potential flaw in the research plan emerged from the selection of sites since selection was based on 'prominent' companies for the potential benefit of less prominent companies. The research processes are to establish experience with IT. No non-user firm agreed to be interviewed. Perhaps this was due to concern over diminished status (even though confidentiality was offered). Since, however, firms that did respond included those that had considered specific IT at a particular time and declined to use it, the factors and processes relating to non-users can be captured.

A potential bias emerged in the selection of Textile and Garment firms. All respondents were second generation of the firm's founder and all had studied overseas. Some had been MD of their firm for 15 or more years so their responses did not appear to represent a problem of inconsistency with mainstream policies in their firm. Perhaps, however, this is representative of a subset and is not fully representative of prominent Textile and Garment firms. Perhaps the international outlook contributed to their success and prominence? All spoke English: was this significant as a self selecting factor? Were the firms not representative of the industry and, therefore, are the findings of limited generalisability? Perhaps, but perhaps not as these prominent companies all had overseas subsidiaries and all garment firms had identified their major markets as being overseas. Perhaps fluency in English and overseas qualifications are more an indication of the requirements for success in conducting international business, and should be recorded as a potentially relevant factor. Further research is required to help resolve the question of possible relationships between these factors.

SISP models review / revision

As part of the research process, an application of the 7S SOG model in China was investigated. The only other applications of the stage model in developing countries identified were Doukidis et al (1993) in Greece and Liang (1993) in Singapore. Doukidis found the model to be not applicable for the small to medium sized enterprises in Greece and called for a revised model. Liang applied several SISP models (including Nolan's stages, Porter's value chain and McFarlan and McKenney's strategic grid) to Singapore at a national level but did not report any difficulties, although perhaps this was due to the level at which the models were applied since individual companies were not considered.

Application of 7S SOG model in China

Zhao and Grimshaw (1991) applied the 7S SOG model to determine the current state of use of IT in China. This appears to be an 'in principle' application based on the knowledge and experience of Zhao since no details are provided of organisations or industries studied or of methods of research or investigation.

Most Chinese enterprises were determined to be at the very early stages of computerisation. The centrally controlled planning system established targets for some major state-owned companies to implement advanced computer-based information systems. These advanced systems were frequently implemented without experience in the organisation with basic computer based systems. Consequentially, the predictive utility of Western based stages of growth models, which look at orderly progression or evolution of systems, was found to be low. The model was, however, seen to be of assistance in diagnosing and explaining problems that may arise.

The gap between the level of technology employed and the managerial skills and attitudes was found to be maintained by the underlying culture in China and the authors argue for a shift in cultural values to facilitate successful implementation of IT. (Zhao and Grimshaw, 1991). In doing so, the authors adopt a remarkably broad view of culture which they have extended to incorporate problems created when IT is implemented by centralised decree. This view of culture appears to be considerably beyond the work on Chinese culture published by Hofstede (1983) and by Bond (1991) who finds Chinese culture, as a uniform set of values, to be present in Singapore, Taiwan and Hong Kong as well as China. The elements of the 7S SOG model which were most at variance with Chinese organisations were found to be those most influenced by culture: staff, style, skills and superordinate goals. With their very broad view of culture, it was seen that the present set of cultural values would have to change if China was to benefit from the experiences learned by the West about implementation of IT, as embodied in the stages of growth model.

This is an atypical response to cultural problems identified as a result of implementation of IT. The literature has generally called for changes in the Western models to accommodate the local culture where problems arise on the basis that IT should conform to local requirements rather than the reverse. (Robey et al 1990, Zhang and Angell 1990, Lind 1991, Ojo 1992).

Revisions of 7S SOG model and Earl's model

Potential revisions of the 7S SOG model were identified as a result of the literature reviews and the characteristics of developing countries. These revisions include a more positive representation of the indicators for the first two stages. Revision of the model will be included as required following the primary research. No specific applications of Earl's model in developing countries have been identified. Potential revisions of the model were identified

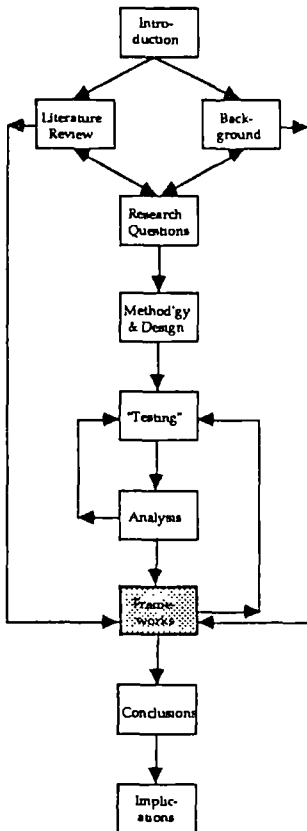
as a result of the literature reviews and the characteristics of developing countries. Revision of this model also will be included as required following the primary research.

3.5 Summary

Exploratory research in a multi-disciplinary area must be conducted with rigour if the results are to be generalisable. This is particularly the case where international application of the research outcomes is intended. This chapter sought to establish the appropriate level of rigour through analysis of the range of potential research approaches and determination of a research methodology, design and implementation plan. Yin's (1989) model, which was developed to improve the rigour of case study research practice, has been fully implemented.

One important contribution of this research is seen to be the experiences arising not only from application of Western SISP models but also from application of Western research approaches. The outcomes of this research are described in chapter 4.

4. A Framework for SISP (Research Findings)



This chapter presents the findings of this research and proposes a SISP framework of good practice for indigenous firms. Individual manufacturing and banking firms are examined to determine how IS/IT is used; how decisions to utilise IT are made; the perceived impact of IS/IT on these firms; levels of expenditure and measures of success. Decisions not to utilise IT are also examined. These research findings are then compared with Western characteristics of IS/IT use; SISP factor and process models are devised; and revisions proposed for Western SISP models on the basis of their general applicability to firms in developing countries and on their application to local companies.

4.1 Level of use of IS/IT in selected manufacturing and banking sites

Manufacturing and banking are treated separately initially, then the combined findings are considered.

Level of use of IS/IT in manufacturing sites

All sites utilised IT systems, but not all in the same areas. All clothing sites used IT in production as well as office systems. The textile site expressed its intention to acquire production systems but stated that it had been unable to source suitable equipment. This company was part of a group in which an associated company operates a cotton spinning mill. Suitable IT based production equipment had been sourced for cotton milling and successfully implemented. The sites are identified as follows:

textile	- HKW	Hong Kong Worsted Mills, Ltd
knitting	- PK	Peninsula Knitters Ltd
knitting	- SHK	Sun Hing Knitting Factory Ltd
cut & sewn	- MG	Manhattan Garments (International) Ltd
cut & sewn	- WTG	Wing Tai Garment Industry Holdings Ltd.

Table 4.1 shows major functional areas in clothing / textile manufacture showing use of automation / IT by the sites. Further details on the companies are shown in Appendix 1.

	Use of automation / IT					
	Overall	HKW	PK	SHK	MG	WTG
Computer information systems						
Order processing	5	√	√	√	√	√
Materials purchasing	5	√	√	√	√	√
Payroll	4	√	*	√	√	√
Accounting	5	√	√	√	√	√
Shipping	4		√	√	√	√
Production automation / IT systems						
Spinning	0	**				
Design	3		√	√		√
Fattern maker	2				√	√
Pattern marking	2				√	√
Cutting	3			√	√	√
Pocket welding	2				√	√
Sewing / knitting	4		√	√	√	√
Washing	1					√
Pressing	0					
Trimming	0					
Quality Control	2			√		√
Packing	0					
Warehouse /Distribution	0					

Table 4.1. Major functional areas in clothing / textile manufacture showing use of automation / IT by company.

* office systems package developed which included a payroll function. This is not used currently as due to rapid growth it no longer meets requirements.

** unable to source suitable woollen spinning production equipment.

Comparison of IT use by selected manufacturers vs industry use.

Compared with the use of IT by textile and garment companies identified in the Kurt Salmon (1992) study of 400 companies: all sites utilised computer information systems compared with 41% of respondents; both of the clothing sites used grading and marking systems compared with 19% of respondents; both of the knitting sites used CAD/CAM compared with 16% of respondents. The 1992 study found that spinning and weaving companies had a lower level of utilisation of IT with 26% of respondents using computer information systems. Therefore, the selected companies showed a higher level of utilisation of IT than may have been expected from the 1992 survey. It is noted that the research sites

were selected as being prominent in the industry. This also enhances their suitability as sources of experience in the use of IT.

Level of use of IS/IT in banking sites

The major functional areas in a service industry organisation such as a bank are obviously different to those of a manufacturing organisation. Table 4.2 shows the major functional areas in a retail bank to which IS/IT could be applied.

Primary Activities

Branch operations (including deposits, withdrawals)

Marketing

Credit card services

Investment and other services (e.g., insurance)

Loans

Securities

International (including Treasury, Bills, Correspondent banking, and overseas branches)

Support Activities

Bank infrastructure (including Finance, Accounts, Administration)

Human Resource Management (payroll, personnel, training)

Technology development

Table 4.2. Major functional areas in a retail bank's value chain.
(source: primary research applied to Porter's model (1985)).

In the selected banks most, if not all, of the activities shown were supported by computer based information systems. The systems were mainly mainframe based. Some PCs were utilised, but were primarily standalone. The systems were predominantly at an operations level. A number of banks reported heavy use of tactical level MIS systems, while others did not have these systems in place. Strategic systems were limited to access by senior management to Reuters and FOREX information systems, CNN news and the preparation of ad hoc analyses and reports to support strategic decision-making. While systems supported the major functional areas, linkages between systems were not complete in all banks. For example, there was some requirement for manual posting by voucher from customer accounts to the general ledger.

All of the banks were running large and very sophisticated computer systems, as can be seen from the profile of current computer usage in banking sites, Table 4.3. The banks have all had a great deal of experience with computer systems since they installed their first systems in the 1960s and 1970s. All banks provide electronic banking services to customers and are members of JETCO.

In the tables following, banking sites are identified as follows:

BEA	Bank of East Asia, Limited
BX	BankX requested confidentiality
LCHB	Liu Chong Hing Bank Limited
WLB	Wing Lung Bank, Limited

Further details on these banks are shown in Appendix 1.

	BEA	BX	LCHB	WLB
Mainframes	2 x IBM ES9000	2 large mainframes	NCR 9863 (6 parallel CPUs)	2 x IBM 4381
Terminals	400	>140	80*	200
Mini-computers	IBM AS/400	-	-	-
PCs	>400	>60	>70	>100
EDP staff	>90	>50	>40	>60

Table 4.3. Profile of current computer usage in banking sites

* using a proprietary system which supports two tellers using each PC.

> more than

As can be seen from Table 4.3, the banking sites represent a different spectrum of users compared with the manufacturing sites. The largest number of EDP staff in any manufacturing company was two programmers.

Comparison of IT use by selected banks vs industry use.

Statistics on banking industry use of IT in Hong Kong are not available, so each bank was asked to compare its level of use of IT with that of its competitors. It is important to note that the Chinese banks do not see their competition as being the major banks, such as the Hongkong Bank. They consider themselves in friendly competition with other Chinese banks. Two of the banks considered they were more advanced users than their competitors, the other two thought their use of IT was about the same as other Chinese banks.

4.2 Decision-making Factors

The factors identified are those on which sites would base investment decisions for IT if making decisions today. These factors include those on which previous decisions have been made, as adjusted in light of their subsequent experience.

The factors were unprompted, i.e., they were not selected from a list of alternatives. Priorities were assigned after consideration of all factors.

Decisions to use IT - factors in manufacturing

Major factors are shown in Table 4.4. The business requirements specified included improvements in productivity (several responses), improvements in production processing speeds, and improved control over business. It was noted that business requirements may differ between off-shore locations. Operational factors included compatibility with existing equipment (which was a major factor for some equipment but a minor factor for others), capacity, growth path and reliability of vendor.

Major factors	HKW	PK	SHK	MG	WTG
Business needs and requirements	=1	1	1	1	1
Financial return	2	2	2	2	2
Management Information	=1*				3
Operational factors		3**	3		
Commitment of top management			4		

Table 4.4. Major factors in IT decision-making - manufacturing.

* The major business requirement identified was to have precise management information on the operations of the firm in order to improve response and control in the rapidly changing business environment.

** Operational factors would become priority 2 for production systems

The major factors identified are completely consistent with those in Western models for investments in IT. A review of IT decision practices in 80 large companies in USA, UK, Australia and New Zealand was undertaken in 1990. The survey found that the most important factors in decisions to invest in IT were to support business objectives and to meet financial criteria, *in that order*. (Bacon, 1992). The major factors identified were also consistent with prior research in Hong Kong. An academic survey conducted in 1990 into computer applications in 66 small scale manufacturing firms in Hong Kong found their objectives from the use of IT to be, in order, improved work efficiency, better quality of product / service, and reductions in cost. (Haigh, 1990).

Medium factors	HKW	PK	SHK	MG	WTG
Operational factors	1				
Inevitability factor	2				
Minimise impact of staff turnover	3				

Table 4.5. Medium factors in IT decision-making - manufacturing.

Operational factors shown in Table 4.5 include responsiveness and general service levels from vendor. Table 4.6 shows minor factors in decision-making.

Minor factors	HKW	PK	SHK	MG	WTG
RFP factors e.g., price, timing	1				
Integration with existing equipment			1		
Availability of appropriate equipment			2	1	
Image					1**
Reduce paper processing	2*				
Established practice / reference sites in HK				2	
Up to date technology			3		

Table 4.6. Minor factors in IT decision-making - manufacturing.

* prior to implementation of their computer system, this was seen as a major factor.

** it was noted that image could become an issue, e.g., if 'everyone' has a CAD/CAM system then there is a lot of pressure to get one.

Interviewees were asked to identify any additional factors (see Table 4.7) which they could recommend to companies considering acquisition of IT.

Advised factors	HKW	PK	SHK	MG	WTG
Consider extra costs of computers	√				
Recognise benefits of computer systems not limited to financial benefits	√				
Don't start until benefits can be clearly seen		√			
Start cheap		√			
Make sufficient allowance for growth in your requirements			√		√
Standardise on compatible equipment			√		
Recognise your expectations will grow with experience			√		
Recognise computers won't solve all problems - must organise appropriately			√		
Use latest proven technology				√	
Don't be seduced by technology					√

Table 4.7. Advised factors in IT decision-making - manufacturing.

The purpose of requesting this advice was to identify factors of general importance which may not have been previously mentioned due to the particular circumstances of the prominent company.

Decisions to use IT - factors in banking

The factors identified in Table 4.8 are the major factors on which banking sites would base investment decisions for IT if making decisions today. The business requirements specified include the necessity to provide competitive products or to support strategic positioning of the bank (many responses) and improvements in the speed and accuracy of processing data. Improvements in productivity were not specifically mentioned by any bank. The necessity, however, for computer systems to process the millions of transactions each week was recognised by all banks. The distinction may not appear to be significant but is mentioned to show that banks have had experience with IT over such a long period that productivity gains from computerised transaction processing may be just accepted as the way business is conducted, and not seen as an additional business need or requirement. Anticipated savings in operational costs due to the introduction of computers was specifically rejected as a major factor by several banks. This may also indicate sensitivity by banks to actual or potential concerns of staff.

Major factors	BEA	BX	LCHB	WLB
Business needs and requirements	1*	1*	1*	2*
Reqs of Commissioner of Banking			2	1
Financial return	2			
Management Information				3
Operational factors				4

Table 4.8. Major factors in IT decision-making - banking.

* Includes computing capacity planning to support current systems with high anticipated rates of growth, as well as to support additional business requirements in the future. Also includes recognition of the operational life span of a computer and the necessity for upgrades / replacements in order to meet business needs and requirements.

The Commissioner of Banking establishes requirements from time to time which must be met by all banks. An example of these requirements is likely to be the establishment of a backup computer site for banking operations. These

requirements are generally to be met in the medium to long term. Banks varied in their view of the importance of these requirements from imperative (major factor) to able to be incorporated into the bank's medium and long term plans, and therefore a minor factor. For the purposes of comparison with other sectors, the Commissioner's pronouncements are seen as regulatory requirements which are incorporated into the business requirements of all companies. Financial return includes cost as a factor as well as cost benefit and returns on investment. Operational factors reflected a policy of the bank to more closely integrate the operation of existing systems.

The major factors identified are consistent with those used in manufacturing (identified above) and, therefore, also consistent with Bacon's (1992) review of IT decision practices in large Western companies. The lower emphasis on financial return was unexpected in banking institutions. It may be seen simply as a characteristic of the Hong Kong banking services market with its high financial return. Carse (1993) reports profitability increases in 1992 of between 25% and 45%. More detailed responses indicated that financial return was particularly important for non-strategic investments of IT by the banks. Given the extreme exposure to international competition and the effective absence of barriers to entry, it is not unreasonable that strategic investments in IT be made in support of business imperatives.

Medium factors	BEA	BX	LCHB	WLB
Use latest proven technology	1		1	1
Operational factors	2	1	3	3
Support for open architecture			2	
Financial return			4	2

Table 4.9. Medium factors in IT decision-making - banking.

As shown in Table 4.9, three of the four EDP departments have company approved policies to use the latest proven technologies. Reasons given for this

policy included competitive threat (potential release of competitor's products which require support of latest technology); service levels to clients which require latest technology (e.g., automatic passbook printing); service levels between banks (e.g., Clearing House and JETCO use cartridges rather than tapes); and lack of vendor support for out of date technology. This policy was reported as being not sufficient justification by itself to upgrade IT.

Minor factors	BEA	BX	LCHB	WLB *
Availability of appropriate equipment / packages	1			
Financial return		1		
Computer purchases by competitors			1	
Established practice / reference sites in HK	2			
Reqs of Commissioner of Banking		2		
Integration with existing equipment			2**	

Table 4.10. Minor factors in IT decision-making - banking.

* All factors identified as Major or Medium

** This was reported as a minor factor in a major upgrade, but a major factor in a minor upgrade. It has been rated as a minor factor since this research is concerned with strategic level, decisions.

Operational factors included capability of vendor to provide experience and responsive support over the long term; minimise change levels since change in banking systems increases risk; and development of integrated platforms of systems on which to build future products. Minor factors in IT decision-making are shown in Table 4.10. Availability of staff experienced with proprietary systems and software is not seen as a factor as the banks develop their own staff to meet requirements (several responses).

Interviewees were asked to identify any additional factors which they could recommend to companies considering acquisition of IT. Their responses can be seen in Table 4.11. Some of the advice is apparently contradictory, e.g., the

importance of proprietary architectures and reliance on vendors. Nonetheless, it is advice based on each bank's substantial experience with IT and perhaps reflects problems they have experienced.

Advised factors	BEA	BX	LCHB	WLB
Carefully assess the reliability of the IT product	√			
Support open architecture IT	√			
Buy established products with good vendor support and rely on vendor		√		
Consider business requirements before all else			√	
Look at requirements before you put a \$ figure on the solution			√	
Make sufficient allowance for growth in your requirements				√

Table 4.11. Advised factors in IT decision-making - banking.

4.3 Decision-making processes

The processes identified are those which sites would adopt in investment decisions for IT if making decisions today. As with the factors, the processes, shown in Tables 4.12 to 4.16, incorporate prior experiences and were unprompted.

Decisions to use IT - processes in manufacturing

Major processes in IT decision-making are shown in Table 4.12. In the case where office systems were not developed specifically for the company by a consultant, initially a package was purchased. This package was subsequently replaced by an office system developed in-house for use within the group. The major processes identified are completely consistent with Western models of processes for IT assessment and adoption. Elements of each of the four Western

Major processes	HKW	PK	SHK	MG	WTG
Ask friends in industry	√				
Monitoring of technology ongoing by CEO / COO	√		√*	√***	√
Discussions with vendors					√
Requirements determined****	√	√	√	√	√
Development of business plan		√*	√*	√	
RFP candidates determined	√	√	√	√	√**
RFP or RF quotes	√	√	√	√	√**
Evaluate RFP (include trials and demonstrations)	√	√	√	√	√**
Prepare proposal	√	√*	√*	√	√
Reviews with senior management	√	√	√	√	√
Approval by Management Committee		√			
Approval by CEO / Board	√	√	√	√	√
Consultant recommends requirements and specs. for office systems	√	√	√	√	√
Consultant company develops customised office systems	√	√	√	√	
Extensive trials of potential production systems					√

Table 4.12. Major processes in IT investment decisions - manufacturing

* production systems only

** office systems only

*** CEO is also Chairman of Hong Kong Productivity Council

**** includes business requirements, functional requirements and consideration of off-shore implications of functional requirements

process models: issue driven, technology driven, opportunistic and normative were included. (Huff and Munro, 1985). The major processes are also consistent with the limited understanding of processes in developing countries identified in section 2.1 above.

Minor processes	HKW	PK	SHK	MG	WTG
Ongoing monitoring of technology in other HK sites				√	√
Monitoring of technology ongoing by senior management		√	√*	√	√

Table 4.13. Minor processes in IT investment decisions - manufacturing

* production systems only

No medium level processes were identified. Minor processes are shown in Table 4.13.

Interviewees were asked to identify any additional processes which they could recommend to companies considering acquisition of IT.

Advice on processes	HKW	PK	SHK	MG	WTG
Seek help from a consultancy	√	√	√	√	√
Seek help from trade fairs				√	
Seek help from vendors				√	
Seek help from reference sites		√			
Look at availability of packages			√		
Trial system / get hands-on experience			√		
Don't employ IT staff - use a consultancy					√
Start with simple systems and grow					√

Table 4.14. Advice on processes for other companies - manufacturing

Note that all sites recommend seeking help from an independent consultancy. Companies which made limited use of consultants recommended making more use. A comment from one MD on the use of consultants was:

"We are good at knitting, not programming. Therefore, we stick to what we know and pay for specialist service."

This recommendation is consistent with the experiences of small and medium sized firms in Singapore. (Yap et al, 1992)

Decisions to use IT - processes in banking

Major processes in IT decision-making for banks are shown in Table 4.15. The uniformity of these unprompted processes reflects their importance as prudent practice in the planning for and utilisation of IT. All processes were considered major. The processes adopted were found to vary according to the situation. There is a full range of processes which have been identified and which will be

adopted for major investments, however, for an upgrade or a minor equipment purchase only some of the processes will be used. Also the processes will not be as detailed or as involved, although the same general functions will occur, (i.e., requirements determination, capacity monitoring, proposal, CEO considers / approves - subject to delegations with Board approval for large sums). The banks' major processes are completely consistent with Huff and Munro's (1985) Western process models.

Major processes	BEA	BX	LCHB	WLB
EDP Dept advised of bank's future plans	√	√	√	√
Capacity forecasts prepared based on current requirements and future plans	√	√	√	√
Requirements determined*	√	√	√	√
Discussions with vendor on IT able to meet requirements	√	√	√	√
Other vendors considered for major upgrades and replacements	√	√	√	√
Computer purchases by competitors reviewed		√	√	√
User divisions consulted as req'd	√			√
Development of technology plan				√
RFP candidates determined	√	√	√	√
RFP or RF quotes	√	√	√	√
Evaluate RFP (include trials and reference sites checking)	√	√	√	√
Prepare proposal	√	√	√	√
Reviews with senior management	√	√	√	√
Approval by CEO / Board	√	√	√	√
On-going capacity monitoring	√	√	√	√
Monitoring of IT developments ongoing by senior EDP staff	√	√	√	√

Table 4.15. Major processes in IT investment decisions - banking
 * includes business requirements and functional requirements

Interviewees' advice on processes for companies considering acquisition of IT is shown in Table 4.16.

Advice on processes	BEA	BX *	LCHB	WLB
Seek help from vendors	√			√
Educate users. Recognise that IT can be threatening to older staff	√			
Employ staff with the right EDP and project management expertise	√			
Develop the expertise in-house				√
Seek help from a consultancy			√	√
Seek help from reference sites and other experienced companies			√	√
Start with simple systems and grow			√	

Table 4.16. Advice on processes for other companies- banking
* nothing more than what the bank does.

Respondents advised seeking help from vendors but seeking it wisely. Other advice followed: Compare the products of different vendors and you can discover the weak points of one product from their competitors. You can then query the vendor on these points. By comparing vendors, you will understand the pricing better. This may help obtain discounts. Beware of vendors proposing a smaller capacity system than you require in order to given a lower price. If you know nothing about computers and you don't want to invest your own time to learn then an independent consultant can be very effective. Consultants, however, won't do everything. Your own judgement is required at the final stage. A caution was raised that not all consultants are equally helpful, knowledgeable or independent.

Purpose of the processes of decision-making

The purpose of these processes was found to be common for all firms in both manufacturing and banking sectors:

"Too risky to enter into the investment without evaluation."

"Necessary to ensure investment is sound and is necessary. The factors and processes are considerable, but so is the investment, i.e., a CAD/CAM system cost \$HK 3.5 million."

"To ensure an appropriate investment. To be safe, to cover all bases."

"To make the right decision."

"Ensuring the best investment for the company".

"Purchasing the right product which will meet your requirements at a reasonable cost. Sometimes the cheapest will not be the best - you must compare the features and functions with your requirements."

"To make sure we do not do the wrong thing. A wrong decision means substantial costs to the bank, and also means that the bank is unable to do what it requires."

"To ensure the right decision is made. In order to ensure this you must be involved."

"Prudent banking practice, and to ensure careful evaluation of investments."

In essence this common purpose is to ensure any investment in IT is appropriate for the business, to minimise the risks and to maximise the potential return. One CEO provided an insight appropriate to a very mature computer user as he expanded on the importance of proper processes prior to investing in IT:

"These are major investment decisions, not only in financial terms. **It is a** commitment to a route which is not reversible [because] once you **train** staff and convert files to computer records, and have six months of

accounts on the computer it is very hard to go backwards to a manual system. Companies use faxes every day, try going back to mail or messengers! At least a year of turmoil will accompany a new computer system. Therefore, a company must be dedicated to the process and committed to the outcomes."

Apart from the common purpose, an additional purpose of organisational learning was also identified by one firm:

"Different people tell you different things and so you learn while you're doing."

4.4 Impact of IS / IT

CEOs and senior management were asked to identify the perceived impact of their existing computing systems on their organisation. The impact was considered for separate categories of systems: operational, tactical and strategic. Operational systems are those dealing with day to day operations of the firm and responses in this category included accounting, payroll, computer integrated manufacturing, CAD/CAM, retail banking and ATM systems. Tactical systems are those dealing with management of the operational systems and responses included management information systems and support for decision-making at a departmental level, such as what-if analyses and departmental budget forecasting. Strategic systems deal with the longer term directions and operations of the organisation as a whole. Responses in this category of systems were limited, but included access by senior management to Reuters and FOREX information systems, CNN and the preparation of ad hoc analyses and reports to support strategic decision-making. Table 4.17 shows a summary of responses on impact.

Level of System	Level of Impact				
	nil, i.e., no systems	low	low - medium	medium	high
operational		1 manuf.	2 manuf.		2 manuf. 4 banks
tactical	2 manuf.	1 manuf. 2 banks	2 manuf.	1 bank	1 bank
strategic	5 manuf. 2 banks	2 banks			

Table 4.17. Summary of impact of existing computerised systems on nine organisations.

These results are consistent with several studies conducted of Western firms which show that there is overwhelming emphasis on operational systems with comparatively little use of strategic systems. (e.g., Li and Rogers, 1991). This table is further evidence of similarities between Asian and Western use of computerised systems.

It is of interest to note that two manufacturing firms utilise tactical systems which are considered to provide a greater level of organisational impact than some of the banks. This appears to reinforce the point that it is not the sector nor the value of investment in IT (which is several orders of magnitude higher in the banks) which determines the importance of computer systems to a company. In order to support further analysis on the level of impact on their organisation, firms were asked if they could run their business profitably and effectively without computer systems. The result was the continuum shown in Figure 4.1.

Yes	Probably	Probably not	No
1	1*	1	7*

Figure 4.1. Summary of results to question, Could you run your business profitably and effectively without computer systems?

* One manufacturing firm considered it could probably run the office systems without computers but could not run its production systems.

One of the firms had less than 18 months' experience with its first computer system. This firm considered it could operate without computers, whereas the other companies were overwhelmingly of the opinion that their mostly operational systems were critical to the survival of the organisation.

Significantly, the firm with 18 months' experience, along with three other firms planned to substantially increase the level of their investments in IS/IT over the next five years. Four other firms considered they would increase the level, and one stated that the level of IS/IT investment would be dependent on the requirements of the business over the next five years.

Levels of expenditure on IT

In order to provide a benchmark for comparison of levels of IT investment, companies were asked to estimate the current level of investment in IT as a % of revenue. Companies were also asked to estimate the current level of recurrent costs on computer and IT systems as a % of revenue. The resultant percentages were intended for use as guidelines for less experienced companies, and also to enable international comparison of the level of commitment to IT.

Investments were defined as including hardware (e.g., production and office systems, printers, plotters, PCs, terminals, and communications equipment), software (e.g., packages, specially developed software) and special computer facilities (e.g., computer room, uninterrupted power supply). Recurrent costs were defined as including specialist staff (IT manager, programmers, operators, consultants etc), hardware and software maintenance, data communication charges (but not items such as charges for automated teller machine (ATM)

transactions), and consumables including power, air-conditioning, paper, magnetic media, etc

Most companies advised that they invested in IT according to their business requirements and did not determine levels of total investment as either a guideline or as an overall control. Therefore, they were unable to provide this information. As the companies had the option of providing the information on a confidential basis which would not be attributed to their company, it is considered that this advice represents current practice. Several companies were able to provide values. Understandably, the information is highly confidential to those companies so it is presented as broad details. The reported details do not use the same base for calculation, so comparisons between the companies are not valid. The values are presented to indicate the degree of commitment to IT. This level of commitment should be considered in relation to responses on success in achieving competitive advantage.

One advanced user reported that the asset value of IT currently installed is approximately 10% of gross income i.e., revenue. Its recurrent costs on IT currently represented 4% of gross income. Over the next 5 years the asset value of IT will increase to 11-12%, while recurrent IT costs will increase to about 5%. These increases are largely due to the shortages of experienced people which will lead to increased use of computers. A second company planned approximately \$US 6 million expenditure on new computer hardware/ software over the next 5 years. Including recurrent costs, mainly staffing, the total expenditure over the next three years as a percentage of 1992 net profit would be 18.5%, 22.5% and 17%. Note these values do not include depreciation, so they represent a substantial commitment to IT. A third company, a bank, provided details of IT expenses compared with annual expenses and published profits, as can be seen in Table 4.18.

	1990	1991	1992
IT expenses as % of operating expenses	9.91%	7.05%	4.5%
IT expenses as % of operating expenses (excluding depreciation)	2.55%	2.58%	2.33%
IT expenses as % of published profit	8.99%	5.57%	3.49%
IT expenses as % of published profit (excluding depreciation)	2.32%	2.04%	1.80%

Table 4.18. IT expenses compared with annual expenses and published profits in a HK bank.

4.5 Comparison of HK vs Western characteristics of IS / IT usage

To support the application and revision of Western SISP models, Western characteristics of IS/IT use are compared with those in Hong Kong.

Evaluation of IT use and measures of success - manufacturing

All of the companies considered their computer systems to be successful. Most companies distinguished between the levels of success of production systems and office systems. Production systems were seen as being more successful. The basis for determining success varied:

"Production systems have calculated cost effectiveness."

"The capacity and productivity of the machines are well known."

"We fill the machine, we make money."

These responses were consistent for all companies utilising production systems. Success in office systems is not as easy to determine:

"Success in office systems is determined through meeting business requirements."

"In the final analysis you must review the requirements for the investment and see if they have been met."

These responses are not necessarily down-grading the potential or actual benefits of IT in the office. Manufacturing companies will be naturally inclined towards performance criteria which are production oriented. Production processes also support calculated cost benefits arising from predictable productivity factors. Since IT in the office does not support predictable benefits and calculated returns to the same extent, the companies' attitudes should not seem surprising. The importance of adopting measures of success for non-production systems can be seen in the statements on whether or not the companies felt they had achieved competitive advantage through IT.

"Yes. Production systems: definitely, and can measure the effect. Office systems: yes, but can't measure."

"Yes, definitely. Competitive benefits from production systems are very easily measured. Office systems: yes, but can't quantify."

"Yes, in general for both production and office systems. The degree of increased competitiveness cannot be easily quantified, but as far as this company is concerned, the answer is yes."

"With production systems - yes! With office systems its difficult to know."

The lack of availability of production systems in the woollen and worsted spinning industry also supported the importance of production systems:

"In this industry it is unlikely that computer systems would provide competitive advantage."

The nature of the competitive advantage lay:

"... in the way in which we are able to standardise processes, obtain expected results and do them all faster."

Part of the advantage appears to be due to economies of scale available to larger firms able to invest in the production systems. The benefits identified are also significant in that they address major problems facing the textile and garment industries, as well as the manufacturing sector as a whole. Graham Mead Research's (1988) finding that:

"Generally the less computerised companies are happiest about their current computerisation level."

was not supported by the responses of the prominent companies. This may be due to the criteria for selection of companies, or, as is more likely, due to changes in the levels of experience in the use of IT since 1988.

Evaluation of IT use and measures of success - banking

All of the banks considered their computer systems to be successful. A typical response to the question: were their systems considered successful?

"Oh, yes! You must computerise to survive, particularly in processing the millions of transactions each week."

The basis for determining success varied:

"Users state requirements, if the requirements are met then the system is judged successful."

"Success of any IT system can be measured by how well the users are satisfied and how cost effective the systems are in meeting the user's requirements."

"Meets needs of company."

"How well you meet your business goals?"

"Success [in strategic systems] is relative to competitor's performance."

The different orientations were indicative of the interviewee's position as EDP manager, business manager or director.

Measures of this success were more difficult:

"Cost effectiveness is one measure, but not all benefits can be quantified."

"Can measure the costs of development. Payback is not the only determinant of success. Some banking products are implemented for competition or image, e.g., ATMs."

"It is easy to calculate the benefit from an operations level system. It is difficult to calculate the competitive benefit or to isolate how much business has been gained."

"No calculated returns. Not that sophisticated. Our bank is a traditional Chinese firm and is not so scientific!" (This is the bank which requested confidentiality).

These responses support the ranking of factors which put more emphasis on business requirements and substantially less on financial returns. The difficulty expressed by manufacturing firms about measurements of success in office systems does not appear to be of concern, i.e., the banks were utilising measures

satisfactorily. The senior banking manager who stated that the bank has no interest in calculating returns on IT investment is unique. No other person interviewed was similarly unconcerned with calculations of returns on investment.

A more complete explanation of the role of IT in the success of a bank was given by an executive from another bank:

"Return on investment in IT gives a financial return, but gives also a long term return in intangible areas. In a service industry, a reputation for leadership in innovation and levels of service is very important. It assists to establish a successful image for the company. IT investments such as SWIFT or the ATM networks help to draw new customers for a particular service which you can then attempt to hold for all services. The business strategy is similar to a supermarket's loss leaders. In other words, the return on investment, or success of IT, will not only be based on immediate financial returns, but can include the strategic opportunities for the business which stem from the IT investment."

Clearly, this banker is applying IT for strategic effect rather than mere support for transaction processing. Three of the four banks considered they had achieved competitive advantage through IT.

"Not over international competitors, but certainly over local banks."

"All banks have computer systems, otherwise they can't survive. We have obtained competitive advantage, for example with the ATM network, and with JETCO."

"The first example was soon after the first computer system was installed. More than 40% increase in new customer accounts was recorded after the

introduction of the system to enable customers to access accounts from any branch. Previously customers had to go to their domicile branch as this was where their balances were kept."

The claim that competitive advantage had been achieved through co-operative action in establishing JETCO, the joint ATM service provider, is significant for other firms in developing countries. The fourth bank did not see any competitive advantage through the use of IT. They saw IT as necessary to keep up with the rest, not to obtain any advantage.

"If we don't use computers we cannot survive. Normally, local Chinese banks step together. We must move at the same time. It takes only a few months for all banks to have the same products."

This bank considered that:

"Computer systems don't save money, they increase the speed and accuracy of operations."

This statement is seen as being representative of the management attitude. This bank responds to product releases by competitors in catch-up mode rather than pro-actively using IT for strategic benefits. The competitor bank above which is an IT leader claims benefits due to "the strategic opportunities for the business which stem from the IT investment". These strategic opportunities are denied to catch-up competitors.

The major competitive advantage claimed is derived from the services provided, i.e., product differentiation. An example is in the provision of ATM access so that customers don't have to queue in the banking hall but can access their

accounts from a wide variety of locations. Strategic positioning and recognition as being a dynamic and innovative organisation is also of vital importance. Not unreasonably, the examples are historical in nature. Few companies advertise a major competitive advantage they have obtained. The banks, however, did have the following advice for less experienced users in how to judge success in computer and IT systems:

"Look at the reasons why you want to invest in IT, and measure according to that yardstick."

"Success in meeting the needs of the company, plus if the costs not growing out of control."

"How well you meet your business goals. Success must be measured on a long term basis. Investment in IT is not just another investment. Payoff on technology is generally not on a short term basis. Payback for computer systems takes longer. Due to built in obsolescence, it would seem that you shouldn't invest in technology, but [for business reasons] you can't afford not to."

Hawgood and Land (1988) identified the subjective nature of assessment in Western firms since effectiveness means different things to different people. Weill (1992) proposed that performance measures be chosen to reflect the business objectives of the investment in IT. The experiences of the Hong Kong research sites were entirely consistent with these Western research findings.

4.6 Decisions not to use IT

The research design called for examination of multiple organisations: those that utilise IT and those that do not utilise IT. Unfortunately, none of the selected manufacturing companies which agreed to participate in the research nor any of

the banks were non-users of IT. Rather than to relax the selection criteria, the selected sites were investigated to determine if they had at any stage considered utilisation of IT and had declined to proceed. All but one of the selected sites had this experience. Therefore, the research findings on decisions not to use IT are based on organisations which are experienced users of IT but which have in specific instances decided not to use IT.

This restriction was considered to determine its impact on the research objectives. It was found that the objective was to support inter-sectoral comparisons; that the banking sector was critical to the comparisons; that IT is considered an essential factor for operation of a modern retail bank; and that, therefore, the research objective was unable to be met in the banking sector irrespective of selection criteria. In order to support inter-sectoral comparisons, the same basis for investigation of decisions not to use IT should be applied in both sectors. Uncertainty remains as to the importance of experience with IT in this decision-making. This uncertainty requires further research for resolution.

Decisions not to use IT - manufacturing

Computer systems are recognised as not providing a solution for every manufacturing problem. Three of the five firms had performed evaluations on IT at various times and had decided not to proceed with its use. In each case the decision was based on the factors and processes previously identified. Reasons given for these decisions were:

"Not justified in support of business requirements or cost-effectiveness."

"After investigation they didn't meet business requirements, and didn't meet economic requirements."

"Didn't meet requirements of company and not cost effective."

One of the other two companies was relatively new to computerisation, and had only experienced positive evaluations. The MD of the fifth company explained that they had not declined to invest in IT, rather they had, "postponed a decision in order to focus senior management's energies on the part of the business that makes money". In other words, there were areas of higher return to the company which were receiving priority.

These responses are consistent with the results of Haigh et al's (1990) survey into computer applications in 66 small scale manufacturing firms in Hong Kong. In that survey some 50% of the non-using respondents considered computers not necessary or too expensive. The remaining 50% indicated an intention to utilise. This survey concluded that there remains a large number of small firms whose managers / owners were not aware or not convinced of the potential benefits of even low cost computers such as PCs. (ibid). The prominent companies clearly show their understanding of the potential benefits, but also their recognition from experience that those benefits cannot be expected in every situation. This introduces another reason for a low level of utilisation of IT.

The high costs of IT and IT services in Hong Kong can be seen as a factor in this consideration of cost effectiveness. Articles noting price differentials for IT between USA and Hong Kong are frequently published. (Riley 1993, Wilson 1993, Wong 1993). The importance of price as a factor in the level of IT utilisation is, however, not completely clear. Customer satisfaction surveys of users of mini and mainframe computers show the top 10 concerns do not include price. System reliability, support and performance aspects are the major concerns. (Tennant, 1992). While the importance of pricing is not clear, the fact remains that prominent companies consistently considered financial returns and cost effectiveness as the second highest factor in decisions to utilise IT. Therefore, the

higher prices of IT solutions in Hong Kong cannot be discounted as a significant disincentive in the adoption of IT. Unlike many developing countries, Hong Kong does not suffer from excessive duties on imports of IT. Consequently, price levels are determined by vendor's anticipated returns.

Any examination of decisions not to utilise IT must also consider constraints due to the nature of the business. The importance of this type of constraint can be seen from the following analysis of production details for cut and sewn clothing firms:

Making cost is 6 - 9% of the retail price, (see also Appendix 2).
Labour costs for clothing are 22% of making cost,
Half of the industry's workforce remains employed in sewing,
75% of sewing time is materials handling,
(HKGID 1991, HKGID 1992).

At the same time, manufacturers are operating on very small profit margins. Consequently, while the potential benefits from IT can be clearly identified, it is of critical importance that firms evaluate each proposal for the use of IT and determine the extent to which those benefits can be achieved by them. As one of the interviewees put it,

"It is easy to spend \$1 million on computers, but hard to earn"

It is of great importance to note that the lists of the major, medium and minor factors on which decisions to invest in IT are based, as well as the list of factors which the prominent companies advise other companies to consider, do not contain any cultural factors. This is a clear indication that low levels of utilisation of IT are not based on cultural considerations such as difficulties due

to language or cultural resistance to change. Reasons given by the prominent companies for not investing in IT are consistently based on an evaluation of the benefits and returns likely to be achieved compared with the costs.

Decisions not to use IT - banking

Computer systems are also recognised as not providing a solution for every banking problem. All four of the banks had performed evaluations on IT at various times and had decided not to proceed with its use. In each case the decision was based on the factors and processes previously identified. Reasons given for these decisions were:

"The optical signature storage and verification system was evaluated and declined as the signatures were not sufficiently clear for Chinese characters."

"After evaluation, we decided it was not suitable. ie the cost was too high and the technology was not mature"

"The technology was no longer the latest technology."

"The total cost became prohibitive."

The reasons given are consistent with the factors specified above, however, cost figures more highly than would be expected from the tables of factors. A higher ranking for the financial returns factor would also be more consistent with both the manufacturing firms and with international experience. Two explanations for this situation may be applicable. Firstly, as the banking market in Hong Kong is driven by strong competition and high levels of growth, major decisions on IT investments will be made on the basis of necessity for survival, rather than financial return. Therefore, major decisions are consistent with the major factors identified. Secondly, there are many minor IT investments which could

be made to support particular products. In these minor decisions, cost and financial returns become more significant. Examples of major investments are the mainframe platform and mainframe backup machines which each cost in the region of \$US 5 million. Minor investments include optical signature storage and verification systems, automated passbook printers and microfilm storage of internal reporting. Consequently, cost is seen as having a greater influence in decision-making for IS/IT than is apparent from the ranking of factors above. As with manufacturing, the high costs of IT and IT services in Hong Kong can be seen as a factor in decisions not to use IT.

In contrast with the manufacturing situation, few, if any, constraints on the use of IT in banking are due to the nature of the business. Banking was identified at an early stage as being an industry in which IS/IT could have strategic importance. (McFarlan and McKenney, 1983). In SISP models, banking is shown as being one of the highest potential users of IT due to high information intensity of the value chain and high information content of the products (Porter and Millar, 1985). This potential has been realised. Spending on IT in the US commercial banking sector alone was estimated to be \$US 15 billion in 1990. Investments in IT and telecommunication based information systems have resulted in the introduction of a wide range of new banking services, a high growth in the volume of banking services, and reduced the cost of processing transactions. (Mallampally, 1992).

Similarly to the manufacturing experiences above, it should be noted that the lists of the major, medium and minor factors on which banking decisions to invest in IT are based, as well as the list of factors which the banks advise other companies to consider, do not contain any cultural factors. This is a clear indication that low levels of utilisation of IT are not based on cultural

considerations such as difficulties due to language or cultural resistance to change.

4.7 Factor and process models (inter-sectoral)

Factors and processes identified in sections 4.2 and 4.3 above have been analysed in order to develop inter-sectoral models.

Decisions to use IT - Major factors in Manufacturing and Banking sectors

As can be seen in Table 4.19, there is remarkable unanimity between the major factors in decision-making for the utilisation of IT in banking and manufacturing firms. Meeting the needs and requirements of the business was the single most important factor in these decisions. The second most important factor in manufacturing was financial return, which was not rated as highly in all of the banks. When considering Table 4.19, it is important to remember that the factors identified by the sites were unprompted, that is the interviewees did not select from a prepared list.

Major factors	HKW	PK	SHK	MG	WTG	BEA	BX	LCHB	WLB
Business needs and requirements*	=1	1	1	1	1	1	1	1*	1*
Financial return	2	2	2	2	2	2			
Management Info.	=1				3				2
Operational factors		3**	3						3
Commitment of top management			4						

Table 4.19. Major factors - Manufacturing and Banking sectors

* Includes regulatory requirements of Commissioner of Banking

** Operational factors would become priority 2 for production systems

It is also notable that in manufacturing firms, computer capacity considerations were seen as being a separate factor from the needs and requirements of the business, while in the banks, the factors were considered inseparable. This is seen as reflecting the more critical nature of IS in the banking sector.

Medium level factors did not display a similar level of unanimity. Only one manufacturing firm identified medium level factors. This firm considered operational factors of most significance at the medium level. Operational factors was second most important at the medium level for banks, after use of the latest proven technology. There was no significant alignment either within sectors or between sectors at the level of minor factors. Apart from one piece of advice, make sufficient allowance for growth in your requirements, there was no alignment in the advised factors. Since the advice was requested on the basis of any additional factors that could be recommended to other firms, it is not surprising that there is a wide range of factors.

It is apparent that, based on the research findings, an inter-sectoral model of the major factors on which to base investment decisions is applicable. The inter-sectoral alignment strengthens the findings. As can be seen in Table 4.20, the most important major factors are the needs and requirements of the business and financial criteria. The factors are listed in order of importance. The order is subject to variation in manufacturing firms for decisions on production equipment where operational factors, primarily compatibility with existing equipment, will be second to business requirements.

Priority Major factors

- 1 Business needs and requirements *
- 2 Financial return
- 3 Management Information
- 4 Operational factors

Table 4.20. Inter-sectoral IS/IT Investment Decision-making Factors Model.

* Includes regulatory requirements.

This finding is consistent with Bacon's (1990) review of IT decision-making practices in 80 large companies in USA, UK, Australia and New Zealand, as reported above.

Decisions to use IT - Processes in Manufacturing and Banking sectors

As can be seen from Table 4.21, there is remarkable unanimity between the major processes in decision-making for the utilisation of IT in banking and manufacturing firms. The major differences are the level of involvement of CEOs in the manufacturing firms, variation in processes by manufacturing firms depending on whether the system is for production or the office, and more formalised procedures in the banks. Heavy use of consultants in the specification and development of office systems by the manufacturing firms is also significant. When considering Table 4.21, it is once again important to remember that the processes identified by the sites were unprompted, that is the interviewees did not select from a prepared list.

The degree of alignment in decision-making processes between manufacturing and banking was unexpected. The research question anticipated common purposes in the processes, but not the common processes themselves. All processes in the banks were considered major. The major differences between sectors were increased formality in the bank's preparatory processes and differences due to the presence or absence of in-house IT staff. Manufacturing companies relied on external consultants for systems development and modification: in-house IT staff in the banks undertook capacity planning and monitoring tasks. The differences were all considered to relate to variations in size and experience in the use of IS/IT. It was not apparent that any of the differences related to specific sectoral characteristics which could preclude development of an inter-sectoral model.

Major processes	HKW	PK	SHK	MG	WTG	BEA	BX	LCHB	WLB
Ask friends in industry	√								
Monitoring of technology ongoing by CEO / COO.	√		√*	√***	√				
EDP Dept advised of firm's future plans						√	√	√	√
Capacity forecasts prepared based on current requirements and future plans						√	√	√	√
Requirements determined****	√	√	√	√	√	√	√	√	√
Discussions with vendor on IT able to meet requirements					√	√	√	√	√
Other vendors considered for major upgrades and replacements						√	√	√	√
Computer purchases by competitors reviewed							√	√	√
User divisions consulted as req'd						√			√
Development of business plan		√*	√*	√					
Development of technology plan									√
RFP candidates determined	√	√	√	√	√**	√	√	√	√
RFP or RF quotes	√	√	√	√	√**	√	√	√	√
Evaluate RFP (include trials and reference sites checking)	√	√	√	√	√**	√	√	√	√
Prepare proposal	√	√*	√*	√	√	√	√	√	√
Reviews with senior management	√	√	√	√	√	√	√	√	√
Approval by Mgmt C'tee		√							
Approval by CEO / Board	√	√	√	√	√	√	√	√	√
Consultant recommends requirements and specs. for office systems	√	√	√	√	√				
Consultant company develops customised office systems	√	√	√	√					
Extensive trials of potential production systems					√				
On-going capacity monitoring						√	√	√	√
Monitoring of IT developments ongoing by senior EDP staff						√	√	√	√

Table 4.21. Major processes in IT investment decisions.

* production systems only

** office systems only

*** CEO is also Chairman of Hong Kong Productivity Council

**** includes business requirements, functional requirements and consideration of off-shore implications of functional requirements

Based on the research findings an inter-sectoral model of the major processes for IT investment decision-making can be derived. These are shown in Table 4.22.

Variations occur depending on the significance of the investment, with minor investments not warranting the full set of processes, and with production technology, which requires more extensive trials.

Objective	Major Processes
Preparation	<ul style="list-style-type: none"> • Environmental scanning • Corporate Strategic Planning • Strategic IS Planning
Requirements determination	<ul style="list-style-type: none"> • Capacity forecasting • Vendor(s) capabilities reviewed • Consultation with user(s) • Requirements specified • Costs : Benefits identified
Formal RFPs	<ul style="list-style-type: none"> • Candidates determined • Preparation / circulation of RFP
Evaluation	<ul style="list-style-type: none"> • Reference site checking • Trials • Evaluation of product(s) vs requirements
Proposal Approval	<ul style="list-style-type: none"> • Preparation of proposal • Review / revision with senior management • Approval by senior management / CEO / Board (as required)
Monitoring	<ul style="list-style-type: none"> • On-going monitoring of performance and capacity • Formal evaluation of investment • Technology scanning

Table 4.22. Inter-sectoral IS/IT Investment Decision-making Process Model.

Note that the inter-sectoral model incorporates a formal process for evaluation of investments, which is based on the current activities of a third of the sites. Formal evaluation of investments is strongly recommended for application by other firms, if for no other reason than as input to future strategic IS planning. Processes advised for less experienced firms were significantly aligned. All manufacturing firms and 50% of the banks recommended seeking assistance from a consultancy. Following this source of aid was assistance from vendors and reference sites. The other recommendations were not aligned within or between sectors.

The major processes identified are completely consistent with Western models of processes for IT assessment and adoption. Elements of each of the four

Western process models: issue driven, technology driven, opportunistic and normative were included. (Huff and Munro, 1985). Further, the processes identified are consistent with tests to judge the effectiveness of decision processes proposed by Parker, Trainor and Benson. The processes are project oriented; on a recurrent cycle; working with limited resources; and predominantly using some form of quantifiable decision-making criteria. (Parker et al, 1989). The authors also proposed tests for the subsequent planning processes which are not as directly applicable as their focus is on consensus building within the organisation. The strongly hierarchical nature of indigenous organisations in Hong Kong and in many other developing countries reduces the importance of any process of consensus building.

4.8 Review and revision of Western SISP models

These SISP models are intended to provide a framework within which the factor and process models developed above can be applied. Proposals have been made to adapt the Western models required to facilitate application in developing countries.

7S Stages of Growth model

The key contributions of this model as seen by Galliers and Sutherland (1991) are:

- focusing management attention onto a broad range of issues associated with the planning and management of IS.
- surfacing assumptions and attitudes held by key executives about the role IT does and might play in achieving / supporting business objectives.
- providing an easily understood means of putting IS/IT management on the senior management agenda.

In addition, it is seen as aiding the process of strategic information systems planning by highlighting the necessity for different strategies by different organisations, or by the same organisation at different times, based on its current use and future intentions for IT. The model is capable of adaptation for individual technologies within an organisation, so that there could be separate models, for example, for production and office systems in manufacturers or product-based and administrative systems in banks. In this work the focus is at a corporate-wide, strategic level so while this capability is noted, it has not been explored.

While conceptually the model strikes a chord, some problems with the model have been identified in section 2.4 above. Other problems were identified as a result of application of the model to indigenous organisations. Review and revision of the Galliers and Sutherland (1991) model to address these problems has been conducted in three phases:

1. Revision of model following identification of general problems and those potentially relating to developing countries.
2. Application of the revised models to each research site. Comparison of the allocation of stages in the revised model compared with the original model.
3. Final review and revision based on phase 2. Identification of differences specific to developing countries. Recommendations for revisions to Western model.

Phase 1

The general difficulties with the model have been detailed in section 2.4 above. These included difficulties in practical application due to its perspective, (a large

company with multiple SBUs developing its own systems which is located in the middle stages of the model); use of complex language and terms, (such as obfuscation and democratic dialectic); generalities which could be difficult to explain to managers, (the elements style and superordinate goals both deal with the culture of the organisation); large gaps in indicators for stages three and four which could inhibit allocation of a firm to a stage; inconsistencies in the development of some of the elements, (e.g., strategy includes a mixture of strategic issues, policies and activities - IT audit, maintain strategic competitive advantage and top-down IS planning - rather than strategies); and dated references, (technologies described as advanced are no longer advanced, current practices such as outsourcing are not incorporated).

Additional potential difficulties are more specific to developing countries. These difficulties also relate to practical application of the model in situations where some of the indicators are irrelevant, (IT as an independent functional group is not consistent with most indigenous companies, and perhaps is also not consistent with most smaller owner-managed companies anywhere); and where other indicators do not represent significant change or growth in the context of indigenous firms. Examples of the later situation are firstly decentralised systems which are not so important in highly centralised companies, therefore, decentralisation should not be seen as an indicator, and secondly the use of office automation for which there is little demand so it should not be seen as an indicator.

Initial revisions to the Galliers and Sutherland model in response to specific difficulties raised in Phase 1 analysis are proposed. These revisions are intended to be consistent with and to strengthen the major contributions of the model

listed above. Where the Galliers and Sutherland model has been shown to be too general or insufficiently specific to support application, the proposals have focused on the IT function. This focus is based on the premise that clear identification of options and direction for IT management would be of greater benefit to both IT and senior management in strategic decision-making than general directions which could be easily dismissed as being irrelevant. In order to reduce the potential for appearing dated, references to specific technologies or practices have been minimised.

Stages

The number of stages was reviewed. There are few compelling reasons for having six stages, as opposed to five or even ten. For the sake of consistency with previous models, however, and noting that the number of stages has not been an issue affecting practical application of the model, six stages have been retained. The labels of the stages were considered. Galliers and Sutherland labels for their six stages are shown in Table 4.23 with proposed revisions.

Stage	Galliers and Sutherland labels	Proposed labels
1	Ad Hocracy	Initiation
2	Starting the Foundations	Building foundations
3	Centralized dictatorship	Management control
4	Democratic dialectic and cooperation	Integration
5	Entrepreneurial opportunity	SBU Integration
6	Integrated harmonious relationship	Inter-organisational

Table 4.23. Proposed labels for stages in Galliers and Sutherland's 7S model (1991) .

The proposals are intended to simplify application of the model while highlighting the changing management approach at each stage. The proposed labels are generally consistent with both Nolan's and Galliers and Sutherland's stages. In labelling the stages for those original models the authors attempted to capture a sense of completed achievement for the final stage (Nolan's final stage being 'maturity' and Galliers and Sutherland's 'integrated harmonious

relationship') such that the stages appear to be leading the way to some IT version of *nirvana*.

It is suggested that models offering practical direction to managers should not appear to advise that there is a final state of perfection. To do so could be viewed as being more appropriate for vendors than academic researchers. The proposed revisions attempt to highlight a path towards integration of business functions and of business with IT, which are currently the primary objectives of SISP (Dixon and John 1989, Scott Morton 1991, Earl 1993, Galliers et al 1994), by outlining the various management approaches and directions which may assist an organisation which *has integration as its corporate goal*. Specific allowance has been made for differing sizes of organisations with stage 5 catering for the increased complexities of firms with multiple SBUs. Smaller less complex firms would seek to develop their use of IT from stage 4 directly to stage 6.

Stage	Proposed strategies
1. Initiation	Initial project investments (testing the waters).
2. Building foundations	Expanded project investments (corporate learning).
3. Management control	Review experiences with IT, increased focus on control, standardisation and professionalism (managing IT function).
4. Integration	Focus on corporate needs for IT rather than IT department's abilities (managing IT integration internally).
5. SBU Integration	Focus on integration of IT between SBUs (managing IT integration across a complex organisation).
6. Inter-organisational	Focus on inter-organisational systems for competitive advantage or for inter-organisational efficiencies (achieving organisational benefits from proactive and co-operative use of inter-organisational systems).

Table 4.24. Proposed revisions for Strategy element, by stage

Strategy

Strategy is concerned with an organisation-wide plan, which is not dependent on the IT department. Revisions are intended to represent corporate strategy consistently. Top-down planning (stage 3) and environmental scanning (stage 5)

are deleted as indicators since in many organisations these will be present at all stages. Table 4.24 refers.

Structure

The Galliers and Sutherland model appears to emphasise that the structure element deals with the internal structure and responsibilities of the IT dept, especially up to stage 5. Pascale and Athos' (1981) model appears to emphasise the structure of the whole organisation. This broader emphasis would more readily incorporate an independent business unit or a separate company for IT. It could also incorporate outsourcing the complete IT function. Classification, therefore, could be done in the same manner as any element, i.e., a wholly owned IT company will be judged on the degree of knowledge of the parent company's operations - as indeed would any IT manager.

On this basis, an independent IT company would be placed in the model at stages 3 or 4, that is, centralised decision-making with IT not participating in business decisions. However, end users would not be running free. Stage 4 features other areas integrated with IT, but with the title of manager unchanged. It is proposed that an independent IT company or function should be located *prima facie* in stage 3, unless the characteristics of the particular company indicate other stages. This would acknowledge that wholly owned IT subsidiaries would perform more integrated tasks, but a non-owned IT company would not be integrated to the same extent. Apart from this broadened emphasis, the indicators included in the Galliers and Sutherland model do not require modification, even with the revised focus of the stages.

Systems

Classification of a company by its use of financial IS instead of core business IS is not appropriate in the Financial Services sector. It is therefore suggested that

financial control systems, e.g., General Ledger systems, should be separated from financial operating systems, e.g., order or customer account processing, as a determinant of growth.

Gaps in stages 3 and 4 should be filled to assist allocation of companies to particular stages, as shown in Table 4.25. Stage 4 could also include systems developed to improve efficiency of the value chain as a requirement for widespread use of DSS. This would reflect the changing emphasis from systems developed to meet political or traditional pressures to more integrated management of the IT function. There is an apparent contradiction in the original model between the stage 4 strategy of integration, coordination and control, and the systems entry of some decentralised control but lack of coordination. It is proposed that decentralisation not be included as an indicator.

Stage	Proposed revisions of Systems' indicators
1. Initiation	<ul style="list-style-type: none"> • Multiple manual and automated IS (replacement). • Financial operating systems, e.g., order or customer account processing, developed or acquired (replacement).
2. Building foundations	<ul style="list-style-type: none"> • Financial control systems, e.g., General Ledger, developed or acquired (replacement).
3. Management control	<ul style="list-style-type: none"> • Heavy maintenance load (new).
4. Integration	<ul style="list-style-type: none"> • Enduser and development tools help reduce backlog (new). • Information management within SBUs and core business (new). • Integrated DBMS systems (new). • Maintenance load reduced - as new systems developed with high productivity tools replace older systems requiring heavy maintenance (new). • Systems developed to improve efficiency of value chain (new). • Remove indicator for decentralisation. • Remove indicator for office technology systems.
5. SBU Integration	<ul style="list-style-type: none"> • Information management across SBUs (new). • Integration of systems from different SBUs, e.g., insurance and banking (new). • remove indicator for decentralisation.
6. Inter-organisational	Unchanged.

Table 4.25. Proposed revisions for Systems element, by stage

Staff

If there are no professional computing skills in-house, then the external consultancy or outsourcing agency should be considered to be in-house for the purpose of classification of this element. Companies which purchase major, integrated packages or which have systems developed to their specifications by outside consultants currently don't appear to be covered by the model. Stage I provides for introductory use of packages, but not for full blown, major integrated and up-to-date systems activities. There are major companies world-wide using packages such as MSA's financial systems. Other than these points, indicators should remain unchanged.

Style

Some confusion is apparent in the 7S model with both style and superordinate goals relating to corporate culture. Pascale and Athos (1981) identify two factors: behaviour of key (IT) managers, and the cultural style of the organisation. If the IT department is external or out-sourced, then the corporate culture becomes of major importance. There is, however, no indication that an external consultancy contracted to develop major systems will exhibit total disregard for the organisation (stage 1) or a "don't bother me I'm too busy" attitude" (stage 2). The description of stage 3, (abrogation of responsibility to end user) is also inappropriate. Stage 4 - cooperation and coordination appears most appropriate, but is not indicative of a changed attitude. Any sustained commercially oriented relationship should be characterised by cooperation and coordination. The later stages are even less appropriate.

The style headings for stages 3 and 4 are unfortunate. Defensiveness and cooperation would more accurately reflect the content of style at these stages. It appears that difficulties could arise in discussions of these aspects of the model with users with the existing titles of abrogation/ delegation and

democratic/dialectic. Proposed revisions outlined in Table 4.26 are intended to emphasise the behavioural focus of IT managers in support of the corporate strategy for that stage. All indicators in the original model have been replaced.

Stage	Proposed revisions of Style indicators
1. Initiation	<ul style="list-style-type: none"> • Inward focus on individual projects (replacement).
2. Building foundations	<ul style="list-style-type: none"> • Inward focus on capability to specify, acquire / develop and implement multiple independent projects (replacement).
3. Management control	<ul style="list-style-type: none"> • Inward focus on management of IT systems: including standards, standardisation, formalisation of procedures and control (replacement).
4. Integration	<ul style="list-style-type: none"> • IT responsive to integrated needs of organisation (replacement).
5. SBU Integration	<ul style="list-style-type: none"> • IT actively integrating IT between SBUs (replacement).
6. Inter-organisational	<ul style="list-style-type: none"> • IT pro-active in inter- and supporting intra-organisational systems (replacement).

Table 4.26. Proposed revisions for Style of IT management, by stage

Skills

Stage indicators for this element have been made more specific in order to improve the utility of the model. The indicators are generally similar to the original in the earlier stages. Some divergence occurs in the later stages in line with the revised strategy for each stage. Table 4.27 refers.

Stage	Proposed revisions of Skills indicators
1. Initiation	<ul style="list-style-type: none"> • Technical, individual based, little or no development of staff (replacement).
2. Building foundations	<ul style="list-style-type: none"> • Technical, group based, introduction of professional methodologies, e.g., for systems acquisition or systems development. Some development of junior staff (replacement).
3. Management control	<ul style="list-style-type: none"> • Technical, group based. Application of methodologies, e.g., systems development and project management. Widespread staff development, standards determined and implemented. Data management and business skills introduced. (replacement).
4. Integration	<ul style="list-style-type: none"> • Widespread integration of technical and business skills in IT and user staff. Development of hybrid staff. Information management (replacement).
5. SBU Integration	<ul style="list-style-type: none"> • Development of hybrid managers and staff in SBUs. Information management across SBUs. (replacement).
6. Inter-organisational	<ul style="list-style-type: none"> • Development of hybrid corporate managers (replacement).

Table 4.27. Proposed revisions for Skills element, by stage

Superordinate goals

As with the element Style, the indicators for Superordinate goals in the original model are not appropriately stated. Pascale and Athos (1981) indicate that this element should reflect the corporate ethos. Galliers and Sutherland have presented indicators with an IT rather than a corporate perspective. It is suggested that an IT orientation is more appropriate for the reasons identified in the discussion of strategies above, however, the indicators suffer from an unnecessarily negative slant. Proposed revisions shown in Table 4.28 are aimed at re-orienting from a negative to a positive representation, and to present a clearer set of indicators for the objectives of IT management.

Stages 1 and 2 in the original model were particular problems. The goal for stage 1 needs to reflect that IT management objectives are frequently less concerned with deliberate obfuscation than preoccupied with the technical aspects of the task at hand. The programmer / consultants are employed for a task by which they will be judged and rewarded. Few are employed to address the level of computer literacy in an organisation or to construct plans for organisational learning. This specific focus by contractors may be seen as one of the disadvantages of using external IT staff. The original stage 2 indicator, confusion, switches perspective to that of the organisation, which is in itself confusing.

Stage	Proposed revisions of Superordinate goals' indicators
1. Initiation	<ul style="list-style-type: none"> No superordinate goals. Preoccupation with tasks - projects, hardware and software. (replacement).
2. Building foundations	<ul style="list-style-type: none"> Few superordinate goals. Preoccupation with related projects, hardware and software. Some allowance for future growth. (replacement).
3. Management control	<ul style="list-style-type: none"> Effective and efficient management of IT department. (replacement).
4. Integration	<ul style="list-style-type: none"> Cohesive management of distributed IT functions. (replacement).
5. SBU Integration	<ul style="list-style-type: none"> Cohesive management of distributed IT functions in SBUs. (replacement).
6. Inter-organisational	<ul style="list-style-type: none"> IT management pro-active in corporate planning and operations. (replacement).

Table 4.28. Proposed revisions for Superordinate goals element, by stage

The result of application of the Galliers and Sutherland model to the nine sites may be seen in Table 4.29.

	HK	PK	SHK	MG	WTG	BEA	BX	LCH	WLB
Stage of company as a whole	W ?	?	1-2	?	2	4	3	B 3	4

Table 4.29. Allocation of sites to stages based on Galliers and Sutherland model.

? unable to determine

Phase 2

The revised model as produced in Phase 1 above was applied to each research site, and a comparison made of the allocation of stages in the revised model compared with the original model. The application of each element of the revised model was considered in order to determine the effectiveness of the revisions. The revised model from Phase 1 is shown in Table 4.30. Additional revisions are proposed as a result of this application.

Elements	Stages					
	1 Initiation	2 Building foundations	3 Management control	4 Integration	5 SBU Integration	6 Inter-organisational
Strategy	Initial project investments	Expanded project investments	Review experiences with IT, increased focus on control, standardisation and professionalism	Focus on corporate needs for IT rather than IT department's abilities	Focus on integration of IT between SBUs	Focus on inter-organisational systems for competitive advantage or for inter-organisational efficiencies
Structure	None	Label of IS Often subordinate to accounting or finance	Data processing dept Centralised DP shop	Information centres Library, records etc in same unit Information services	SBU coalition(s) (many but separate)	Centrally coordinated coalitions (corporate & SBU views concurrently)
Systems	<i>Ad hoc</i> unconnected Uncoordinated Multiple manual and automated IS Operational Financial operating systems, eg order or customer account processing, developed or acquired	Many IT applications Many gaps Overlapping systems Centralized Operational Financial control systems, eg General Ledger, developed or acquired Many areas unsatisfied Large backlog	Mostly centralized Most major business activities covered Database systems Tactical Expanded end-user computing Enduser and development tools help reduce backlog	Information management within SBUs and core business Integrated DBMS systems Some DSS - <i>ad hoc</i> Systems developed to improve efficiency of value chain Maintenance load reduced - as new systems developed with high productivity tools replace older systems requiring heavy maintenance	Information management across SBUs Integration of systems from different SBUs, eg insurance / banking More DSS - internal, less <i>ad hoc</i> Added value systems (more marketing oriented) Some strategic systems (using external data) Lack of external and internal data integration Integration of communications technologies with computing	Inter-organisational systems (supplier, customer, government links) New IS based products External / internal data integration
Staff	Programmers / contractors	Systems analysts DP Manager	IS planners IS manager Data base administrator Data administrator Data analysts	Business analysts Information resources manager (Chief Information Officer)	Corporate / business / IS planners (one role)	IS director / member of board of directors
Style	Inward focus on individual projects	Inward focus on capability to specify, acquire / develop and implement multiple independent projects	Inward focus on management of IT systems: including standards, standardisation, formalisation of procedures and control	IT responsive to integrated needs of organisation	IT actively integrating IT between SBUs	IT pro-active in inter- and supporting intra-organisational systems
Skills	Technical, individual based Little or no development of staff	Technical, group based Introduction of professional methodologies, eg for systems acquisition or systems development. Some development of junior staff	Technical, group based. Application of methodologies, eg systems development and project management. Widespread staff development, standards determined and implemented. Data management and business skills introduced.	Widespread integration of technical and business skills in IT and user staff. Development of hybrid staff. Information management	Development of hybrid managers and staff in SBUs. Information management across SBUs.	Development of hybrid corporate managers
Superordinate goals	No superordinate goals. Preoccupation with tasks - projects, hardware and software.	Few superordinate goals. Preoccupation with related projects, hardware and software. Some allowance for future growth.	Effective and efficient management of IT department.	Cohesive management of distributed IT functions	Cohesive management of distributed IT functions in SBUs	IT management pro-active in corporate planning and operations

Table 4.30. Revised 7S stages of growth model (adapted from Galliers and Sutherland, 1991).

As an overall comment, the allocation of organisations to stages proceeded with less difficulty in the revised model than in the original model. This is to be expected as the revised model was designed to address potential problems in allocation of stages. In contrast to the original model, all organisations were able to be assigned to a specific overall stage. Also, allocation of specific stages to elements was much more precise. In the original model, considerable subjective judgement was required in the allocation of some elements, particularly strategy, systems and skills at the more advanced stages. The application of the revised model is considered for each element.

Stages

Following application of the revised model, the stages were reviewed. The major issue arising was the nomination of stage 6 as being inter-organisational. Modern retail banks operate multiple inter-organisational co-operative systems as part of normal business practice. These systems include on-line credit card processing, with card owners; international funds transfer (SWIFT) with other banks; ATM networks, with other banks and with joint service providers such as JETCO; Point of sale systems, with retailers; clearing house operations, with other banks; direct debit of salaries into individual accounts, from employers; and so on. The inter-organisational systems have spawned new IS products, and are supported by integration of external and internal data, so all of the indicators for stage 6 have been met by virtually all retail banks.

After consideration, it was decided to retain the revision unchanged for three reasons. Firstly, banks involved in inter-organisational systems operate some of the most sophisticated systems currently implemented. Therefore, the stage is appropriate as an indicator of direction and growth. Secondly, the range of elements and indicators in the model is sufficiently comprehensive to provide

an adequate means of discriminating between banks. Finally, notwithstanding the presence of systems indicators at stage 6, due to the overwhelming number of indicators at lower stages, no bank was allocated to stage six in systems.

Therefore, the model provided direction even for users of the most sophisticated systems.

Strategy

The revisions supported more precise allocation of stages. The only revision proposed is to change stage 4 from IT department's 'abilities' to IT department's 'operations'. This revision is proposed to clarify the changing focus from IT departmental matters to corporate matters when applying the model and to emphasise the difference between the inward IT focus in stage 3.

Structure

One of the most significant structural problems with the original model which surfaced during the interview cycles was where an external company is allocated responsibility for IT. There are two main situations here. One is where a wholly owned subsidiary serves as IT Dept. The second situation is where an external independent company is used to, e.g., develop systems to the company's specification. This could be where, e.g., a manufacturing company focuses on what it does best and purchases expertise in areas outside its strengths.

Alternatively, it could be where a consulting company has developed a standard integrated package for an industry which many companies adopt.

A third situation arises which has not been further considered as it is atypical.

This is where a company spawns a separate IT company to commercialise internally developed products. During the course of the research, each of these three situations was identified in various companies. The proposal for the structure element in Phase 1, i.e., to consider the external IT organisation to be

internal for the sake of allocation, were found to be a satisfactory solution to this problem. No further revisions are proposed.

Systems

See also Stages above. This element is potentially most vulnerable to dating. Systems which are examples of sophisticated state of the art today will be commonplace tomorrow. This weakness cannot, however, be avoided as the model is intended to provide direction in the area of systems. No further revisions are proposed.

Staff

In allocating firms to stages, the function of staff members was considered but the actual title of the staff member was ignored. Titles and reporting structures on organisation charts in some indigenous firms often bear no relationship to actual responsibilities and authorities, e.g., the head of accounts department also being responsible for a separate EDP company. Titles common in the West are at times used in uncommon circumstances. The organisation chart of one firm showed staff with titles of chairman and vice chairman who were both executive directors reporting to the MD.

At a technical level, in conservative indigenous organisations such as banks, systems programmers may be called systems analysts, and a data base administrator may have the title of programmer. The IS Manager may be one of several staff with the title of senior manager, which is more representative of the bank's hierarchy than the IT industry's. Smaller firms in both developed and developing countries appear to have a similar discrepancy between title and function. In smaller firms, the title IT manager may be functionally a computer operator / programmer, and a programmer may be functionally the IT manager. Therefore, adherence to titles such as those identified in the Galliers and

Sutherland model is not as important. Descriptions of key responsibilities distinguishing between positions could be useful, but have not been provided. The wide variation in responsibilities in Western organisations and the low level of specialisation in indigenous companies reduces the level of utility of such descriptions. In application of the revised model, most companies have been placed in stage 2 or 3. No revisions are proposed.

Style

The revisions supported more precise allocation of stages. No further revisions are proposed.

Skills

The revisions from phase 1 proved satisfactory, but application of the revised model by sites identified a potentially significant problem. While the allocation of the systems element in banks was at stages 4 and 5, with one exception, the level of skills supporting those systems was at stage 2. The systems and technology utilised particularly by the banks (e.g., the IBM 9000 series computer) are among the most sophisticated commercial systems utilised. However, the skills and staff policies in indigenous banks don't equate with those expected in a Western firm using this equipment and with this level of sophistication in their systems.

An example is the level of use of professional methodologies in areas such as systems development. Many banks appeared not to appreciate the value of these methodologies. The head of IT in one bank did not know if a methodology was used. The head of IT in another bank stated:

"Staff are presumed to stay a maximum of two years. Therefore, we don't want to take six months to train them in a new methodology as this will reduce productivity. Provided the programs work properly, this is OK!"

Staff turnover in this bank is 30% - 40% annually at present. Some years it has been higher! It would appear that this is exactly the situation where standardisation of practices would be most beneficial. In a third bank it was acknowledged that no systems development methodology was used but that the bank needed to catch up with proper practice.

Revisions from Phase 1 included indicators for staff development. These were found to be particularly relevant in this phase. The revisions also supported more precise allocation of stages. No further revisions are proposed.

A weakness of the revised model is in determination of the stage of skills for an external contractor. A completely accurate determination would require interviewing the contractor on the same basis as if they were an internal department. This may not be feasible, as there is little benefit for a contractor in being interviewed, but considerable risk and cost if they are. The risk relates to the possibility of an adverse rating by the interviewer which may complicate relationships with the client. The cost ranges from the cost of interview time to a commercial company which charges by the hour for services to the potential loss of their client following a poor rating.

No externally owned contracting company was interviewed during the research cycle. In one site, an external EDP organisation had been established to provide internal EDP services. Interviews were held in this company with the senior managers. In other sites, allocation of stage for the skills element was based on the user's experiences and perception of the level of professional service.

Superordinate goals

Difficulty was experienced in one manufacturing site in the allocation of a stage for this element. In this firm, the CEO assumed a leading role in the utilisation of IT. The internal IT department comprised two technical staff, a programmer and a systems analyst. Due to the direction provided by the CEO, the strategy element was allocated to stage 4. However, the stage for superordinate goals was allocated according to the focus of the IT staff members, at stage 2. This rationale was subsequently reviewed for appropriateness by comparison with other sites and found to be reasonable.

In the original model, all firms able to be allocated a stage in this element were allocated to stage 4 - cooperation. As a result of the revision, all firms were allocated a stage: five firms to stage 2, two to stage 3 and two to stage 4. This is seen as a more reasonable result based on the interviews with each firm. No further modifications are recommended for this element. A comparison made of the allocation of stages in the revised model compared with the original model is shown in Table 4.31.

	HK W	MG	PK	SHK	WTG	BEA	BX	LCH B	WLB
Original model	?	?	?	1-2	2	4	3	3	4
Revised model (2)	2	2	2	3	3	4	3	3	4

Table 4.31. Allocation of sites to stages based on original vs revised model (phase 2).

? unable to determine

The allocation of stages to companies was analysed and considered for reasonableness. It was noted that two manufacturing sites had increased their rating on the revised scale and were now rated at the same level as two of the banks. Following review of the interview records for each site, it was concluded

that notwithstanding the differing levels of investment in IT and differing levels of sophistication in systems, the overall stage of use of IT was similar for each site. The ratings for management focus (strategies, goals and style) as well as systems, staff, skills and structure varied between the sites. The sites were not directly comparable in most elements. Sometimes the banks led the others and sometimes the banks lagged, but based on the indicators, the sites were comparable and the overall rating was reasonably representative of their being at a similar stage in their development.

This reasonableness review emphasised the importance of the numbers of stages and precision of the indicators. If the model included more stages, then a greater degree of discrimination could be supported. If the indicators included levels of financial investment, then again, a greater degree of discrimination could be supported *in this case*. Use of financial indicators to represent stages of development is likely to create additional problems, including limited international applicability, as well as being unrepresentative of reality. There are few compelling reasons for insisting that a small firm potentially could not be at an equal, if not higher, stage of growth in its use of IT than a large firm.

Phase 3.

The final phase in the modification of the 7S SOG model involves review and revision based on the experiences in phase 2. Identification of differences specific to developing countries will be made, as will recommendations for revisions to models for developed and developing countries. Determination of an organisation's location in the stages of growth model should not be seen as a one-time event. A company which implements state of the art systems and is allocated a high stage will, over time, regress through the model if no upgrades are made to those systems. Similar regression will occur as a result of, e.g., staff resignations. Resignations may also impact allocation of skills. Consequently, it

is strongly recommended that an organisation's location on the model be reviewed on a periodic basis, perhaps in line with major investment cycles.

As a result of application of the model in phase 2 to the sites, only one minor change is recommended. This may be considered remarkable, however, it is due more to the overall aims of the model than to the accuracy of the revisions in phase 1. The 7S SOG model has general aims and phase 1 identified general rather than organisation specific problems. The utility of a general model is reduced, not enhanced, if it becomes specific to individual firms. Hence, phase 2 was intended to test the general proposals for reasonableness, not to serve as a source of more specific revision. The revisions proved to be reasonable and generally applicable, so with one minor change, they stand. The only revision proposed is to change stage 4 from IT department's 'abilities' to IT department's 'operations'.

Following revision of the 7S SOG model in phases 1 and 2, the revisions specific to developing countries can be identified. These revisions are primarily in three areas: the IT department as an independent functional unit, decentralisation of IT and the utilisation of office automation.

The view of an IT department as an independent functional unit reflects the perspective of the Galliers and Sutherland model, i.e., that of a large company with multiple SBUs located in the middle stages of the model. The degree of applicability of this model to smaller and medium sized enterprises is questionable. A series of studies has shown that MIS success in smaller and medium sized firms is positively associated with the rank of the manager responsible for IT, and that the IT knowledge and experience of the CEO is of critical importance. (Ein-Dor and Segev 1978, DeLone 1981, Raymond 1985, Martin 1989). Consequently, with the control of the IT function by a senior

manager or by the CEO, it is unlikely that a successful IT department in a smaller firm would develop an independent role. This lack of independence relates to the size of an organisation, but is also a factor in indigenous organisations with a strong ethnic cultural inclination towards centralised authority. Both size and ethnic culture are relevant to indigenous organisations.

The Galliers and Sutherland (1991) model includes the use of decentralisation of IT as an indicator of growth. As has been seen above, this is not appropriate in small and medium enterprises as a whole, nor in indigenous firms. The continuing validity of this indicator in larger Western organisations needs to be tested. With the widespread use of micro-computer based IS systems, it could be argued that decentralisation is more an indication of normal practice for large or small organisations than an indicator representing a stage of development. It is proposed that this indicator be removed from any model applicable to either developing or developed countries.

Lack of applicability of an indicator relating to the use of office automation is particular to developing countries. This, however, is the sole indicator which is clearly different between organisations in developing and developed countries. Currently, sites reported no use of OA due to there being no business requirements for the products. This may change. As the local language products emerging on the market begin to become more widespread, their presence may create demand in this area and there is a possibility that OA products will be utilised. Due to these reasons, the potential for a single model with universal applicability and the potential for future utilisation, the OA indicator should be reinstated.

Earl's Sector model

The key potential contribution of the series of frameworks proposed by Earl (1989) is the placement of organisations into quadrants (or sectors) based on their current activities and potential for IT, and the subsequent indication of appropriate management practices for an organisation located in a particular quadrant. Modifications are proposed for Earl's frameworks to overcome the problems identified in 2.4 above as well as problems arising from the research. Earl's models are more general and provide fewer specific details and directions than the 7S SOG model. Consequently, fewer modifications for application in developing countries are proposed. Similarly to the 7S SOG model, the review and revision of Earl's model is conducted in three phases:

1. Revision of model following identification of general problems and those potentially relating to developing countries.
2. Application of the revised model to each research site.
3. Final review and revision based on phase 2. Identification of differences specific to developing countries. Recommendations for revisions to Western model.

Phase 1.

General problems with this model, as shown in section 2.4 above, include: insufficient means to support consistent allocation of an organisation to a specific quadrant; orientation towards the operations of large companies; and a lack of consistency between frameworks which may cause difficulty in determining a coherent management strategy. As has been determined in section 2.1 above (and reviewed in the context of Earl's model in 2.4) smaller firms are prevalent in developing countries. Therefore, it is proposed to pursue

revisions relating to firm size as this will be of most assistance to indigenous firms. Other revisions which may be specific to developing countries are not proposed until after the interview phase since the frameworks are not presented in sufficient detail to identify a set of potential problems.

Earl's indicators for location on McFarlan and McKenny's strategic grid (Table 2.7) are appropriate as they are predominantly systems oriented. Placement of organisations according to the types of applications systems used or planned is a good indicator since it is not dependent on particular external environments and consequently supports international application. Where the indicators vary from systems, such as the reporting structure for the IT director or training in IT for senior executives, they are not as successful.

The indicators for Support and Factory activities are based on systems, so no revisions are proposed. Indicators for Turnaround include three which are not related to systems: leadership coming from the board, top IT executive appointed and information management education programmes for senior executives. These indicators are more representative of large organisations with independent IT departments, which is not typical of small business. Therefore, it is proposed that they be dispensed with. One other indicator is not systems related. This relates to rapid increases in the IT budget during the Turnaround activity. While this is not as directly tied to large organisations as the other three indicators, in the interests of simplicity and universality of application, it is proposed also to remove this indicator. Its exclusion should not reduce the applicability of the framework as it is not an independent test but an outcome of one of the other indicators - new systems which will be critical to survival or growth of the organisation.

Two indicators for the Strategic activity are not systems related and are more applicable to larger organisations: IT director on or near board and all managers need sound understanding of IT. It is proposed that these be dispensed with for the same reasons as large organisation indicators were deleted in Turnaround. A third indicator - IT investments dominate a firms' capital budget - may not be an effective test. Lack of precision in interpretation of 'domination', as well as insufficient flexibility to cater for current practices such as outsourcing, reduce its utility. Consequently, this indicator is also proposed for deletion. The impact of these proposed revisions on the strategic grid is that the number of indicators has been reduced but the general applicability of the framework to smaller organisations and in consequence, indigenous firms, has been increased. One further revision is proposed, that the indicator not require IS to have been *always* crucial to the organisation. This presumes new businesses or new business operations and is not appropriate in, e.g., established banks. The outcome of these proposed revisions is that all of the research sites can be confidently allocated to a quadrant in the strategic grid without concern over indicators which were not appropriate.

Reviewing Earl's three major frameworks: information management by strategic grid (Table 2.9), the sector (quadrant) framework for IT (Table 2.10), and the sector (quadrant) information management framework (Table 2.11), it would appear in principle that the first two frameworks can incorporate small business, based on strategic grid indicators (revised above) for the first framework and on characteristics included in the second. Naturally, variation occurring between small firms may lead to allocation in other quadrants, as appropriate, and this can be catered for in the existing frameworks.

The third framework, however, appears problematic. Unfortunately, as explained in section 2.4 above, this framework is potentially of most significance

to this research as it contains the most specific details of management practice for both direction to indigenous firms and for comparison between management practice in developed and developing countries. Smaller businesses, with their increased emphasis on centralised decision-making, reduced emphasis on independent specialised departments and greater entrepreneurial approach, do not appear to fit into the quadrants.

An additional, but potentially more significant, problem is that the organisation strategies which appear to be appropriate from Earl's adaption of McFarlan and McKenney's strategic grid do not appear to be consistent with sectoral strategies identified by Earl in the third framework. An example of this inconsistency is that by allocation of a small business to the support quadrant in Table 2.9, the planning strategy is identified as *ad hoc*. Allocation to the drive or delayed quadrants (Table 2.11) derives a sectoral planning strategy for the organisation as IT-push or Default, respectively. The problem does not appear to be related to categorisation, as the *ad hoc* strategy does not arise for any quadrant in the sectoral model. This problem is not limited to the planning element but occurs across the framework. Consequently, it is not feasible to propose revisions of the frameworks on the basis of size of organisation. Since this is a fundamental problem the proposal of revisions was deferred until additional information could be gathered in the interview phase.

Proposed amendments relating to the other general problems in Earl's three frameworks have been deferred. Rather than attempt to revise the frameworks with few guidelines on the types of practical difficulties to be experienced in its application, it has been resolved to obtain more specific information during the interview phase.

Phase 2.

This phase considers application of the sector (quadrant) information management framework to each research site. The first step is to allocate sites to quadrants, based on Table 2.10 Earl's Sector (Quadrant) framework for IT.

Delivery quadrant

IT is the means of delivering goods and services in this quadrant.

Characteristically, computer based transaction processing systems provide critical support for business operations. Earl (1989) proposes the financial services sector to be included in this quadrant. Based on the interview sites, it is found appropriate for banks to be allocated to this quadrant. Each bank stated they were unable to operate profitably and effectively without computer systems. Further, computer and telecommunication based systems are the basis for the maintenance of competitive strategies through integrated products. The local retail banking environment has shown over the past 10 years that computer based systems can deliver significant increases in market share to the leaders in IT, at the expense of the laggards.

Note that the banks interviewed included a range of sizes, with the largest having total assets some five times the smallest. There was no selection of sites based on market factors such as market leadership or prominence. It can be noted in passing that the research pilot site, a garment manufacturing firm, would be allocated also to this quadrant. This allocation emphasises the difficulties in locating an industry sector in a specific quadrant.

Dependent quadrant

In this quadrant, business strategies are increasingly dependent on IT. Business strategies are enabled by major automation, information and communication technologies. Earl (1989) proposes automobile and textile manufacturing to be

included in this quadrant. On consideration of the textile and garment research sites, there is little difficulty allocating four of the five sites to this quadrant. The allocation in all cases is based primarily on automated manufacturing processes rather than office information systems. All garment sites stated it would be difficult to operate without IT-based production and process control computer systems. The textile site was unable to source production computer systems, so is not applicable. The dependence on IT by the garment manufacturers, however, was not as marked as in the delivery quadrant.

Delayed quadrant

In this quadrant IT has no strategic impact. Opportunities or threats from IT are not apparent or perceived. The textile site can be allocated to this quadrant. This firm, which operates woollen spinning mills, is part of a group which also operates cotton spinning mills. While there has been ample application of technology to cotton spinning processes by the firm, automated products supporting woollen and worsted spinning are not available commercially. Consequently, it is proposed that the characteristic of this quadrant in Table 2.10 be modified to reflect the possibility of involuntary allocation to this quadrant, 'IT and automated products not available for use'. This company has no production IT and is still in the initial stages of implementation of office systems.

Drive quadrant

No sites were allocated to the Drive quadrant, but the stated characteristics and strategic context appear reasonable and also appear to be consistent with the other quadrants in identifying the possible range of uses of IT.

Once sites have been allocated to quadrants, the next step is to review the policies recommended for each quadrant. The stated approaches to planning,

organisation, control and technology for the banks in the Delivery quadrant are not unreasonable given the circumstances of the banks. This quadrant closely aligns and integrates IT with the business, which is representative of indigenous firms. The garment manufacturers in the Dependent quadrant do not fare as well. Earl's approaches for this quadrant are for IT planning to be derived from the business plan, which is representative of the sites; IT organisation to be based on the strategic business unit, which is not representative; control of IT to be Loose-tight to support focus on effectiveness rather than efficiency, which is not representative; and Technology policies to be pragmatic based on business need, which is reasonable. Consequently, revisions proposed for this quadrant are for the organisation to be centralised and for controls to be tight-loose.

In the Delayed quadrant, Earl's approaches are for IT planning to be conducted by default, which was not the experience of the textile site where IT was planned for, but was subject to *ad hoc* factors such as changes in the business environment; day to day responsibility for IT in the organisation to rest with the IT unit, which was not representative of the situation in which a consultancy developed the systems under the direct supervision of the chief operating officer; tight financial controls is reasonable; but an *ad hoc* approach to technology is not representative of specification and development of an integrated package. The planning for IT was carried out when the situation made it necessary. The technology itself was then carefully determined according to needs. Consequently, revisions proposed for this quadrant are *ad hoc* planning, centralised IT organisation and pragmatic technology decision-making.

Phase 3.

At the level of small business, and for indigenous organisations, there are similarities of management approaches which do not appear to be catered for by Earl's model. Rather than revise his framework in line with suggestions in

phase 2, which may reduce its utility for larger firms, it is proposed to develop a separate sector (quadrant) information management framework for smaller and indigenous organisations (Table 4.32). This revision is consistent with Earl's original premise that there are no universal policies and approaches to information management, and also with his recognition that his frameworks were based on the experiences of large firms. The Drive quadrant, which was not considered in phase 1 has been also reviewed and revisions proposed to the approaches which are intended to be more representative of smaller and indigenous firms.

	Delivery	Dependent	Drive	Delayed
Planning	Integral	Derived	IT-push	<i>Ad hoc</i>
Organisation	Corporate	Centralised	Corporate	Centralised
Control	Tight-loose	Tight-loose	Tight	Tight
Technology	Architectural	Pragmatic	Enabling	Pragmatic
Strategy-mode	Infrastructure-led	Business-led	Opportunity-led	not applicable

Table 4.32. Proposed Quadrant information management framework for smaller / indigenous firms. (Adapted from Earl, 1989).

To provide more assistance to firms attempting to formulate IS strategies by application of this framework, Earl's strategy-mode approaches have been appended to the framework. These approaches suggest that in the delivery quadrant, emphasis will be on establishing the infrastructure to support long term business goals. Firms in the dependent quadrant will use IT to support immediate business goals. Drive quadrant firms will not have the infrastructure or the current dependency on IT but will seek an IT supported business opportunity to reposition the firm. Firms in the delayed quadrant have no strategic impact from IT since no IS/IT strategy will be formulated.

This revised framework should be applicable equally to small organisations in developing and developed countries, however, further work will be required to

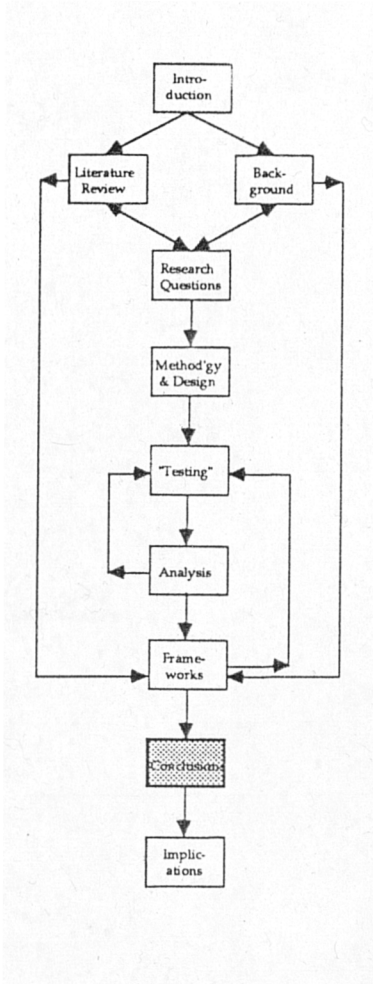
confirm this. These proposals should be seen as initial attempts to provide assistance rather than final models. To obtain maximum assistance to organisations, it is highly likely that further refinement and modification will be necessary as a result of practical application in a range of industries and countries.

4.9 Summary

This chapter proposed a framework of models of good practice which indigenous enterprises can apply in their SISP decision-making. In the development of this framework factor and process models derived from exploratory research were compared with Western models; the potential impact of IT on indigenous enterprises was identified; benefits achieved from use of IT have been considered and examples of the level of investment in IT required to obtain these benefits have been presented. While the proposed framework focuses on the rationality of SISP decision-making, indications of outcomes and the means of evaluating these outcomes have been included in order to locate this decision-making in the corporate context.

The Western SISP models aimed at providing specific direction to corporations were reviewed and revised. General difficulties with the application of these models in developing countries, which had been identified in chapter 2, were addressed; the revised models were applied to the specific case study sites and subsequently reviewed with additional revisions proposed as a result of this application. Conclusions based on these applications and the proposed framework as a whole are presented in the following chapter.

5. Conclusions on Research Findings



This chapter synthesises work presented in various sections of this thesis into conclusions regarding SISP in support of business strategy in general, and in developing countries in particular. Conclusions are drawn initially on the effectiveness of the research plan, design and processes and then on the research outcomes: factor and process models, decision-making to utilise or not to utilise IT and subsequent evaluations of its use. Propositions stated in Chapter 1 are reviewed in light of the research findings and conclusions drawn on their applicability. The proposed SISP models are reviewed to determine their suitability in developed as well as developing countries. The research questions posed in Chapter 1 are re-considered, answers are proposed and the anticipated contribution of this work is examined.

The results of this research should be interpreted through the limitations of the study, that is, the use of managing directors and senior staff as primary interview subjects, reliance on their memories of historical events, and reliance on the level of their satisfaction with Information Systems as a key measure.

Nonetheless, it provides a more detailed understanding of the dynamics of SISP by indigenous companies in a developing country than has been offered previously. It proposes a framework of good practice in SISP decision-making factors and processes as well as revised SISP models of sectoral placement and stages of development which may be useful for organisations in developing as well as developed countries in determining their actions and directions.

Moreover, the research processes and techniques utilised can be applied by investigators in other contexts where they seek to examine qualitatively relationships between factors, processes and levels of utilisation of Information Technology. Conclusions reached on the research and its outcomes follow.

5.1 Research Plan, instruments and process

In the final analysis, the research plan, instruments and process proved to be satisfactory in that they supported resolution of the research questions and propositions. The research plan, however, proved to be somewhat ambitious. The plan for a Western researcher to undertake interdisciplinary, longitudinally oriented case study research into privately owned indigenous Asian firms in a developing country, while applying rigorous research techniques which constrained the amount of flexibility available, proved to be high in risk. The successful conclusion of the research represented a level of good fortune which, perhaps, should not be relied on in future research.

Yin's (1989) framework for conducting case study research was found, with minor modifications, to be highly appropriate and able to make a major contribution to the structure and integrity of research conducted in developing as well as developed countries. His framework and research approach can be used to address and overcome criticisms of case study research that, as a methodology, it is not sufficiently rigorous nor capable of supporting generalisations.

It has been noted that one advantage of longitudinal studies is to capture processes since processes cannot be identified by single shot research. It has been opined that since processes are implemented over time, single shot research may not be able to identify the full scenario. (Franz and Robey, 1987). This was not the experience of this research. The processes utilised in evaluation and adoption of IT were well established and remarkably uniform in all sites. Perhaps they represent prudent business practice. In any event, the processes identified in the first round of interviews were not altered in the second, even though in many instances, major purchases of IT had occurred in the interim (especially in the banks).

A major advantage of longitudinally oriented research proved to be the establishment and development of good working relationships between the researcher and the businessmen participating in the research. As credibility and trust developed in the relationship, the degree of openness and the type and quality of information offered increased markedly. It is believed that this level of the relationship contributed markedly to the research and facilitated one of the strengths of longitudinal studies - the richness of the information gathered.

An additional advantage of case study research emerged subsequent to the research in discussions with other IS researchers. Case studies are an excellent means of improving a researcher's understanding of both the complexities of

systems in organisations and the environment in which practitioners must design, develop, implement and manage these systems. This improved level of understanding can only benefit the researcher, the research and the applicability of the research outcomes. Viewing published lists of IS managers' concerns is helpful for identifying directions, and the distribution of surveys is useful for examining specific areas of IS. To understand fully the complexities of Information Systems, however, there is little substitute to studying them in context.

5.2 SISP Factors, processes and the adoption of IT

Studies of utilisation of IT in the manufacturing sector over the last five years have consistently found that the level of utilisation is low compared with other sectors in Hong Kong, and also compared with the manufacturing sectors in major competitor nations. Government analyses of the viability of manufacturing industries in Hong Kong have concluded that its future will depend on:

- improvements in productivity and technology levels,
- upgrading product quality, and
- diversified markets.

In contrast to manufacturing utilisation of IT by banks is high. Eminent bankers have identified technology investments as being critical to their survival.

Longitudinally oriented case study research of indigenous firms was conducted in 1992 and 1993 to identify strategies and experiences with IT which could be used as a base to develop SISP models. The aim in developing these models is to provide a framework of good practice which could assist other indigenous firms

in their use of IT, which, it is hoped, may have a positive influence on their level of utilisation of Information Technology. The outcomes of this research follow:

Literal replication of major factors and process in both manufacturing and banking sectors strengthens the analytic generalisations able to be drawn. The diversity of sources of the research outcomes include: firms in manufacturing and financial sectors which, respectively, experience low and high sectoral levels of IT utilisation; firms with experience in the use of IT ranging from less than two to more than 20 years; firms having experience with a range of systems at operational, tactical and strategic levels; and firms ranging in size in terms of employees from 250 to more than 2500. While the research outcomes would be further strengthened by greater diversity, such as additional sectors, wider range of sizes of firms and, from the point of view of international application, firms in other countries, it is suggested that there is sufficient diversity to support the inter-sectoral models and other outcomes proposed.

Factor models

Decisions to utilise IT have been found to be based on major factors which are common to all companies. The uniformity of factors has supported the proposal of an inter-sectoral IS/IT Investment Decision-making Factors Model (see Table 4.20). The successful experiences of these selected sites warrant their use as IT role models. As the Factors Model is based on their common experiences it is strongly concluded that less experienced firms could benefit from application of this model to improve their SISP decision-making. For further details see Proposition 1, in section 5.3 below.

Process models

Decisions to utilise IT have been found to be based on major processes which are predominantly common to all of the firms. Some variation occurs within firms in decisions for production or office systems; within firms according to the size and nature of the investment; and between firms depending on their level of experience. Notwithstanding these variations, the uniformity of core processes in all firms is sufficient to support the proposal of an inter-sectoral IS/IT Investment Decision-making Processes Model (see Table 4.22). As the Processes Model is based on the common experiences of the selected sites it is concluded that less experienced firms could benefit from application of this model to improve their SISP decision-making. For further details see Proposition 3, in section 5.3 below.

Decisions by indigenous firms to utilise IS/IT.

Factors and processes used in decisions to utilise IT in these Hong Kong firms have been found to be substantially similar to those used in Western firms in USA, UK, Australia and New Zealand. Based on their own experiences, the companies unanimously recommended that firms less experienced in IT should seek assistance from an independent consultancy. Companies which had used consultancies extensively recommended the process. Companies which had used consultancies minimally, recommended greater use.

Decisions by indigenous firms not to utilise IS/IT.

Decisions not to utilise IT have been found to be based on the same major factors and processes as decisions to utilise IT. Several significant factors and a business

constraint have been identified as contributing to lower levels of use of IT. Since one of the major factors in decisions not to utilise IT is financial return, higher prices for IT solutions in Hong Kong compared with USA cannot be discounted as a significant factor in lower levels of utilisation of IT. Findings on this factor, however, were not conclusive. The second significant factor has been seen to be the wage differentials between USA and Hong Kong. As shown in Table 2.3 Hong Kong wages are approximately a third of USA levels so, coupled with higher IT costs, there is less incentive for employers to implement technology in order to reduce wage costs. The third significant factor is the perceived lack of availability of suitable IT based systems. This lack of availability was seen in production systems for specific industries, such as woollen spinning, as well as in banking where examples were given of products for which the banks perceived demand but which were insufficiently mature to be implemented as retail banking products.

A significant constraint on the utilisation of IT has been found to be the nature of the business. All industries should not expect to achieve the same level of use of IT nor to expect to use IT for the same purpose. Major productivity improvements in cut and sewn clothing manufacturing, for example, may be gained more from improved work practices (such as materials handling) than from IT.

Cultural aspects which had been considered potential constraints to the use of IS/IT included difficulties with language and cultural resistance to change. Notwithstanding the cultural differences between developing and developed countries, not one company during the course of interviews and discussions identified an instance in which the influence of culture could be considered a constraint on the utilisation of IT.

Evaluation of the use of IT.

Evaluation of the use of IT was based on interviews with managing directors and senior staff. The key measure was the level of their satisfaction with Information Systems. The companies all considered their IT systems to have been successful and most felt that IT had provided competitive advantage. Benefits from production systems have been found to be readily quantifiable and measurable. This ease of measurement has been found to promote their use. Manufacturers find benefits from office systems are more uncertain as they are difficult to quantify and measure. This difficulty may retard the utilisation of office systems. Banks find no difficulty in measuring the benefits of operational level systems but had difficulty once the benefits of the system extended beyond direct financial return in operational level systems. Difficulty in measuring return may retard the utilisation of more complex and strategic systems. While each company must ultimately determine its own measures of success, assistance in ways to measure success in smaller office systems and in more complex tactical and strategic level systems appears to be necessary.

This difficulty in measurement of the benefits of IT was raised as an issue in an IS Research Colloquium (Crawford, 1985) and has been the subject of considerable work since that time. (Lincoln 1986, Hawgood and Land 1988, Weill and Olson 1989, Kumar 1990, Clemons 1991, Weill 1992). Farbey and colleagues in 1992, however, find that despite the range of evaluation techniques available, very few had been used.

Therefore, evaluation of the success of IS/IT systems from the level of their satisfaction with Information Systems is not unreasonable. It recognises that each firm must carefully consider its own situation, define its own requirements

and determine if an IT solution is available, suitable and financially viable. Evaluation is then based on the perceptions of CEOs and senior management, including managers responsible for the IT function, as to its success. Based on the experience of the research sites it can be concluded that simple, relevant, accurate and easy to use techniques for measuring benefits would assist increases in the level of use of IS/IT since it could reduce the uncertainty of IT investment decision-making.

5.3 Characteristics of IS / IT usage (compared with propositions)

Proposition 1.

Proposition 1 states: There are common factors in the decisions of prominent competitive indigenous organisations to utilise Information Technology. These common factors may be grouped, e.g., by economic sector or size of organisation. Proposition 1 addresses research questions 1 and 3.

Decisions to utilise IT are based on major factors which were common to all manufacturers as well as all banks. Investments in both production and office systems are based on the same major factors, although the relative importance varies. The two most important decision factors were business requirements and financial returns, in that order. Business requirements sought by manufacturers are mainly productivity improvements, followed by improvements in processing speeds and improved control over the business. Banks sought to support strategic positioning, to provide competitive products and to improve internal efficiencies. The uniformity of factors has supported the proposal of an inter-sectoral IS/IT Investment Decision-making Factors Model. This proposition is considered to be supported.

Proposition 2.

Proposition 2 states: The influence of environmental and financial factors are of prime importance in the decision of a competitive indigenous organisation to utilise or not to utilise Information Technology. Proposition 2 addresses research questions 1, 2 and 3.

Bacon's (1992) work on decision-making factors in USA, UK, Australia and New Zealand companies provides the framework for this exploratory proposition. The two most important decision factors for both manufacturing companies and banks were business requirements and financial returns. These findings are entirely consistent with Bacon who found that the most important factors in decisions to invest in IT were to support business objectives and to meet financial criteria, *in that order*. The inter-sectoral IS/IT Investment Decision-making Factors Model exclusively comprises business and financial factors in response to the environment.

Research findings on decisions not to use IT are based on organisations which are experienced users of IT but which have in specific instances decided not to use IT. While this has been found to be satisfactory for the purpose of this research, some uncertainty remains as to the importance of experience with IT in this decision-making. This uncertainty requires further research for resolution. There is, however, sufficient evidence to consider this proposition to be supported.

Proposition 3.

Proposition 3 states: There are common purposes in the processes of decision-making of competitive indigenous organisations to utilise or not to utilise Information Technology. Proposition 3 addresses research questions 1 and 4.

The major processes identified in both manufacturing and financial sectors are substantially common and, as well, are completely consistent with Western models of processes for IT assessment and adoption. Elements of each of the four

Western process models: issue driven, technology driven, opportunistic and normative were included. (Huff and Munro 1985). The uniformity of processes has supported the proposal of an inter-sectoral IS/IT Investment Decision-making Processes Model. This proposition is considered to be supported.

Proposition 4.

Proposition 4 states: The factors and processes are substantially similar to those used in Western organisations, as shown in contemporary models of SISP. Proposition 4 addresses research questions 5 and 6.

Details of the comparability of factors and processes found in indigenous firms with those in Western firms are provided above. This proposition would have to return positive findings to support development of a model of SISP, as indeed it does. This proposition is considered to be supported.

Proposition 5.

Proposition 5 contains a series of propositions seeking to establish areas of similar environmental characteristics between developing and developed countries which will support the previous propositions in resolving research question 7. In order to support proposition 4, it will be necessary to show that the characteristics of IT usage bear some similarities with those in advanced economies. The following research propositions have been studied in the advanced economies, and were examined in this research. All of these propositions relate to environmental factors, and all have implications for analysis of low levels of utilisation of IT.

Proposition 5.1 Larger organisations are earlier adopters of IS, and use them more extensively. (Gremillion 1984, Raymond 1985 - both disconfirmatory). In considering these conclusions it must be remembered that, as measured by numbers of employees, the size of the research sites ranged from 240 to about 2,500. Ranking the sites by size as determined by numbers of employees, each of the four banks were larger than the manufacturers. All of the banks were earlier adopters of IT than any of the manufacturers. Within the banks, the larger banks adopted IT before the smaller. In the manufacturers, the smallest was the most recent adopter, in 1991. The earliest manufacturing adopter, however, was the mean in terms of size, followed by the second largest. Consequently, the first part of the proposition may be given weak support with a note that economic sector appears to be of significance in early adoptions and that size may or may not be a factor within a sector.

The second part of the proposition, the degree of extensive use, presents some difficulties in measurement. Raymond (1985) considers the number and nature of applications to be a measure. He classifies systems as operational (transaction

systems) and administrative (supporting decision-making). While the nature of systems provides a simple comparator, the relevance of the number of systems and the level at which they are applied is more subjective. It would appear that manufacturing systems would be more inclined towards operational systems than banks, but this proved to be not the case. Section 4.4 above on the impact of IS/IT included characteristics of systems in the interview sites. Most of the systems in both sectors were operational. At a tactical level, however, the four highest rated sites were two banks and two manufacturers. The two manufacturers were ranked second and third out of five in terms of size for that sector. The banking situation cannot be discussed without breaching a request for confidentiality. The research findings, however, are considered strongly disconfirmatory to the second part of the proposition as this does not apply either within or between sectors.

Proposition 5.2 Organisational size is associated with the sophistication of IS (Lehman et al, 1986 - yes; Li and Rogers, 1991 - no). The key issue in this proposition is a temporally neutral definition of sophistication, since technologies considered to be sophisticated today can become commonplace tomorrow. In 1986 Lehman and colleagues considered computer graphics to be an indicator, which illustrates the problem as this technology is in widespread use today. Li and Rogers (1991) developed a stages of growth model incorporating varying emphasis on technology factors, such as batch processing, database, communications, decentralisation and applications; system characteristics, including operational vs control vs strategic systems; and organisational concerns such as end user awareness and computing. This model dates from the same period as the Galliers and Sutherland model (1991) and suffers similarly from dated practices. Rather than attempt to redevelop the Li and Rogers model, the level of sophistication was determined from the location of each site in the systems stage of the revised 7S SOG model shown in section

5.4 below. According to this rating, all of the banks used more sophisticated systems than any of the manufacturers, which was reasonable. The most sophisticated bank was the largest, but the correlation broke down at that point. There was no correlation with the proposition by the manufacturers. Consequently, the findings are considered disconfirmatory, with the note that economic sector appears to be a stronger factor in the level of sophistication of systems.

Proposition 5.3 Larger organisations have both a higher proportion of managers and a higher proportion of information workers than smaller organisations (Yap and Walsham, 1986). Yap and Walsham's proposition is based on a 1984 survey into 638 business organisations in the UK service sector. These firms were all of small to medium size. Two immediate problems arise with this proposition. Since banks are part of the service sector, their details should relate to Yap and Walsham's findings. Unfortunately, they do not. Table 5.1 shows a comparison of percentages of employees in Hong Kong's licenced banks (Carse, 1993) with Yap and Walsham's (1986) findings for organisations with equivalent numbers of employees. Even after some allowance for differences in international practices the correlation with HK banking sites does not hold so, from the perspective of the banking industry, the findings are considered disconfirmatory.

	U.K. service sector	Hong Kong banks
managerial level	4%	13%
supervisory level	combined	23%
clerical and supporting level	18% - 44%	64%

Table 5.1. Comparison of UK service sector and HK banking sector employee profiles.
(Adapted from Yap and Walsham 1986 and Carse 1993)

As has been noted above, the manufacturers are smaller in terms of numbers of employees than the banks. Since the primary purpose of the manufacturers is manufacturing, it is not unreasonable that the percentage of managers and information workers is less than for the banks. The percentage of manual workers ranged between 80% to 93% of their workforce. Within the manufacturers, there was no correlation between size of organisation and proportion of information workers, so from the perspective of manufacturing industries the findings are considered disconfirmatory. The situation where larger banks have more information workers than smaller manufacturers is seen as relating strongly to the sector rather than to the size. Consequently, the findings are considered strongly disconfirmatory within sectors. Support of the proposition may be claimed between sectors, however, this is considered sector rather than size significant. Further work is required to investigate the gross differences between UK and HK employee profiles reported in these two studies.

Proposition 5.4 Organisations with more knowledge workers and information workers versus material workers tend to use computers. (Yap and Walsham, 1986). This proposition was unable to be confirmed or disconfirmed as all of the research sites selected were users of IT. See also the discussion of site selection in section 3.3 above.

Proposition 5.5 The adoption of computers has no relationship to overall profitability, regardless of industry sector (Yap and Walsham, 1986). Banks in Hong Kong, whether publicly listed or privately owned are currently under no obligation to publish details of profitability. Following criticism of the lack of details available to international agencies such as Moody's Investors Service, and low ratings of Hong Kong's banks in regional surveys regarding the level of disclosure in annual reports, this current practice may be amended by requirement of the Monetary Authority. (Fung, 1993b). Four of the five

manufacturers are privately owned and also are under no obligation to publish details of profitability. Consequently, this proposition is unable to be confirmed or disconfirmed.

Proposition 5.6 Regardless of company size, IS is being used primarily for operational and management controls rather than at a strategic level. (Li and Rogers, 1991). As has been shown in section 4.4 above, IS is used primarily at an operational level with some tactical systems but with only two sites (banks) claiming use of strategic level systems. Even these two banks consider their strategic systems to have had a low level of impact on their organisations. Consequently, the findings are considered to be strongly confirmatory.

Propositions 5.7 and 5.8 are considered in section 5.4 below.

Other conclusions regarding usage of IT can be drawn from the research findings. These conclusions relate mainly to possible reasons for low levels of utilisation of IT. The banks all considered their IT systems to have been successful and most felt that IT had provided competitive advantage. The means of measuring this success proved to be more difficult once the benefits of the system extended beyond direct financial return in operational level systems. This difficulty in measuring return may retard the utilisation of more complex and strategic systems.

While each company must ultimately determine its own measures of success, assistance in ways to measure success in competitive systems appears to be necessary. Current IS theory suggests that each organisation should set its own measures based on its organisational aims and objectives. While this may be satisfactory in the short term, it is suggested that the establishment of measures,

perhaps on an industry basis, would provide enhanced assistance as a management planning tool.

5.4 Suitability of reviewed / revised Western models for application in developing and developed countries

The Western SISP models selected are quite similar as both are aimed at providing practical assistance to firms. They recognise that management issues and responses differ according to the circumstances of an organisation, and within the organisation at different times. Earl's (1989) frameworks are aimed more at corporate management enabling an organisation to be located according to its current systems and future plans. It provides advice as to the general approaches which may be followed, such as the degree of control and the initiating force for IT planning, rather than specifying detailed objectives. Galliers and Sutherland's (1991) 7S SOG model is considerably more detailed as it seeks to provide indications of specific practice over time. While this model contains greater complexity it is more consistent in its approach than Earl's frameworks. Due to its level of detail the 7S SOG model has an increased likelihood of becoming dated as technologies and management practices evolve. Proposals have been made for both models to enhance their applicability in developing and developed countries.

7S SOG model

Proposed revisions have been made in three phases: addressing general problems such as language, dated practices and allowance for the characteristics of indigenous firms; the application of the revised model to the research sites and subsequent revision; and finally, identification of proposed revisions particular to developing and developed countries. The outcome of the final

stage has been consolidation of two different models into one, in the hope that it will be of more general applicability. This consolidation was feasible due to the very limited differences between the two sets of proposals and also due to the purpose of the model which recognises and caters for differing characteristics of organisations.

The process of revising the Galliers and Sutherland model has led to consideration of what a stages of growth model can and can't do. It can provide general directions and highlight potential areas of development, integration and coordination. It can't provide a specific roadmap for every company on how to manage its IT. Each element needs to be considered to determine the appropriate stage for each organisation. This determination will have to be, ultimately, subjective unless expensive consultancy is employed to assist. Notwithstanding this level of imprecision, the model still serves a purpose which otherwise could be met only through expensive or time consuming assistance from others. To the extent that the model promotes senior management in an organisation to consider proactive rather than reactive response to the management of IS/IT then the model can be seen to be successful.

Proposition 5.7 stated that Information systems in organisations move through stages (phases) in their evolution. (Nolan 1979, Earl 1983-9, Bhabuta 1988, Hirschheim et al 1988, Galliers and Sutherland 1991). Location of indigenous firms on the revised 7S SOG model, and review of their earlier experiences, shows a stage of growth model is appropriate and that the proposed revisions provide suitable indicators of this growth. This proposition is considered to be supported. Table 5.2 refers.

Elements	Stages					
	1 Initiation	2 Building foundations	3 Management control	4 Integration	5 SBU Integration	6 Inter-organisational
Strategy	Initial project investments	Expanded project investments	Review experiences with IT. increased focus on control, standardisation and professionalism	Focus on corporate needs for IT rather than IT department's operations	Focus on integration of IT between SBUs	Focus on inter-organisational systems for competitive advantage or for inter-organisational efficiencies
Structure	None	Label of IS Often subordinate to accounting or finance	Data processing dept Centralised DP shop	Information centres Library, records, OA etc in same unit Information services	SBU coalition(s) (many but separate)	Centrally coordinated coalitions (corporate & SBU views concurrently)
Systems	<i>Ad hoc</i> unconnected Uncoordinated Multiple manual and automated IS Operational	Many IT applications Many gaps Overlapping systems Centralized Operational	Mostly centralized Most major business activities covered Database systems Tactical	Information management within SBUs and core business Integrated DBMS systems Integrated OA systems Some DSS - <i>ad hoc</i>	Information management across SBUs Integration of systems from different SBUs, eg insurance / banking More DSS - internal, less <i>ad hoc</i> Added value systems (more marketing oriented) Some strategic systems (using external data) Lack of external and internal data integration Integration of communications technologies with computing	Inter-organisational systems (supplier, customer, government links) New IS based products External / internal data integration
Staff	Programmers / contractors	Systems analysts DP Manager	IS planners IS manager Data base administrator Data administrator Data analysts	Business analysts Information resources manager (Chief Information Officer)	Corporate / business / IS planners (one role)	IS director / member of board of directors
Style	Inward focus on individual projects	Inward focus on capability to specify, acquire / develop and implement multiple independent projects	Inward focus on management of IT systems: including standards, standardisation, formalisation of procedures and control	IT responsive to integrated needs of organisation	IT actively integrating IT between SBUs	IT pro-active in inter- and supporting intra-organisational systems
Skills	Technical, individual based Little or no development of staff	Technical, group based Introduction of professional methodologies, eg for systems acquisition or systems development. Some development of junior staff	Technical, group based. Application of methodologies, eg systems development and project management. Widespread staff development, standards determined and implemented. Data management and business skills introduced.	Widespread integration of technical and business skills in IT and user staff. Development of hybrid staff. Information management	Development of hybrid managers and staff in SBUs. Information management across SBUs.	Development of hybrid corporate managers
Superordinate goals	No superordinate goals. Preoccupation with tasks - projects, hardware and software.	Few superordinate goals. Preoccupation with related projects, hardware and software. Some allowance for future growth.	Effective and efficient management of IT department.	Cohesive management of distributed IT functions	Cohesive management of distributed IT functions in SBUs	IT management pro-active in corporate planning and operations

Table 5.2. Revised 7S SOG model (universal). (Adapted from Galliers and Sutherland, 1991).

A final comment on the development of a stage of growth model relates to the degree of subjectivity which is required in the application of any such model. An internal contradiction arises in that the purpose of the model is to identify broad issues and to provide direction for management in many different organisations and, in consequence, must be quite general. At the same time, however, the model needs to be sufficiently specific to support allocation of an organisation to a stage for each element. There are, in addition, practical limits to the number of indicators which can be provided. The degree of subjectivity arises in the making of judgements in the allocation of an organisation to a specific stage for an element where the circumstances of a particular organisation may not be identical to the indicators provided or, alternatively, may be similar to indicators in more than one stage.

No practical means have been identified to limit this degree of subjectivity while retaining the utility of a general model. An option which may be appropriate is to develop stages of growth models on a sectoral or industry basis for a specific environment. Apart from the difficulty in developing such models, there is a subsequent danger of becoming too specific, in that a narrow focus may be built into the model which could be counter-productive to firms seeking strategic opportunities.

Earl's Sector model

Earl's Sector model does not deal with economic sectors but with the location of a firm to quadrants of similar activity. This is an unfortunate use of terms as it can create confusion in users. Earl's model incorporates a series of frameworks which have their origins in diverse areas. The frameworks aim to provide senior management insights into the various approaches to IT which may be particular to their organisation at a given time. As a whole, the model should be

seen as achieving this aim. The diversity of sources of the frameworks, however, result in a lack of consistency in the approaches suggested by the original model.

In a three phase process, revisions have been proposed to address to some degree general problems including the inconsistencies and to modify the frameworks to make them more applicable to firms in developing countries. The thrust of the proposals for developing countries varies between frameworks. Some have no proposed changes; others, including the indicators for placement on McFarlan and McKenney's (1983) strategic grid (Table 5.3) have proposed changes which reduce the orientation to large companies thus producing a more universal model.

Activity	Indicators
Support	<ul style="list-style-type: none"> • IS has little impact in present or future. • Some administration systems to help improve efficiency. • Islands of specialist technology in production processes. eg cement works
Factory	<ul style="list-style-type: none"> • IS crucial to current operations but not at heart of firm's strategic development. • Advanced production systems in place for fundamental processes. • Future applications not strategic. eg steel works
Turnaround	<ul style="list-style-type: none"> • IT becoming strategic. • New competitor systems planned which will be critical to organisational survival and growth. • In the past, IT may have had lower profile. • IT budget rapidly increasing, eg retail chain.
Strategic	<ul style="list-style-type: none"> • IS crucial to organisation and future is dependent on IT. • Business operation not feasible without computers. • New products and services computer based. eg credit card company.

Table 5.3. Revised Indicators for each activity in McFarlan and McKenney's Strategic Grid (Universal). (Adapted from Earl, 1989).

Some of the frameworks were so heavily biased in favour of larger firms that separate complete frameworks are proposed for application by smaller firms, including those in developing countries, see Table 5.4. Parts of Earl's model

overlapped parts of the 7S SOG model, such as styles of IT leadership (Earl, 1989 pp 194 - 198). In the interests of simplicity of application, the models have focused on their separate areas - general management approaches to IT and detailed IT practices.

	Delivery	Dependent	Drive	Delayed
Planning	Integral	Derived	IT-push	<i>Ad hoc</i>
Organisation	Corporate	Centralised	Corporate	Centralised
Control	Tight-loose	Tight-loose	Tight	Tight
Technology	Architectural	Pragmatic	Enabling	Pragmatic
Strategy-mode	Infrastructure-led	Business-led	Opportunity-led	not applicable

Table 5.4. Proposed Quadrant information management framework for smaller / indigenous firms. (Adapted from Earl, 1989).

Proposition 5.8 stated that firms can be positioned in a strategic grid according to their present and likely future impact of IS/IT. (McFarlan and McKenney 1983, Earl 1989). The purpose of this location is to provide assistance to management in its approach to IT. Proposed revisions to this model have sought to address many of the problems in application of the original model to developing countries. Efforts have been made to reduce inconsistency between the different frameworks, although further refinement and modification will be necessary as a result of practical application in a range of industries and countries. The resulting frameworks appear appropriate for initial application to indigenous firms. Consequently, this proposition is considered to be supported.

5.5 Conclusions on research questions

Research questions posed in section 1.4 above are considered in light of the research findings:

1. How do indigenous organisations decide to use IT?

Factors and process utilised in IT decision-making as identified by indigenous organisations were remarkably similar for all sites, and were also consistent with studies of firms in developed countries, such as UK, USA, Australia and New Zealand. This uniformity could perhaps be explained as representing prudent business practice, although further work would be required for conclusive explanation.

2. How do indigenous organisations decide not to use IT?

In the indigenous organisations interviewed, IT decision-making factors and processes were the same regardless of whether the decision was to use or not to use IT. While these findings were uniform across the sites, they are not completely conclusive as they are based on IT-using organisations which at some stage considered investment in IT but which declined to proceed. All but one of the research sites had this experience. The one remaining site was relatively inexperienced in the use of IT and the situation had not arisen. Further research is required to determine if the factors and processes utilised by IT experienced organisations are the same as for those organisations without IT experience.

3. What factors are most important in these decisions?

Decision-making factors have been identified. The major factors are, in order, business requirements and financial return. These factors were uniform across sectors and represent an inter-sectoral factor model.

4. What processes are most important in these decisions?

Major decision-making processes common to both sectors have been identified. The major processes have been consolidated into an inter-sectoral model.

5. How do these factors compare with those used by organisations in Western countries in their decisions to invest in Information Technology?

Decision-making factors used by indigenous firms are consistent with those used in Western countries, as shown by international IS research.

6. How do these processes compare with those used by organisations in Western countries in their decisions to invest in Information Technology?

Processes used in IT investment decision-making are subject to more variation than factors but are consistent with the range of processes incorporated in Western process models. Based on the experience of Western organisations, it was expected that there would be uniformity of purpose, but more variety in processes than was the case. The purpose reported by indigenous firms was uniform. There are striking similarities in the major processes used in decision-making for major IT investments by indigenous firms.

7. Can Western models of the utilisation of IT be structurally amended to enable their use by firms in developing countries?

Revisions have been proposed to Western SISP models which would address shortcomings and potentially permit a greater level of applicability in indigenous firms. The revisions have been successfully applied to indigenous firms. The question of the level of applicability, however, has not been finalised and further

work is required to determine suitability in other sectors, with different sized firms and in other developing countries.

5.6 Contribution of research

Chapter 1 contained a list of areas to which this research could potentially contribute. Following completion of the research this potential contribution has been reviewed and areas of accomplishment noted.

- Exploratory and confirmatory research has been conducted into the identification of SISP factors and processes used in the adoption and diffusion of IT. This has been accomplished with the identification of IT decision-making factors and processes which are common to manufacturing and banking firms.
- Inter-sectoral SISP models for factors and processes used in the adoption and diffusion of IT have been devised.
- Differences in SISP activities between organisations in the West and in Hong Kong have been identified, with subsequent impact on IS theory. The differences have been found to be significant between large Western firms and smaller Eastern firms. Significant similarities, however, have been found between smaller Western firms and their Eastern counterparts. This finding is likely to have implications for future IS research.
- Western SISP models of placement and progression have been applied to indigenous firms and have been subsequently reviewed and revised based on the applications. The outcome of these revisions may be of assistance to firms in developed as well as developing countries.
- A rigorous framework for longitudinal case study research based on current IS research theory, particularly as proposed by Yin (1989), has been

implemented. With minor amendments, this research framework has been found to be most applicable and capable of significant contribution to the rigour of case study research.

This research focuses particularly on IS research in developing countries, to which it has contributed by:

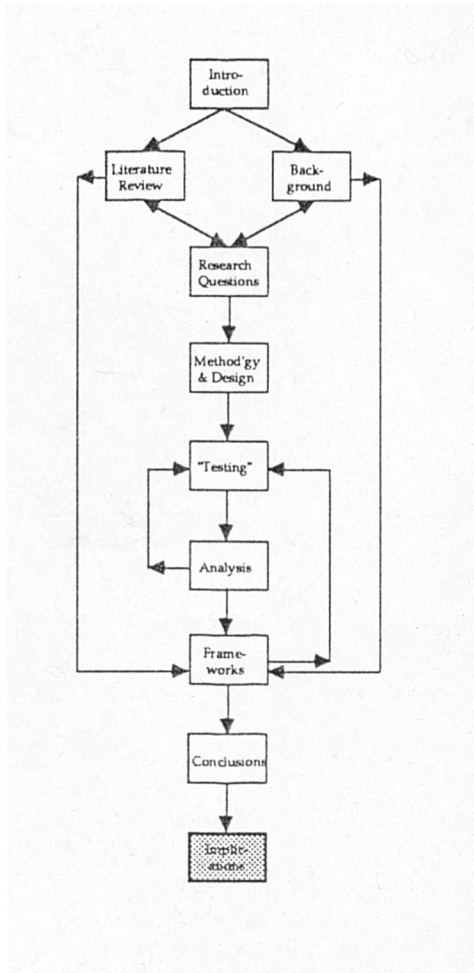
- comparison of SISP activities in organisations in developing and developed countries.
- provision of additional linkages with mainstream IS research theory in the areas of decision-making for the adoption and diffusion of IT and in the evaluation and measurement of IT use.
- development of a framework of good practice comprising SISP models for sectoral placement, IS/IT progression and IT investment decision-making which are specifically designed to assist firms in developing countries.
- provision of an up to date framework for conducting IS research in developing countries based on application of Yin's work.

5.7 Summary

Following investigation of the SISP practices of indigenous enterprises in developing countries and application of revised Western SISP models this chapter reaches conclusions on the research questions and propositions stated in chapter 1. The uncertainty regarding the dynamics of SISP decision-making has been addressed. Strategic decision-making by these enterprises has been found to be based on major factors and processes which are predominantly common to firms both between and within different economic sectors, irrespective of the size of firm or the level of sophistication of its systems. These factors and processes are consistent with research findings into the practices of Western firms

Conclusions have been reached regarding the suitability of applying Western models of SISP in a developing country. Many of the modifications proposed to increase suitability relate to the differences in size of organisation in developing countries, which are smaller than the very large corporations on which many Western models are based. Implications of these conclusions are dealt with in chapter 6.

6. Research Implications



This chapter discusses implications of the conclusions reached in Chapter 5. These implications will be significant for indigenous firms, for IT vendors and also for researchers. Implications relate to business practice, research issues and to the low level of IT utilisation in developing countries.

This research has sought to help address the problem of low utilisation of IS/IT in developing countries through the provision of assistance to indigenous enterprises in their determination of appropriate actions and directions for the effective strategic use of IS/IT. The form of this assistance was intended to be the development of a framework of practical SISP models of decision-making, sectoral placement and stages of development which could be applied by these indigenous firms. The framework would be based on good practice in SISP decision-making (established by exploratory case study research) and on modification of Western SISP models for application in developing countries.

It is believed that the development of such a framework suitable for application by indigenous enterprises has been achieved. In the process of this development, exploratory case study research has been conducted to determine the rationality of strategic IS decision-making by indigenous firms. In researching the dynamics of this decision-making the factors and processes utilised by these firms have been identified. Organisational and environmental factors were found to be most significant. Western models of sectoral placement and stages of development were reviewed for compatibility with the characteristics of developing countries and subsequently revised. The revised models were then applied to indigenous firms in the manufacturing and banking sectors and reviewed once more. While the development of this framework has been based on research into organisations in Hong Kong the general characteristics of developing countries have been considered in the development process. The models as finally proposed appear to be suitable as a means of assistance to indigenous firms in their SISP practices.

While the outcomes of this research should be interpreted through its limitations, particularly as they are based on a single study in a single country, there are implications arising from the research requiring further consideration.

6.1 Thesis - strategic implications

Examination of the SISP decision-making practices of indigenous firms appears to have implications for other firms, for IT vendors and also for researchers. Many of the implications relate to reasons for a low level of utilisation of IT. There is a need for improved means of measurement, particularly for office and non-operational level systems. Since decisions are based on the capability of IT to meet business and financial requirements, the lack of ability to measure the success of systems in particular may result in a negative impact on the utilisation of IT. If CEOs cannot gain conclusive evidence of the benefit of IT, why should they expend time, energy and money on investments in IT?

Since financial returns are an important decision-making factor, the higher costs of IT systems in Hong Kong and in the region are of concern as a potential disincentive to apply IT-based solutions to business problems. A survey of 123 papers presented at international conferences and published in journals found the major perceived disadvantage of IT in developing countries was its high cost. (Saraswat and Gorgone 1991). Articles noting price differentials for IT between USA and Hong Kong are frequently published. (Riley 1993, Wilson 1993, Wong 1993). The importance of price as a factor in the level of IT utilisation is not, however, completely clear and more research is required.

The West, with its high relative wage rates, has substantial incentive to pursue labour replacement through IT. Even though Hong Kong has higher wage rates

relative to other manufacturing countries in the region, the labour costs in Hong Kong are still several times lower than, for example, in the USA. Consequently, there is less incentive to adopt IT solutions to productivity problems.

The strategy adopted by smaller indigenous banks of banding together cooperatively to offer expensive IT based banking products, such as joint product development and ATM access, is significant. This joint venture has proven to be a most appropriate and cost effective means of maintaining the capability to compete with giant international competitors, as it enables the achievement of economies which would be otherwise denied. Competition between the indigenous banks is provided through final tailoring and product presentation. The implications of this co-operative advantage are clear for other industries, particularly in developing countries, which are faced with similar levels of competition.

Implications specific to the development of SISP models follow.

6.2 Models and frameworks

The implication of the adaptation of SISP models for use in developing countries is that indigenous firms may have assistance in their strategic decision-making. An expected consequence of this additional assistance, which requires verification, is that improved decision-making may lead to improved use of IT, hence to higher levels of utilisation of IT.

This research anticipated sufficient differences between organisations in developing, compared with developed, countries that structural modifications would be necessary to support the application of Western models in developing countries. During the course of the research, it has become clear some Western

models of SISP may be directly applicable to organisations in the East. It must be clearly stated, however, that this does not imply that all Western models will be directly applicable.

IS Research in Western countries has identified significant differences between the operations and practices of large compared with small / medium organisations. For many years, research was conducted on Fortune 500 sized companies with the expectation that their operations and practices would be universally applicable. It comes as little surprise that subsequent research into smaller and medium size companies shows substantial differences in many of the indicators included in the SISP models. Small business cannot be considered to be scale models of bigger business as small businesses have their own challenges and requirements. Firms in developing countries have been seen to be more aligned with smaller Western companies in size, structure and experiences. The implication is that mainstream IS research focusing on smaller organisations may be more directly applicable to developing countries. If this can be shown then a rich source of management assistance could be available to help indigenous enterprises. Further work is necessary to explore the potential of this link.

Implications of the proposed revisions to the 7S SOG and Sectoral models are that general management of firms located in developing countries may receive specific assistance in their efforts to use IT effectively. This assistance may be at the level of general approaches to the management of IT, with a range of approaches outlined which depend on the location of their firm in a strategic grid. This assistance may be also at the level of specific and detailed systems and IT practices so that firms can determine their current situation and identify paths of development in their use of IT.

The objective of these proposed models is to move towards increasing the effectiveness in the use of IT in meeting the requirements of indigenous organisations which may have implications for increasing the levels of utilisation of IT in developing countries. While the proposals represent only initial attempts in this direction, the objective is of sufficient importance to warrant persistence with these efforts.

6.3 Unanswered Research Questions

The research questions posed at the beginning of this work were all able to be answered, but some answers were more conclusive than others. Research findings on decisions not to use IT are based on organisations which are experienced users of IT but which have in specific instances decided not to use IT. While this has been found to be satisfactory for the purpose of this research, some uncertainty remains as to the importance of experience with IT in this decision-making. This uncertainty requires further research for resolution.

Additional questions which were unable to be finalised in this research arose from the propositions. For proposition 5.3, further work is also required to investigate the gross differences between UK and HK employee profiles reported in two studies. Proposition 5.4 - organisations with more knowledge workers and information workers versus material workers tend to use computers - was unable to be confirmed or disconfirmed as all of the research sites selected were users of IT. Proposition 5.5 - the adoption of computers has no relationship to overall profitability, regardless of industry sector - was unable to be confirmed or disconfirmed due to the lack of available information on corporate profitability. These propositions were intended to identify similarities and differences in the characteristics of Hong Kong and Western firms as an aid to determining

strategies to increase the level of utilisation of IT. This goal remains applicable and further work in this area is appropriate.

6.4 Agenda for Future Research

This agenda is by no means complete, but is suggestive of interesting and worthwhile areas for research in the field of strategic information systems. Apart from addressing inconclusive findings on some research questions, confirmatory research should be undertaken to examine the findings from this research in other contexts in order to determine the generalisability of the outcomes. Major areas of interest will be the applicability of the proposed framework of good practice (comprising strategic decision-making models of factors and processes as well as models of placement and progression) in other industries and countries and the viability of linking small business in the West with indigenous firms in developing countries as a means of accessing developed theory and practice to further assist indigenous firms. Application of this framework in countries other than Hong Kong is most important due to the substantial differences between developing countries as a whole, as well as the unique attributes of Hong Kong.

As mentioned in section 2.1, the issue of the significance of culture (both ethnic and organisational) on the level of utilisation of IS/IT in developing countries is contentious. While there have been frequent claims regarding the negative influence of culture it is often unclear from the details accompanying the claims if they are based on empirical research as opposed to personal belief or if "culture" is being used as a convenient excuse for failures which do not require further analysis or corrective action. Resolution of this issue is thought to be important for the utilisation of IS/IT in developing countries and warrants urgent investigation. Other findings which could benefit from further

investigation are the structural reasons proposed for lower levels of utilisation of IT, particularly the influence of higher prices for products and services.

A logical development of this work on SISP decision-making and strategic management of IS/IT would be to further examine the area of evaluation and measurement, particularly relating to office, tactical and strategic systems, with the intention of providing additional assistance to corporate management in their strategic decision-making. As noted above, where strategic decision-makers are unable to determine the return on an IT investment or are unable to properly evaluate the benefits of a proposed system there is reduced incentive to utilise IS/IT. This area of research would be consistent with the efforts in this work to address the current levels of utilisation of IT in developing countries.

Based on this work it is strongly suggested that Yin's (1989) framework be adopted for case study research. Without wishing to imply any limitation in the use of research methodologies, it is hoped that the documentation of the application of Yin's framework in this research will be of assistance to IS researchers in developing countries.

6.5 Summary

This research is based on concerns over the internationally significant issue of increasing the level of utilisation of IT in developing countries since IT has been seen as a means of accelerating the economic and social development in these countries. The rate of IT utilisation has been seen to be low with uncertainty as to why. This uncertainty has been compounded by a lack of knowledge of the rationality of strategic IS/IT decision-making by indigenous enterprises.

It is the author's belief that this research has succeeded in its objectives to assist the effective use of IS/IT by indigenous organisations by:

- identification of the factors and processes utilised in SISP decision-making by indigenous organisations,
- proposal of a model of good practice for indigenous firms,
- proposal of a framework of assistance for the strategic management of IS/IT which incorporates decision-making practices, management policies and directions based on stages of development of a firm's use of IT and on sectoral placement. This includes emphasis on the use of IT for competitive and co-operative advantage.
- the further development of links between Western models of SISP and their application in developing countries which may lead to additional models of assistance.

The objective in proposing this framework is to move towards increasing effectiveness in the use of IT in meeting the requirements of indigenous organisations, with the expectation of positive implications for increasing the levels of utilisation of IT in developing countries. While this framework has been developed primarily in a Hong Kong context it is intended to be applied by organisations experiencing similar problems in the management of IS/IT in other developing countries.

In addition an agenda for future research, based on inconclusive responses to some research questions and on suggestions for associated research, has been proposed and a rigorous approach to case study research prepared by Yin (1989) has been shown to be applicable for research in the context of developing countries.

Appendices

Appendix 1

Company profiles of interview sites

Name of company	Hong Kong Worsted Mills, Ltd
Current primary purpose	Spinning woollen and worsted yarns
Major markets	HK (suppliers to wool and acrylic knitting companies)
Ownership	public (part of larger private group)
Size of company	(Confirmed FHKI details)
number of employees	240
\$ revenue pa	\$HK 140 million

Name of company	Manhattan Garments (International) Ltd
Current primary purpose	garment manufacturing (mainly trousers)
Major markets	USA, UK, Canada
Ownership	private (part of larger private group)
Size of company	(Confirmed FHKI published figures)
number of employees	700
\$ revenue pa	\$HK 400 million

Name of company	Peninsula Knitters Ltd
Current primary purpose	Knitwear manufacturing (sweaters / cardigans in wool, blends, cashmere, silk and cotton)
Major markets	North America and EEC
Ownership	private (part of larger private group)
Size of company	
number of employees	300 (approx. 1500 including overseas)
\$ revenue pa	HK (only) >\$HK 300 million

Name of company	Sun Hing Knitting Factory Ltd
Current primary purpose	Knitting factory ie woollen sweaters
Major markets	EEC, USA, Japan
Ownership	private
Size of company	(FHKI published figures)
number of staff,	360 plus overseas subsidiaries
\$ revenue pa	\$HK 100 million

Name of company	Wing Tai Garment Industry Holdings Ltd.
Current primary purpose	garment manufacturing (jeans, trousers, jackets, shorts, dresses, overalls).

Major markets UK and EEC, USA, Japan
Ownership private (part of one of Asia's major trading groups)
Size of company
number of staff, 650
\$ revenue pa \$HK 51 million
(FHKI published figures satisfactory. - Unchanged for several years)

Name Bank of East Asia, Limited
Current primary purpose banking
Ownership publicly listed
Size of company
number of employees Total >2,500
\$ total assets \$US 7,850 million (\$HK 61,232 million)
(1992 Annual Report)

Name BankX
Current primary purpose banking
Ownership private
Size of company
number of staff, Total > 850
\$ total assets too revealing

Name Liu Chong Hing Bank Limited
Current primary purpose banking
Ownership private
Size of company
number of staff, Total > 850
\$ total assets \$US 1,662 million (\$HK 12,962 million)
(1992 Annual Report)

Name Wing Lung Bank Ltd
Current primary purpose banking
Ownership publicly listed
Size of company
number of staff, Total > 1200
\$ total assets \$US 3,000 million (\$HK 23,492 million)
(1992 Annual Report)

Appendix 2

Value chain for Hong Kong manufactured items of clothing

(Derived from Kurt Salmon Associates p 101.)

Note that the range of costs is dependent on quality, volume and market.

Item	% of retail price
Fabric / yarn	12 - 18
Other materials	1.4 - 1.9
Making cost	6 - 9
Support costs, e.g.,	0.2 - 1.3
- design	
- fabric sourcing	
- production control	
- customer liaison etc	
Other (incl profit and quotas)	1.6 - 4.2
	<hr/>
FOB price [i.e., delivered to dock in HK]	22 - 32
HK sourcing, shipping and wholesaler's markup	8 - 24
Retail markup	50 - 60
	<hr/>
Retail price	100

Appendix 3.

Research instruments

The major areas in the research instruments were shown in Table 3.2. Complete details of research instruments follow. Note that these are not questionnaires and should be considered in conjunction with the Phases in Data Collection subsection in section 3.3 Research Design.

Round 1 interviews

- **Background details on company**

Name of company

When business founded

Where business founded

For what primary purpose business originally founded

Current primary purpose

Area of primary business ie sector

Major market

if overseas then where, now

& in next five years.

Ownership public or private or other

Relationship between CEO and Founder

Size of company (show FHKI entry seek confirmation)

number of staff, HK Other

Total

\$ revenue pa

Type of staff

managers

information workers

materials workers (incl factory supervisors)

Rate of annual growth over past 5 years

=CPI, less 5%, 5 - 10% more, more than 10% more

Organisation chart showing major strategic business units, and reporting structure for IT unit.

Would you consider this company large, medium or small in the market compared with other HK companies?

- **Use of IT - Place company within sector and stages of growth model.**

Experience with technology

Would you consider this company advanced, medium or small user of IT

Would you consider your closest major competitors adv, med or small users of IT

Current levels of use of IT,

what is installed,

user depts?

Round 2 interviews

Responses from Round 1 which had already been reviewed and approved in the feedback cycle were presented as a basis for determining change in the company.

General questions for research interview into experiences of prominent local companies with computing & I.T.. Please note this is not a questionnaire. The purpose in providing these questions is to enable preparation by the companies, to improve the accuracy of responses.

- **Any changes to background details on company**

Name of company

Current primary purpose

Sector of primary business

Major market

if overseas then where, now & in next five years.

Ownership

CEO

Size of company

number of staff,	HK	Other	Total
------------------	----	-------	-------

\$ revenue pa			
---------------	--	--	--

Type of staff

managers & information workers

materials workers (incl factory supervisors)

Current rate of annual growth

- **Changes in technology since last interview**

Have any IT systems been installed since last interview:

application systems (all operational?)

tactical(MIS) -

strategic(DSS) -

What departments use new systems

Why were the new systems purchased

How much did it/they cost

- **Choices of Technology**

Factors previously reported as being applied to investment decisions in computing. Add any new factors. Identify factors as major or minor.

Rank major factors in order of importance (Number 1 is most, least is number -).

What technology factors are considered important in decisions on technology.

Are there any other major factors you would recommend a less experienced company should consider in its decision making? Rank in order of importance.

Processes previously reported as being applied to investment decisions in computing. Add any new processes. Identify processes as major or minor. Rank major processes in order of importance (Number 1 is most, least is number -).

External consultancy involved in either requirements specification or hardware / software selection? Yes/No/Why?

Are there any other major processes you would recommend a less experienced company should consider in its decision making? Rank in order of importance.

What is the major purpose of the decision making factors and processes?

- **Investing in computing & I.T.**

Current level of expenditure on computing and IT. (These values will be used for general comparisons and will not be identified with a particular company)

Estimate of current level of investment in IT as a % of revenue.

[Include hardware (eg production & office systems, printers, plotters, PCs, terminals, & communications equipment), software (eg packages, specially developed software), and special computer facilities (eg computer room, UPS,)]

Estimate of the current level of recurrent costs on computer and IT systems as a % of revenue.

[Include specialist staff (IT manager, programmers, operators, consultants etc), hardware and software maintenance, data communication charges (but do not include items such as transaction charges for ATMs), and consumables including power, airconditioning, paper, magnetic media etc]

Has this level changed substantially in the past year?
In your opinion will the current % level increase or decrease over the next 5 years?

Could you estimate the level in 5 years time?

- **Declining to invest in computing & I.T.**

Have you ever considered a particular investment in computing and IT systems and subsequently decided not to proceed? Give details of situation(s), (dates).

Were the factors and processes identified above used in the decision making process?

Please list the reasons for deciding not to proceed?

Have you subsequently reviewed the decision? When? What was the outcome?

- **Evaluation of investments**

In your opinion, have the current computer and IT systems been successful?

On what basis do you determine success?

[eg general cost effectiveness, calculated cost effectiveness, user satisfaction, management satisfaction, other (please identify)]

On what basis would you advise less experienced companies to judge success in computer and IT systems?

- **IT Department and Strategies**

Impact of changes on IT Department and its strategies

Documentation available?

Any changes to previously reported business environment?

- **Outstanding questions arising from previous responses**

[as required]

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