A PRACTICAL MODEL FOR CONSTRUCTION PARTNERING

by

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ABSTRACT

This thesis aims at developing a practical model for construction partnering. Systematised research activities are organised to develop and examine a conceptual model of partnering by means of surveying methods; to transform the conceptual model to a practical model for partnering espousal using a modelling technique; and to evaluate the practical model by employing comparative case study. As a result, the study provides a raft of contributions, both theoretical and practical. Firstly, it clarifies the definitions for strategic and project partnering. Secondly, a three-stage (Formation, Application, and Completion and Reactivation) conceptual model of partnering is proposed, while the posited critical success factors and performance criteria for the three-stage partnering process are tested. The results indicate that there are similar as well as different process characteristics between project and strategic partnering. More specifically, project and strategic partnering have a similar process and are affected by a common set of success factors, except for the Reactivation stage where there are specific factors affect the intention of involved parties to form further co-operation. Based on all findings, a practical model that integrates the key processes and associated components is developed by means of the Procedural Mapping Model (PMM). The Practical Model of Partnering (PMP) is composed of three major establishments including Interactive Process Description (IPD), Supporting Mechanisms (SMs) and Goals' Assessment Matrices (GAM). The IPD consists of six interactive processes, which are Representative Selection Process, Team Building Process, Partnering Agreement Process, Goals' Attainment Process, Joint Problem Solving Process, and Reactivation Decision Process. Also four common and four functional SMs are suggested to form. The four common SMs is used to sustain a high positive level of open communication, effective co-ordination, mutual trust and top management support for the whole partnering process. On the other hand, the four functional SMs (long-term commitment, continuous improvement, partnering experience and learning climate) are designed particularly for long-term co-operation (i.e. strategic partnering). GAM is used to audit the level of attainment of the partnering

goals. The PMP has been evaluated by using two case study methods of real-life examples in Hong Kong. The results indicate that the materials of the PMP are appropriate to be adopted in Hong Kong. Although the scope of this thesis is not planned to ascertain the utility of the PMP in the contexts of other countries, this study has taken the first step to test its effectiveness. Finally, the thesis provides suggestions for future research and proposes new perspectives for construction partnering.

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

The problems associated with the construction industry have been well documented in various government initiated reports which have criticised the industry for its relatively low performance and productivity as compared to other industries (e.g. Latham, 1994). This has been exacerbated by its highly fragmented and adversarial nature. Co-ordinating and integrating parties involved in projects have become an arduous task because of the diverse cultural and behavioural characteristics that parties possess. According to Brown and Beaton (1990), failures encountered with the procurement process can contribute to 30 per cent of a project's cost being wasted due to problems of integration. With this in mind, there is a need for alternative management practices and tools that can be used to co-ordinate, integrate and stimulate integration between parties in order to improve their productivity as well as project performance (Tatum, 1990). Partnering has been advocated as mechanism for developing relationships to improve inter-organisational relations (Helland, 1995). Since the emergence of it in the construction industry in the late 1980s, partnering has become a primary management strategy for improving organisational relations and project performance.

1.2 PROBLEM STATEMENT

1.2.1 The Nature of Construction

The construction industry in most developed countries has suffered dramatically from two major changes in its business environment. Firstly, in the early 1970s when there were high inflation rates and oil embargoes (Cook and Hancher, 1990). Secondly, entering into the 1990s, the industry faced

many new prominent changes (Thompson and Sanders, 1998). In summary, these changes are:

- increased competition;
- higher standards for competitive success;
- dwindling resources;
- the existence of a global market/economy;
- enhanced legal concerns;
- accelerated emergence of new technology;
- the need for more flexibility and faster response time;
- regular internal operations assessment; and
- the increased risk in construction contracting.

In addition to the above changes that have initiated a crisis in construction, the nature of the construction industry puts extra burden toward the running of the business. The market and organisational structure of the construction industry is highly fragmented and divisive. Using Hong Kong as an example, the market is occupied by a large number of local and overseas contractors; and many construction companies are held by conglomerates where construction is one element of their diversified businesses (Rowlinson and Walker, 1995). The industry is also occupied by a large number of medium- and small-sized firms, which makes it a highly competitive environment. According to Rice and Reddin (1994), there are several reasons accounting for the fragmented nature of the construction industry. Some major reasons are as follows:

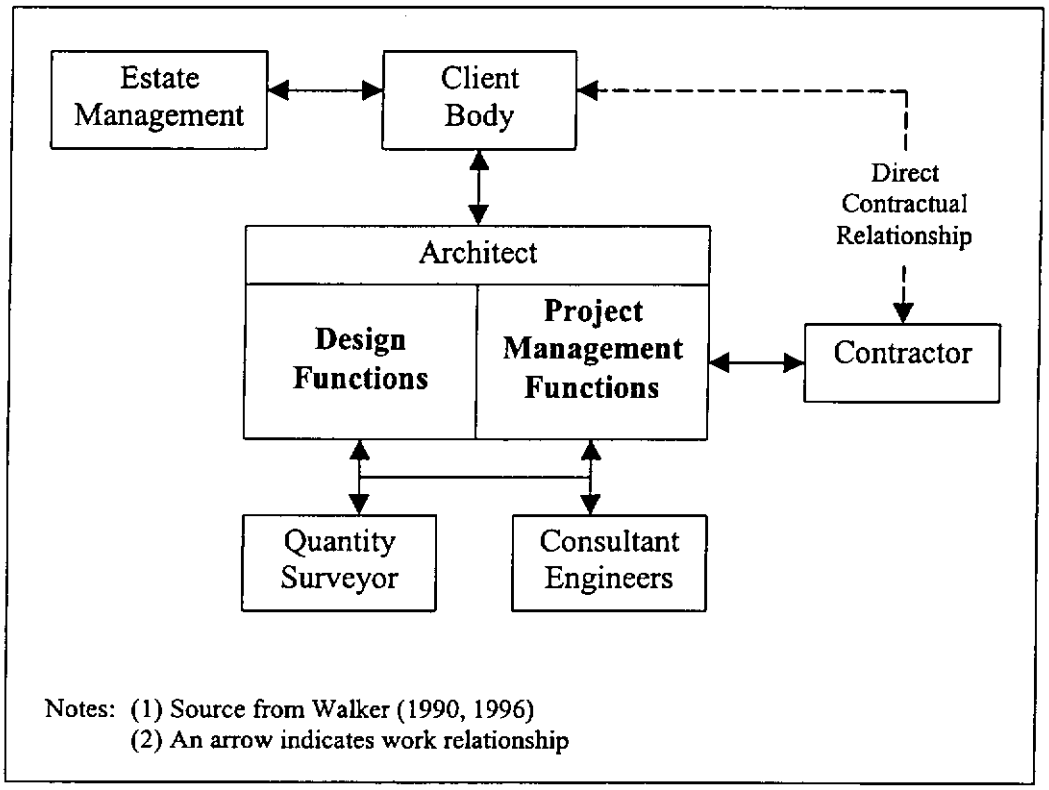
- The construction industry is free to entry. There is no restriction to start a business. Establishing a construction-related business does not incur a large amount of capital investment.
- Owner of a construction business does not necessitate a professional status. The owner can employ professional people to run the business.
- Starting a construction business does not require a high technology infrastructure, hence reducing the difficulties to commence the business.

- Although high transportation costs of moving materials, labour and equipment limit the contractor's geographical area of operation, many firms are able to bypass the transportation costs by means of subcontracting to other parties, increasing the number of parties involving in a construction project.
- A single project may involve various products with a complex assembly of multiple components requiring diverse specialities.
- The construction industry has a trend of erratic sales fluctuation. When the market stagnates due to recession, the small firms with small overheads are much more flexible to adapt in order to survive. In other words, the construction industry tends to be fragmented.

Many years ago, the Emmerson Report (1962; c.f. Walker, 1990) had already stated that the construction industry has been separate from other manufacturing areas due to the split of responsibility for design and production. After decades, this structure has not yet changed, which creates many problems. In general, construction projects are organised by different parties who link hierarchically together by contracts with highly restricted terms and conditions (Barlow and Jashapara, 1998). These parties include clients/owners (private or public), architects, engineers (e.g., structural, mechanical, etc.), project manager, general contractors, subcontractors, suppliers, etc. For example, a client can be an individual or organisation commissioning and paying for the design and construction of a project or facility (BPF, 1983). The client can be the user of the facility, or they (i.e. client and user) can be separate entities (Zeisel, 1981). The architects and structural engineers are responsible for the outline design and structural analysis of the facility respectively (Kamara et al., 2000). A general contractor is responsible for the construction work, whilst a project manager co-ordinates different parties and monitors the execution of a project (CIC, 1996). Other major parties, such as quantity surveyors, building engineers, and special contractors, have their own responsibilities. All of them possess differentiated skills and knowledge although they belong to the same industry. Because of

the diversity of these parties, they tend to have their own goals and objectives, which can be conflicting and may induce adversarial relations.

Using the construction industry in Hong Kong as an example, Walker (1990, 1996) supported that such a split of professional contribution has been running in Hong Kong. The conventional project structure (as shown in Figure 1.1) arranges that the architect is responsible for design; other consultants act for the architect for project management; and the client is responsible for estate management. Normally, the contractor is appointed after the design is complete, usually by open tender, although appointment can be made by negotiated tender or some other means (Rowlinson and Walker, 1995). In many cases, the parties are independent to each other. Walker (1990, p.9) stressed that "the more complex the client organisation and/or the project, the more interdependent will be the tasks to be carried out in achieving the project and the more the contributors will rely upon each other to carry out their work satisfactorily".



Notes: (1) Source from Walker (1990, 1996)
(2) An arrow indicates work relationship

Figure 1.1: The Conventional Project Structure in Hong Kong

This kind of highly differentiated construction structure is common around the world. The diversified construction professions' structure calls for a high level of integration (Walker, 1989). Howard (1989) in his study found that owing to moving into more integrated design and construction, Japan and European contractors can be less fragmented than their U.S. counterparts. So, a more integrated and consolidated fashion should be approached.

1.2.2 The Problems of Construction Projects

Construction projects rely on the integrated efforts of several hierarchically linked parties by using their differentiated skills, knowledge, and technology. These parties are usually independent organisations with separate sets of objectives and goals, management styles, and operating procedures. Due to the fragmented nature of the construction, problems such as communication and co-ordination are encountered frequently which can affect the performance and productivity of projects. The loose-knit coalition of the parties further forms the basis of conflict on most projects (Newcombe, 2000). By all means, construction projects are inherent around a cluster of issues. Together with other project problems (see Table 1.1), construction work is difficult to plan, organise, lead and monitor, and may carry a guarantee of failure. These problems – warts and all – need to be solved.

Table 1.1: Some Major Project Problems

Thompson and Sanders (1998)	Redundant efforts
	Disappointing termination of relationships
	Too much supervisory activities
Crowley and Karim (1995)	Detrimental outcomes, such as litigation, lost time, wasted money, and poor morale
Wilson *et al.* (1995)	An inherent lack of communication and co-operation among contractual parties results in cost and schedule overruns, and ultimately litigation

The construction industry, which is plagued with problems associated with the fragmentation of the construction process, needs to improve in efficiency (Atkin and Pothecary, 1994; Latham, 1994; DOE, 1995; Egan, 1998; Kamara et al., 2000). Additionally, in order to solve the existing co-operation problems in construction, which are surrounded by an increasingly complex environment, alternative strategies need to be explored for establishing core competencies, creating communication channels and maintaining high construction quality. It has been recognised that fragmentation is influenced by economic factors, such as absence of economies of scale or experience curve (e.g. Porter, 1980). They have attempted to conceptualise different forms of contractual integration (Puddicombe, 1997) to stabilise the relationships between construction parties, such as the use of long-term procurement contracts (Williamson, 1979) and the formation of the quasi-firm inside the contracting system (Eccles, 1981). However, these contractual approaches to integration do not recognise the social psychological approach that is needed for effective integration (Puddicombe, 1997).

New managerial strategies such as total quality management (TQM), business process re-engineering (BPR) and partnering have been and are being developed to perform the process in an integrated manner. While TQM and BPR require substantial investment in terms of time and cost, partnering can provide quick results with minimal start-up costs (Wilson *et al.*, 1995).

1.2.3 Partnering as an Alliance

According to some business strategists (e.g. Lei, 1993; Shash, 1998), an alliance is one way to cope with the complex and competitive environment where a large number of labour specialities operate. Shirazi et al. (1996) reiterated this viewpoint and further recognised the importance of interaction between construction project partners for sustaining a faster responsiveness to the dynamic environment, leading to the effectiveness of the construction process. As such, they suggested that members of an alliance must put forth their collaborative efforts to:

1. Establish informal channels for communication.
2. Adopt a flexible co-ordination mechanism, which is associated with different co-ordinated devices.
3. Bring about vertical as well as horizontal decentralisation.
4. Minimise the formal lines of command.

An alliance can take many forms, e.g. a joint venture or partnering. A joint venture is the contractual establishment of an independent company (formed by at least two parties). With the presence of a legitimate link between joint venture parties, fewer obstacles to the flow of information are expected (Aly, 1995). Given the discrete nature of the construction business, joint venture might not be appropriate. As Hsieh (1998) mentions, in Taiwan, although more than 80 per cent of general contractors admitted that they require a long-term relationship with specific sub-contractors and material vendors, they prefer informal relationship (financially independent) rather than any form of joint ownership.

The formation of alliances between organisations has become a contemporary management strategy that can be used to improve business performance (Lei, 1993; Shash, 1998). According to Krippaehne et al. (1992), the effective management of an alliance can be used to obtain and sustain a competitive advantage in the marketplace. There are however numerous terms in the management that are used to describe an alliance, for example:

- partnering (Harback et al., 1994);
- integration (Andersin et al., 1993);
- partnership (Mohr and Spekman, 1994);
- network (Cravens et al., 1996);
- strategic alliance (Parkhe, 1993);
- strategic partnership (Ellison and Miller, 1995);
- vertical integration (Krippaehne et al., 1992); and
- co-operative partnership (Willcocks and Choi, 1995).

Bearing in mind the various terms for an alliance that can be found in the literature, research that focuses on its effectiveness for improving inter-organisational relations has become ubiquitous. Among these terms, "partnering" is frequently used in the construction industry. In Australia, partnering studies have increased exponentially since the publication of the New South Wales Commission's inquiry into the productivity of the building industry (NSWG, 1992).

For the past two decades, partnering has been increasingly applied in the North American construction industry (Larson, 1994). It has been widely adopted in other places (e.g. Hsieh, 1998). In addition to enhanced project performance (in terms of quality, cost and schedule), its utility has been expanded to safety improvement (Matthews and Rowlinson, 1999). Its value has been well recognised. For example, Rowlinson and McDermott (1999) conceived partnering as one of the best practices for procurement systems in construction and invited Jason Matthews (1999), an active partnering researcher, to write a chapter on partnering for their recently published book on procurement systems. Some might replace it with other terms such as "strategic alliance" (e.g. Barlow and Jashapara, 1998) or "vertical integration" (e.g. Krippaehne *et al.*, 1992).

Partnering in construction is different from typical partnership as the former promotes advantages such as risk sharing and joint problem solving (Cowan *et al.*, 1992). Essentially, partnering is the establishment of an informal group among construction partners and creates legitimate-like relationship but partners are financially independent. It is basically used to resolve disruptive inter-organisational conflicts (Crowley and Karim, 1995). In the eyes of Brown (1983), conflicts are generated at the organisational interface. Unlike most resolution tactics that focus on the healing of individual conflicting parties, the formation of a partnering alliance can influence the organisational interface between parties to be more adaptable to the surrounding environment.

Partnering involves forming a permeable membrane at the interface to restrictively open the boundaries between conflicting parties and maintain sufficient internal regulation to prevent the escalation of problems, while not suppressing critical discrepancies. In other words, parties can tighten or loosen the interface constraints according to their own discretion.

1.2.4 The Benefits of Partnering

Partnering can be a corrective as well as preventive process. It helps organisations resolve issues in a corrective manner. It will also prevent disputes and adversarial relationships by establishing mutual trust and sharing of risks. According to Badger and Mulligan (1995), there are some possible reasons and potential benefits for the construction projects as depicted in Table 1.2.

Table 1.2: Possible Reasons for and Potential Benefits from Forming Alliances

Reasons for forming alliances	Access technology
	Share risks
	Secure financing
	Enter new markets
	Serve core customers
	Improve competitive position
Benefits gained from alliances	Enhance competitive position
	Increase market share
	Obtain new work
	Broaden client base
	Increase cultural responsiveness
	Reduce risk
	Increase profits
	Increase labour productivity

Source from Badger and Mulligan (1995)

The essence of running a construction business in the 1990s is to establish one's own core competencies and provide quality services to customers, leading to customer satisfaction (Ellison and Miller, 1995). Looking ahead to the 21st century, organisations should be aware that customer satisfaction might continue to be a major indicator of business success. Thus, the

development of a partnering strategy is needed to strengthen an organisation's competitive advantage in order to achieve their business targets (see Figure 1.2).

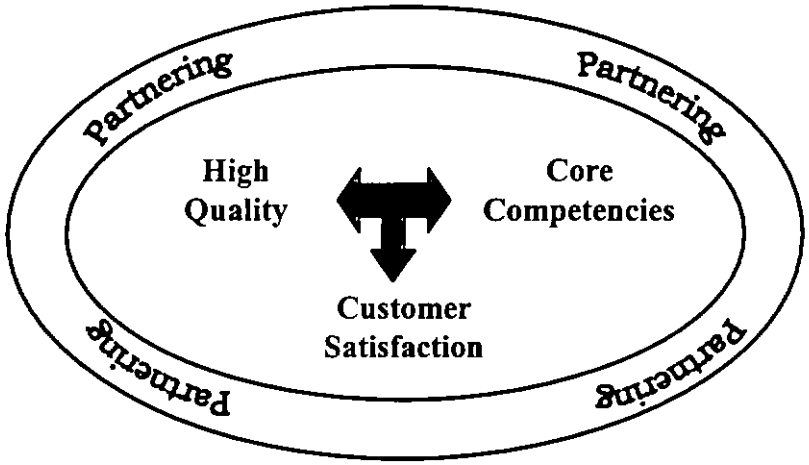


Figure 1.2: Partnering as a Cohesive Boundary

1.2.5 Partnering in Construction

Hierarchically linked parties who possess differentiated skills and knowledge typically organise a construction project. As a result, complex relationships exist within project teams and if not managed effectively can adversely affect a project's performance (Walker, 1994). According to Crowley and Karim (1995), partnering can be conceptually viewed as an organisation that is formed by implementing a co-operative strategy that modifies and supplements the traditional boundaries between separate companies in a competitive market. In fact, those who encourage the formation of partnering invariably look for some benefits, such as long-term commitment, mutual trust and cost effectiveness. Fundamentally, there are three situations that can be used to induce partnering in construction:

- **Bidding New Contracts**. Prior to bidding for a project, construction organisations could use partnering to strengthen their capabilities by providing complementary skills. Partnering is often misunderstood to be

only related to contractual requirements and not as a strategy for pre-contractual (or bidding) co-operation. The functioning of partnering would stop after the contract is awarded to the involved organisations. They undertake the project based on the roles and responsibilities stated in the terms and conditions of the contract.

- **Executing Contracts**. Partnering is commonly used for a single, short contract term project (or so called one-off project). After the completion of the project, the partnering team will be dismissed. Partnering at this situation helps to monitor the execution of the project conforming to some pre-approved goals and objectives. Some of these goals and objectives are equivalent to those of the project while others are newly created and will contribute to the project performance.
- **Organisational Growth**. It is often argued that project-specific partnering is ineffective because trust and commitment could not be developed during short contract term (Love et al., 1998; Loraine, 1994; Munns, 1996). It is suggested that partnering can be implemented on an on-going basis so that trust and commitment can be developed and used to create a learning environment. Noteworthy organisations that form long-term relationship should have some experience and knowledge of each other's operations and strategic direction so that they can co-operate together in an effective manner. The partnering can be used for exchanging resources in terms of knowledge, skills, experience, visions, ideas, information, etc. Only by equal sharing of these internal resources, organisations will be able to improve their competitiveness in the marketplace.

In essence, partnering can extend beyond a single project-based relationship to long-term co-operation. Such partnering involves the top management of individual organisations to discuss compatible and conflicting goals and objectives at the strategic level. Its function to assist in achieving competitive advantage cannot be overlooked. Therefore, it is worth identifying the key characteristics of both project and strategic partnering, which forms the main objective of this thesis.

1.3 OBJECTIVES OF THE THESIS

Partnering is a management concept to improve the relationships between construction parties. Other benefits include improved efficiency, increased value, lower legal costs, enhanced trust, continuous improvement, effective communication, etc (CIB, 1997). However, there are many factors exerting influence on partnering. Some of these factors are proposed to be critical to the success of partnering. They are called the critical success factors (CSFs). Partnering can be disruptive and painful if the involved parties pay little or no attention to these factors. In fact, the identification of the key success factors enables scarce resources of time, manpower and capital to be allocated properly and helps to determine the critical paths that form the prerequisite components of a partnering arrangement.

Partnering has been studied ubiquitously with such diversified foci as structure, model, process, types, etc (e.g. Krippaehne *et al.*, 1992; Crowley and Karim, 1995; Crane *et al.*, 1997; Thompson and Sanders, 1998). There are also publications of partnering by well-known institutions as follows:

- CII (1991) – Conducted a survey of partnering to identify the practices of partnering (In search of construction excellence).
- Cowan et al. (1992) – Developed a conceptual model of project partnering and distinguished partnering from partnership.
- CII Australia (1996) – Conducted a survey to identify the practices of partnering.
- CIB (1997) – Cases to identify the practices of partnering.
- RCF (1998) – Developed "the seven pillars of partnering" and focused mainly on strategic nature of partnering.

However, there are still interesting issues of partnering being worth of pursuit. They include:

- To develop a conceptual model of partnering
- To identify critical success factors of partnering
- To distinguish between project and strategic partnering
- To develop measures of partnering performance
- To conduct empirical tests for investigating the above key issues

For example, CIIA (1996) conducted a general study of partnering and the identification of critical success factors with associated performance indicators/criteria is their second most important recommendation. The first one is that partnering should be arranged in the early stages of the project delivery process. Improved communication and the hiring of independent and experienced partnering facilitator are at the third and fourth place respectively.

Factors and criteria are sometimes hard to be distinguished. Lim and Mohamed (1999) attempted to explain their relationship using their meanings in the Concise English Dictionary (Hayword and Sparkes, 1990). In the Dictionary, a factor means "any circumstance, fact, or influence which contribute to a result", whereas a criterion is described as "a principle or standard by which anything is or can be judged". A pictorial representation of their meanings and relationships has been provided in Figure 1.3 (Lim and Mohamed, 1999).

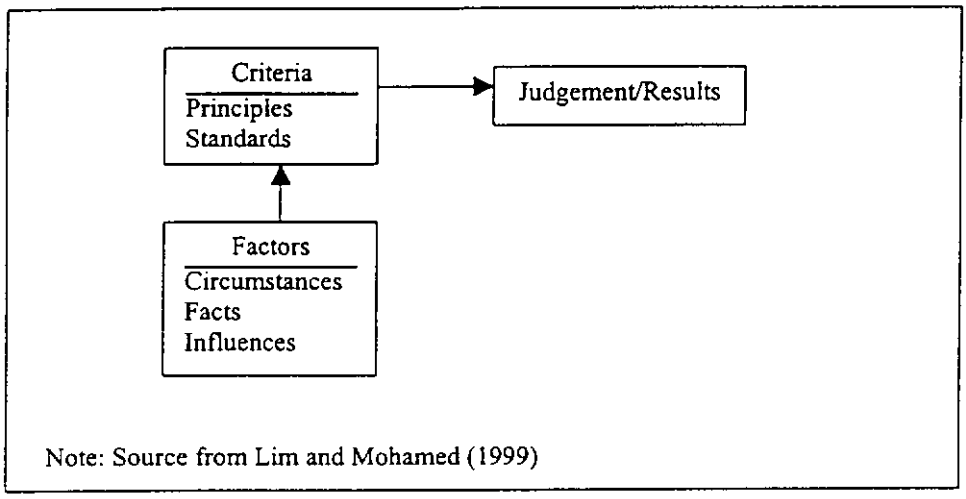


Figure 1.3: A Pictorial Representation of Criteria and Factors

There are studies having identified CSFs of partnering (e.g. Barlow et al., 1997; CII, 1991; Cowan et al., 1992; Brooke and Litwin, 1997; CIB, 1997). Although these studies have provided different combinations of factors that would affect a partnering process at different stages, there is a paucity of research that has empirically examined a partnering model of CSFs.

Development of a general model of CSFs has been attempted in other closely related areas, such as project management (Belassi and Tukel, 1996). It is certain that such a model helps to group the CSFs so that their effects at different phases of a project life cycle can be determined and clearly explained. Therefore, this study would like to develop and test a general model of CSFs that affect the process of construction partnering. Such a model has four main features:

- It identifies a group of key factors. It is known that there are too many variables in a partnering process. Some have a large effect while others' effects are small. That's why the use of the term "critical" to screen out the less important ones.
- It excludes those factors that are specific for individual partnering plans. In other words, the factors that the study examines are general in scope and can be applied to different partnering teams within the same type of partnering. In general, there are two types of partnering – *strategic* and *project-specific*.
- It focuses on the factors that are easier to be controlled or adjusted. Although some factors are crucial to partnering, the identification of them is said to be useless if they are outside the control of the parties. It is well accepted that construction parties have little control over the environmental factors (e.g. Newcombe, 2000). For example, factors related to political and economical environment could not be accessible by the construction parties. If the government or the economy does not encourage the formation of partnering, it is definitely difficult to change this situation. Moreover, although these environmental factors may be

crucial to partnering, the study of their effects requires large-scale nation-wide study (Rowlinson, 1988), which incurs a large amount of money, time and manpower that this thesis cannot afford to spend. These non- or hard-to-accessible/adjustable factors are therefore excluded from this thesis.

- Other than tangible factors, this thesis would study intangible factors such as behavioural factors. When the informal partnering arrangement intervenes the formal contracting configuration, behavioural factors become significance, which basically cover influences coming from people or groups of people (Newcombe, 2000). Therefore, this study focuses on human and organisational factors, both tangible and intangible. Such socio-technical dimensions have been used extensively in construction project research (Newcombe, 2000). Some early socio-technical studies can be traced back to the sixties by the Tavistock Institute (Higgins and Jessop, 1965, c.f. Newcombe, 2000).

The model presented in this study represents a general partnering process. It has several benefits. First, it provides a better tool for understanding CSFs of partnering. Second, this general model provides a good basis for further research. Third, a practical model can be designed based on this general model since the general model is anticipated to be applicable in the real context. Fourth, practitioners may find the model useful for partnering implementation by incorporating their specific concerns into this general model. Fifth, this study also introduces a methodology for practitioners to identify the aforementioned specific factors.

In summary, the main objectives of this thesis include:

1. *Development of a general conceptual model to highlight the relationships between essential factors and criteria and the partnering process.* These essential factors and criteria are viewed more consistently around the world since a local or domestic model was not proposed in this thesis.
2. *Test of the level of importance of these factors on project and strategic partnering in order to determine the critical success factors.* As this study

examines a broadly received conceptual model, it is planned to use responses from around the world.

3. *Development of a practical model of construction partnering.* This is the practical value of the conceptual model. A modelling technique is used to develop this practical model appropriate for implementing in construction projects.
4. *Evaluation of the usability of the practical model.* Cases of Hong Kong are used to ascertain the effectiveness of the practical model. Although the results are not sufficient to claim that the practical model can be applied across different nations, this takes the first step to evaluate the model.

1.4 METHODOLOGY OF THE THESIS

Research activities were performed to achieve the objectives stated above. These activities form the methodology of the thesis to conduct the study. Figure 1.4 illustrates a seven-step methodology by means of a flow chart diagram. Specifically, a review of the existing partnering literature (Step 1) was undertaken to develop a general conceptual model specifying the relationships between essential elements and the partnering process (Step 2). The conceptual model was tested by means of surveys using questionnaire (Step 3). A refined model (Step 4) was used to develop a practical model (Step 5) to highlight the important paths and components for a successful partnering. This practical model was then tested and evaluated by two case study methods (Step 6). The final stage presented the evaluation results (Step 7). They are described below:

- **Literature Review (Step 1)** – The existing partnering literature offers various degrees of value to the construction parties to facilitate the partnering practices. In order to address and claim for the scope of study and propose some hypotheses to be examined, a review of the partnering literature was conducted.

- **Development of a Conceptual Model (Step 2)** – A general conceptual model is designed which highlights the relationships between essential factors and criteria with a more consistent view around the world and the partnering process. The conceptual model specifies the relationships between three major components: a partnering process, critical success factors and criteria of partnering success. The model is developed to not only propose original concepts but also provide a scope of study for validation. To accomplish the latter, surveys using questionnaire are conducted.

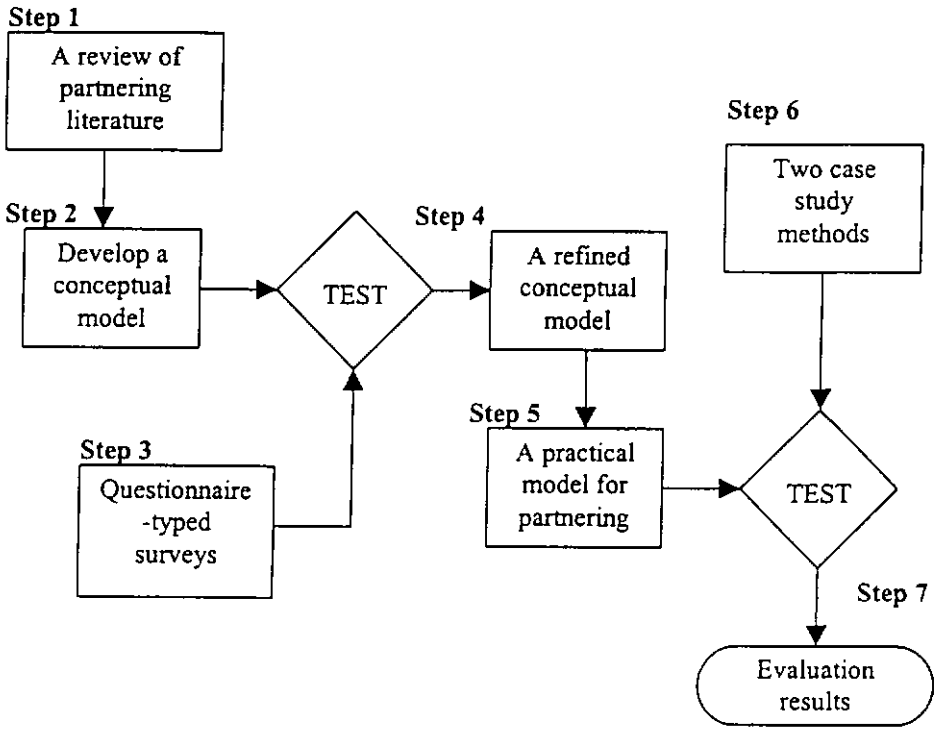


Figure 1.4: Methodology of the Thesis

- **Use of Surveys (Step 3)** – Using surveys to validate hypothesised models is common in empirical research. In order to test the conceptual model broadly, three surveys were conducted to collect data from around the world. The first survey was conducted by involving the design of a questionnaire to be posted in some web forums, which were subscribed by those professionals in the field of construction. Another questionnaire was

designed for the second survey and was also posted to the same forums. As it was difficult to locate a vast number of companies that have experience to induce a partnering relationship, a large sample survey was not possible. Instead, a more subjective method was used to test the model, which was the Analytic Hierarchy Process (AHP). Experts who could provide useful opinions were invited to answer a set of questions in the questionnaire.

- **Test and Refinement of the Conceptual Model (Step 4)** – Mean scores were calculated for the first survey to determine the level of importance of the factors on the process stages for project and strategic partnering. T-test was used to compare the two types of partnering. In the second survey, mean scores were also calculated to determine the importance level of the critical success factors for a partnering process. The third survey (AHP) was used to weight the importance level of critical success factors and criteria on the partnering process stages and prioritise the importance level of different process stages. The results of the three surveys were used to refine the conceptual model.

- **Development of a Practical Model (Step 5)** – After tests and refinement, the conceptual model was finalised. This refined or finalised model specified the significant relationships of the elements within the model. Suggestions and implications to establish favourable conditions for these elements and their relationships were crucial, which further helped to develop a practical model for organisations to benchmark and modify to fit into their individual partnering establishment.

- **Two Different Case Study Methods (Step 6)** – The practical model was then tested using two different case study methods. As Nelson (1996) suggested, any theory developed based on data collected from a survey can be tested in a case study. Firstly, a case that showed the use of the practical model by a group of companies was included to ascertain the effectiveness of the model. Secondly, comparative case study was adopted

to ascertain its usefulness in different real contexts. Two cases were used in this method. Comparing and contrasting cases can highlight similarities and differences, providing accumulative insights when testing a theory or model. McCaffer (2000) also acknowledged that comparative cases, both successful and unsuccessful, are very informative to test proposed systems, including partnering arrangements.

- **Test and Evaluation of the Practical Model (Step 7)** – The practical model was tested and evaluated through a comparative case study and a real life implementation of partnering. The former helps to address the real needs of the industry, while the latter shows its real value in application. More insights can be distilled to practically strengthen the partnering process and academically provide extra contribution to the partnering literature.

1.5 ORGANISATION OF THE THESIS

The thesis is organised as follows:

Chapter 2 provides definitions of partnering, presents the literature review of partnering and describes the hypotheses to be examined.

Chapter 3 describes the two main tests used in this thesis. They are the Analytic Hierarchy Process (AHP) and the case study.

Chapter 4 presents the three surveys that are used to develop and test the conceptual model.

Chapter 5 presents the process for the development of the practical model of partnering. The conceptual model acts as the foundation for this process, which involves the use of modelling technique to portray the essential components of partnering.

Chapter 6 presents the evaluation of the usability of the practical model using two case study approaches. The first one is a case that shows the implementation of the practical model for a group of construction parties. The second one is a comparative case study. Two extremely different cases – one successful and the other unsuccessful – would be used.

Chapter 7 presents the contributions of this thesis. Both research and practical implications are provided.

1.6 SUMMARY

This chapter represented the introduction of this thesis. Problem statement and the objectives of the thesis were described. The methodology and organisation of the thesis were also presented, which provided a clear picture of what were going to do in this thesis (i.e. the study of the thesis).

CHAPTER 2: DEFINITIONS, LITERATURE REVIEW AND RESEARCH HYPOTHESES

2.1 INTRODUCTION

This chapter aims at reviewing the partnering literature to develop a set of hypotheses that help to achieve the research objectives of this study. The examination of these hypotheses also aids to determine a conceptual framework of partnering. In addition, a background of the evolution of partnering and the definitions of project and strategic partnering are presented.

2.2 A BACKGROUND OF PARTNERING

The footprints of partnering can be traced from many different industries throughout the whole world. Prior to the emergence of such an informal relationship, formal partnership has been extensively used in the industries. Some experts herald Henry Ford and the Ford Motor Company as the first organisation to implement formal partnerships back in the 1920's (Stralkowski and Billon, 1988). When the Model T was first being produced, Ford Motor Company relied heavily on its suppliers to separately supply the engines, the axles, the bodies, the windows, etc. Ford's suppliers became its partners economically and industrially with their profits and growth closely linked to Ford's.

Du Pont is also a pioneer organisation in establishing formal, universally acknowledged partnerships with other organisations. In 1986, Du Pont established a formal partnership with Fluor Daniel. As a result of this establishment, Fluor Daniel has become responsible for approximately one-third of Du Pont's billion dollar contracts and has expanded its workforce to 300 employees solely servicing Du Pont production (Wilkinson, 1988; Rubin and Lawson, 1988). Du Pont has found that when their partners profit, Du

Pont profits as well. Over the years, Du Pont has established a raft of product development partnerships with numerous customers across all fields (CII, 1991). Du Pont motivates its partners by assisting in their innovations and assuring their stability when they take a risk. The formal partnership allows partners to gain access to Du Pont's resources. In return, Du Pont benefits by securing services and products quickly and by bringing their products to the market quickly to become the exclusive suppliers to its customers. After a specified period of time, Du Pont's partners are free to share their services and products with other corporations and reap further benefits of greater profitability and market share (Northouse, 1994).

However, unlike the private-sector, public-sector (the government agencies) works with the prime contractor and their subcontractors who successfully bid for the project (Cowan, 1991). For a fair environment, formal partnership in public work is restricted. On the other hand, formal partnership is easy to fall into a crisis that a dominant party takes control over other smaller parties due to conflict of interests. When these small parties feel that they are no longer individual entities, they are depressed and disenchanted. Failure is a likely consequence of this approach. The upshot is that it becomes a monster to slay and the relationships among parties will become worse (Edelman et al., 1991). The project may fail because the support for it fizzles out before it comes to fruition. Cowan et al. (1992) also agreed that partnership is associated with some drawbacks, such as limited relationship, adversarial problem solving, win-lose situation, risk transfer, conflicting objectives, etc.

When typical partnership is anticipated to be a disappointment, partnering is expected to outweigh it by promoting advantages such as risk sharing and joint problem solving (Cowan *et al.*, 1992). Essentially, partnering is the establishment of an informal group among partners and creates legitimate-like relationship but partners are financially independent.

The first major organisation to introduce the concept of partnering into the construction industry was the U.S. Army Corps of Engineers. In 1988, under the command of Col. Charles Cowan, the Corps utilised partnering principles

in construction projects to combat the deteriorating relationships between their own personnel and their contractor counterparts (Edelman et al., 1991). When he took up the post of the Director of the Arizona Department of Transportation in 1991, he started implementing partnering on heavy highway construction projects and promoted the advantages of partnering to other Departments of Transportation across the nation (Northouse, 1994).

Due to a state of transition of the construction industry that requires a large amount of capital investment and long-term budgets in operation, maintenance, modernisation and replacement costs, there is a widespread of the use of partnering within the industry. However, organisations impose some form of partnering without a uniform process. Northouse (1994) also argued that the partnering process is interpreted differently by various parties. For example, some are conducting a-week-long partnering workshops while others are conducting half-day workshops. The existing literature does not have a convergence view of partnering, and debates about its effectiveness and benefits are still undergoing.

2.3 DEFINITIONS OF PARTNERING

Because partnering is yet to mature, a myriad of definitions exist. According to Crowley and Karim (1995), partnering can be defined in one of the following three major ways:

(1) The anticipated outcomes or attributes of partnering such as compatible goals, mutual trust, long-term commitment, etc.
(2) The process that led to the outcomes where partnering is used as a verb to indicate an action such as committing to common goals, organising partnering workshops, developing trust, etc.
(3) The organisational interface that generates the new organisational structure.

It is likely that the nature of the relationship between project team members gives rise to different degrees of partnering (Barlow et al., 1997). Basically, partnering can be classified as "project partnering" and "strategic partnering" (Matthews et al., 2000). According to the Reading Construction Forum (1995) focusing on many examples from the USA and other industries, the benefits arising from project partnering with 2-10 per cent savings in cost, whilst from strategic partnering embracing all its components with up to 30 per cent. The following paragraphs will describe these two types of partnering according to their definitions and associated benefits.

2.3.1 Project Partnering

An early partnering definition is provided by Stralkowski and Billon (1988) who refer to it as a process in which two or more parties co-operate to an exceptionally high level to achieve their separate but complimentary goals and objectives. Cowan (1991) defined partnering as a co-operative approach to contract management for the purpose of reducing costs, litigation, and stress. Abudayyeh (1994), on the other hand, defined it as a commitment to recognise owner/contractor relationships as integral parts of the daily operations involved in construction. Dozzi et al. (1996) referred to it as a more systematic and businesslike approach to risk apportionment. However, these definitions do not explain how to achieve such a relationship. Crowley and Karim (1995, p.36) define partnering as:

> "(an) organisation (that) implements a co-operative strategy by modifying and supplementing the traditional boundaries that separate organisations in a competitive climate. In this way, partnering can be used to create a cohesive atmosphere for all project team members to openly interact and perform."

Translating this concept to a working definition of project partnering has been provided by Cowan et al. (1992, p.4), which is:

> "a method of transforming contractual relationships into a cohesive, co-operative project team with a single set of goals and established procedures for resolving disputes in a timely and effective manner".

In addition to the American definitions, the New South Wales Government of Australia also provides a definition of project partnering as:

> "a management process employed to overcome the traditional adversarial and litigious nature of the construction industry. Partnering uses structural procedures involving all project participants to: define mutual goals, improve communication and develop formal problem solving and dispute avoidance strategies" (NSW Public Works, 1995; c.f. CIIA, 1996, p.11)

2.3.2 Strategic Partnering

Beyond a single project, partnering can be formed in strategic terms. The National Economic Development Council (NEDC) defines a long-term partnering as:

> "a contractual arrangement between a client and a chosen contractor which is either open-ended or has a term of a given number of years rather than the duration of a specific project. During the life of the arrangement, the contractor may be responsible for a number of projects, large or small and continuing maintenance work and shutdowns. The arrangement has either formal or informal mechanisms to promote co-operation between the parties" (1991; c.f. Matthews *et al.*, 1996, p.119).

The Construction Industry Institute (CII) provides a definition of strategic partnering, which brings together the essential components to define such a

relationship as well as the arrangement requirements and potential benefits. The CII (1991) defined strategic partnering as:

> "a long-term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisational boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services".

A more recently developed definition of strategic partnering is provided in the book "The Seven Pillars of Partnering". Although the authors did not refer to their so-called second generation partnering as strategic partnering, the definition has reflected the strategic nature of the inter-organisational relationship. It refers to partnering as:

> "a set of strategic actions which embody the mutual objectives of a number of firms achieved by co-operative decision making aimed at using feedback to continuously improve their joint performance" (RCF, 1998, p. 4).

2.4 LITERATURE REVIEW OF THE CONCEPTUAL MODEL

For the past decade, partnering has become a primary management strategy for improving organisational relations and project performance. Research into construction partnering has become ubiquitous. Consequently, many research and practice papers have been published in the mainstream construction journals. The idea of partnering is relatively new to the construction industry when compared to other industries such as manufacturing. Partnering has yet

to mature in construction, which is evident in the diversified nature and scope of studies that have been undertaken to date.

The existing literature offers different aspects to the construction parties to facilitate partnering practices to construction, however, many of these practices lack of clear direction. Due to the copious number of articles on partnering that have been published, a comprehensive review and critique of the research on partnering is crucial. Li et al. (2000) has conducted a partnering literature review. Rather than argue for a particular viewpoint, they believed that it would be more beneficial to investigate systematically what we do know about partnering and how we can proceed to learn more. Instead of continuing refer to and quote what is widely recognised in the literature, they specified the type of investigations needed to generate the knowledge base for improving our understanding of partnering issues.

Li and his colleagues (Li et al., 2000) chose to review the last ten years' issues of four major construction management journals – *Construction Management and Economics*, *Journal of Construction Engineering and Management*, *Engineering, Construction and Architectural Management*, and *Journal of Management in Engineering*. The selection of these journals was based on the study of Chau (1997) who found that these four journals had the highest scores in quality rating.

They concluded that guidelines and models for partnering being developed over the last decade focused on five main research themes – empirical research and studies on the types of partnering, partnering models, partnering processes, and partnering structure. Moreover, they suggested that future research should be focused on empirical studies of the following directions: investigating better performance measures and critical success factors, developing and testing partnering models and processes, and formatting and selecting partnering strategies. More importantly, the main purposes of this thesis will address some of their suggestions that are listed below:

1. Empirical investigations should be incorporated when we have to ensure the reality of our thoughts and concepts.
2. Research in partnering can be divided into two main categories – project partnering and strategic partnering. Developing separate sets of literature for the two categories is justified. Furthermore, the process of developing a guideline to move from project to strategic partnering is worthwhile. For example, under what conditions an organisation is able to form a closer affinity with other parties? How to achieve and sustain such conditions?
3. The success of partnering depends on a favourable association within a group of factors. In other words, these factors exert their influence on the level of attainment of partnering. However, there are numerous factors affecting partnering. For a relevant research, it would merely target on those factors that are general and applicable.
4. Since partnering is voluntary and there is no publication reporting statistic number of companies participating in partnering, a large sample survey is not appropriate. More subjective methods, such as the Analytic Hierarchy Process (AHP), would be used to collect data from a small group of experts who have been practising partnering.
5. It is suggested to establish a partnering model more applicable to the real context. Model development usually involves the use of dimensions/factors to determine different conditions of relationship.

The empirical methods would be described in the next chapter. This chapter will focus on a literature review of partnering to establish a set of hypotheses for testing, with regard to elements such as the two types of partnering (project and strategic), the partnering process and critical success factors.

2.4.1 Types of Partnering

As previously mentioned, there are two types of partnering - *project partnering* (relationships established for a single project) and *strategic partnering* (a long-term commitment beyond a discrete project). The advantages and disadvantages of both types of partnering can be found in most

construction management textbooks (e.g., McGeorge and Palmer, 1997). They are distinctive in which strategic partnering can secure long-term benefits, whereas project partnering cannot. Loraine (1994), however, argues that project partnering has long-term economic considerations. For example, price competition has been perceived by most to "pollute" the 'genuine' partnering relationship, but it may also be used to monitor construction quality and progress (Matthews *et al.*, 1996). In addition, project partnering has no restriction on market entry and can therefore stimulate competition, which may have long-term benefits. In fact, the long-term benefits of project partnering are so few that they cannot outweigh its many short-term outcomes. Loraine (1994) states that the challenge is how to allow such long-term benefits to operate in a non-adversarial relationship.

As the construction industry is dominated by one-off projects, project-specific partnering will be likely to take the leading role in promoting a closer relationship in construction projects (Matthews *et al.*, 1996). This is supported by an earlier paper written by Brochner (1990) who predicted that there is a need for the formation of project networks. In this network, members are all information intermediaries that support a single project. Indeed this is especially true in the public sector where partnering can only be promoted at the project level due to their competitive tendering policy (Woodrich, 1993).

Saad and Hancher (1998) viewed that partnering is an effective management tool to navigate the project management process from the planning phase to the commissioning/start-up phase, *via* the design (including conceptual and detailed), procurement and construction phases since it can be incorporated into each of the five phases. This implies that the partnering concept can be integrated with project management to become the working principles of project partnering.

Larson (1995) examined alternative management approaches to project success using a large sample with 280 construction projects. His investigation was based on a questionnaire. For comparing the four types of owner-contractor relationship, he postulated six major criteria (meeting schedule,

controlling cost, technical performance, customer needs, avoiding litigation, and satisfaction of participants) to measure the degree of success of the relationship established in a project. Comparisons were also made between low-bid and non-low-bid projects. His findings supported that partnering was among the most successful approach to managing the owner-contractor relationship in both low-bid and non-low-bid projects.

Brooke and Litwin (1997) have been engaged in an on-going project management research for twenty years with data collected from seven large organisations (e.g. IBM and General Motor). They identified the best and poor success predictors of projects, and critical management practices based on the experts' views.

On the other hand, Agapiou *et al.* (1998) incorporated the strategic partnering concept into their logistics approach to the procurement process, which highlights the active participation of top management, long-term development of relationships between construction parties and the establishment of confidence and dependence between parties.

Stipanowich and Matthews (1997) suggested that a primary advocate of partnering is the Dispute Avoidance and Resolution Task Force (DART), which intends to change the culture of the construction industry by restoring the spirit of co-operation and teamwork. Thompson and Sanders (1998) referred to strategic partnering as a coalescing relationship that involves re-engineering processes to fit into cultural integration. The intention is to develop core competence in pursing the achievement of corporate and business strategies. Ellison and Miller (1995) used the term synergy to explain such a relationship. A synergistic relationship is to seek cultural furtherance of the parties that commit to modify the work practices and have a desire and willingness to experiment with new models, approaches, and means of solving problems to attain superior performance.

Krippaehne *et al.* (1992) suggested that partnering is likely to improve vertical integration and maintain a company's competitive position. For example,

partnering can be used to distribute risk between parties resulting in reducing the exposure of each entity while vertical integration internalises risk (Cook and Hancher, 1990).

Strategic partnering does not rely on a partnering contract. It implies that the formality of contract can be replaced by a verbally agreed co-operation. However, it is not harmful to the involved parties for the establishment of a written agreement as it can be used as future reminders for achieving those goals and objectives. Moreover, it can help reduce any disputes that may originate from the distortion of memory of any involved parties. For further information on partnering agreements refer to Ellison and Miller (1995).

Project partnering does not have to be contractual either and can be used to supplement a construction contract. Matthews and Rowlinson (1999), Brooke and Litwin (1997) and Miles (1996) stated that a charter is commonly drawn up during a workshop and signed by the key project personnel. The charter states the common goals and objectives, the relevant measures, the incentive systems, etc.

It is argued that a partnering process is working mainly in line with the phases of a construction project whether it is a strategic or project-specific partnering. Practically, project partnering is an effective management tool to improve a one-off construction project by enhancing the relationship between the construction parties. In project partnering, the partnering team establishes the common goals and objectives for all parties to achieve. In the context of a strategic partnering, it becomes a management philosophy that is expected to work continuously for each and every project, and there are more expectations from team members than a project partnering. Their distinctive characteristics give rise to the first set of hypotheses:

Hypothesis 1a: There are critical factors common to both project and strategic partnering.

Hypothesis 1b: Long-term factors affect more on strategic partnering than project partnering.

2.4.2 The Partnering Process

Li et al. (2000), in their partnering review paper, distinguished the concepts of partnering model, process and structure. A partnering structure is better represented in a schematic form of the integration by different construction parties, which are then cut and diced, and finally be squirted through an array of diagrams (Crowley and Karim, 1995; Cheng et al., 2000). The diagrams conceptualise the relationships between partnering parties. It aimed at focusing on the parties that were engaging in adversarial relationships and, by re-organising their interface, fundamentally improve their ability to resolve inter-organisational conflicts. Newcombe (2000) and Gobeli and Larson (1986) also suggested that a pure project organisation is a superior structure for construction projects because it increases the success of a project when the role of the project manager is strengthened. This pure project form is an informal structure cut across the formal contracting structure to enhance the management of the project.

In addition, model development is valuable in shaping and describing the underlying concepts relating to the scope of research. It attaches meaning to various conditions of a doctrine, belief or principle. For example, partnering, as a management concept, might consist of various conditions in relationship that would give rise to different approaches, constituting a partnering model. Authors who have developed models for partnering include Crowley and Karim (1995), Ellison and Miller (1995), Larson (1995), Matthews *et al.*, (1996), Thompson and Sanders (1998). These models promote different sets of description of the relationships among construction parties. The authors argue that there are different levels of partnering, which specify various relationships' patterns between the construction parties. Their partnering approaches are in a continuum/spectrum, with each variation resulting in a separate application (Thompson and Sanders, 1998).

Determining which model to use for creating a partnering relationship can be an arduous task. One useful selection method is to check how authors have derived their models. What criteria or dimensions were used to identify approaches to partnering? Among their efforts, Krippaehne *et al.* (1992) developed a framework for selecting vertical integration strategies from higher to lower levels of strategy – full integration, taper integration, quasi-integration, and contracts (explicitly each reflect the degree of partnering; similar to the four levels of partnering identified in Ellison and Miller, 1995). In order to survive in such a fragmented industry, construction parties must pursue appropriate vertical business integration as one of their core competitive strategies. The selection is based on three primary forces – *bargaining power*, *current market niche* (originally as business unit objectives), and *industry volatility* - which are the major industrial traits.

The work of Thompson and Sanders (1998) identified dual dimensions (business-driven benefits of partnering and degree of objectives alignment) for cross-linking to produce four approaches to partnering, each of which (except the competition approach which is not partnering in reality) has a specific application. The underlying concept assumes the greater the long-term benefits and the higher the degree of goals/objectives, the higher the approach (or level) to partnering. Since other authors did not mention what criteria they used to develop their models, it is not possible to compare their used dimensions and to distil any critical comments based on them.

Moreover, the literature provides effective solutions to overcome the problems associated with a partnering process. The processes that have been presented are diversified in their application. Abudayyeh (1994) suggests a 3-step process to facilitate the construction performance at the project level. The 5-stage process model suggested by Crane *et al.* (1997) offers value to organisations for preparing to implement strategic partnering. Wilson *et al.* (1995) alternatively adapted a change process in implementing partnering. Matthews *et al.* (1996), on the other hand, presented a semi-project partnering approach. The term "semi-project partnering" implies that the process involves

limited competition, which should be avoided in genuine partnering that should emphasise negotiation but not competition.

It is understood that partnering involves a change process (Wilson *et al.*, 1995). A traditional change mechanism consists of three stages – unfreezing, transforming and re-freezing. Each time when a construction team applies partnering on a construction project, an intervention occurs. Partnering is generally established through a structured, facilitated process which is designed to provide an environment, especially the use of workshops, for developing a co-operative atmosphere within the partnership (Moore *et al.*, 1992). Moreover, it is essential to design a constructive and effective process for timely resolution of differences (Dozzi et al., 1996). According to Wilson et al. (1995), a partnering process is a method systematically initialising, implementing and internalising the partnering concepts. Cowan et al. (1992) suggested that although partnering process has customised shapes or forms dependent upon the specific needs of the involved parties and the construction project, there is a consistent pattern of the partnering process. This process consists of certain elements including pre-project activities, implementation stage, top management support and completion.

These terms (i.e. structure, process and model) are distinctive in their underlying principles and themes, and provide different contributions to the establishment of a partnering relationship. In contrast, some of their characteristics are useful to develop a partnering process model, which are listed below:

- It is clear that implementing partnering involves a process. This process discloses all key elements that have to be incorporated, such as stages of the process (i.e. sub-processes). It also helps to highlight the problems that may occur in the process.
- Three process stages are identified - formation, application and completion. Each stage is an independent sub-process and forms the basis for next stage.

- For a long-term co-operative partnering, the completion stage of a project will be the foundation for reactivating another partnering process.
- The web-like structure of partnering implies that all those key construction parties should be involved. The structure also highlights some of the problems that may hinder the partnering process.
- A model concept helps to promote the ideas of generality and applicability. It also specifies the relationships of all elements within the model.

In general, the second set of hypotheses is developed for addressing these concepts:

Hypothesis 2a: There are similar as well as different process characteristics between project and strategic partnering.

Hypothesis 2b: A partnering process consists of stages exerting considerable degree of influence on the success of partnering.

2.4.3 Critical Success Factors in Construction Partnering

In business environments other than construction, inter-organisational relationship has been studied extensively (e.g. Rai et al. 1996; Mohr and Spekman, 1994; Parkhe, 1993). Each of the aforementioned authors has used different approaches to examine the characteristics and the process of alliance in their respective environments. On the other hand, the study of impact of characteristics/factors on construction project has been documented (e.g. Belassi and Tukel, 1996; Chua et al., 1999). Similarly, factors affecting construction partnering have also been identified but in very diversified approaches. Two examples of empirical work are presented briefly hereinafter.

A small empirical study of Dozzi et al. (1996) found that partnering, team building, co-operative alliances and alternate dispute resolution are not fully used in the sample organisations, particularly in the public sector. They further stressed that owners should take the initiative to induce a partnering relationship as they are the main beneficiary and because they effectively control the contractor-selection process, contract content and project organisation. Initiatives must also show advantages to all parties if they want to be successful.

Gardiner and Simmons (1998) in their qualitative study of 19 building, process engineering and civil engineering construction projects found that team building at the beginning of a project helps to reduce the occurrence of dysfunctional conflict. The importance of managing conflict at an early stage of a project has been well documented in the construction management literature (Phillips, 1985; Thamhain and Wilemon, 1975). Gardiner and Simmons (1998) supported that project parties are organised as a social unit where they may need to undergo structural modifications to execute the temporary relationships effectively; however, there is little time to plan for such an organisational change. Inter-organisational team building promotes organisational development at the start of a project (CIIA, 1996) and therefore provides the opportunity to interact, learn and regulate for the whole project life cycle. Team building should then be a core element of partnering.

Besides the empirical studies, other works have also been documented in the literature. More specifically, some studies have paid more attention to a set of attributes of partnering while some others have focused on individual attributes. For example, Barlow and Jashapara (1998) studied such attributes as learning, communication, trust and continuous improvement. Cook and Hancher (1990) discussed about commitment, trust and mutual benefits. On the other hand, Lazar (1997; 2000) studied the impact of trust on partnering relationship. Miles (1996) was fond of studying the role of alternative dispute resolution (ADR). Some have studied attributes for strategic partnering (e.g. Ellison and Miller, 1995) while others on project partnering (e.g. Larson, 1995).

A more recent research work conducted by Cheng et al. (2000) provided a review of the published literature from construction management as well as other management disciplines to identify critical success factors in partnering projects. They also described how these factors could be evaluated to improve the productivity and performance of construction projects. They intended to integrate various management viewpoints to establish a new partnering framework. Their framework (as shown in Figure 2.1) suggested that by using appropriate management skills and developing a favourable context, partnering would become successful.

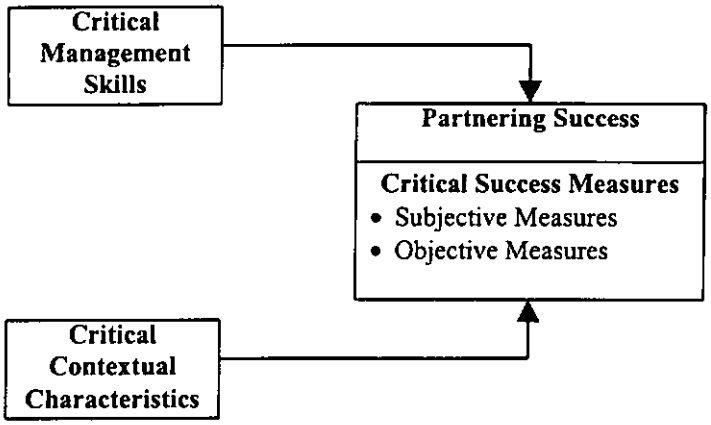


Figure 2.1: A Framework of Partnering in Construction

Note: Source from Cheng et al. (2000)

Essentially, the partnering process involves the formation of inter-organisational relationships that have always been a problem. Breakdowns in communication and disruptive conflicts are a *leitmotif* of construction and as a result it has become very adversarial in nature. For effectively managing the relationships, management skills are of critical importance. They form the basis for initiating and facilitating the partnering process. The appropriate management skills needed to convert critical threats to opportunities (i.e. effective communication and conflict resolution) and is conducive to

successful partnering. On the other hand, some characteristics in the partnering context may strengthen or hamper the partnering relationships. In consequence, it is important to identify the critical paths conducive to the success of partnering. This involves the study of CSFs. For evaluating the level of the CSFs within a partnering organisation, individual measures have to be developed. Cheng et al. (2000) also highlighted the test of the CSFs of partnering, and suggested that senior executives who are familiar with partnering should be invited to provide their opinions during data collection phase.

Wakeman (1997) provided a multi-layered framework to partition the components affecting the partnering process into separable layers around a closure core of issues (as shown in Figure 2.2). The most distinctive contribution of the framework is that it prioritises the different dimensions that influence the core issues. Specifically, the most influential component is closest to the core while the degree of influence weakens with increasing distance from the core.

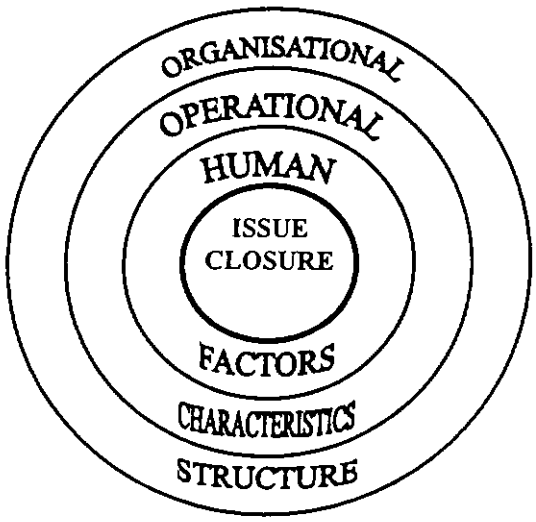


Figure 2.2: Decision-Making "Target"

Note: Source from Wakeman (1997)

In summary, adjacent to the core (the closest layer) is a layer of human factors that are personified in the form of commitment and drive of the partnering participants. This highlights the importance of teambuilding. Closure may be hampered or blocked by one person within the team. The next level, moving out from the core, is a procedural or operational characteristics, which defines the rules for agreement and codes of conduct among the participants. The outermost layer is the partnering organisational structure that provides the roles and relationships within which the partnering members can arrive in their decisions.

These frameworks provide individual structures to specify some relationships of some key elements. These elements are the factors affecting the partnering process. However, there are numerous factors existed in a partnering process. Some are specific for a particular process while some are more general in nature that may affect most or all of the processes. There are only a few developments of conceptual framework of general factors, of which can be found are mostly valuable. The above frameworks did not pay attention to the partnering process. One such process model was established by Cowan et al. (1992) who argued that a partnering process consists of the pre-project and implementation stages (see Figure 2.3). Within each stage, some elements are the core components.

Specifically, after the selection of partners, the project managers help to form the bonding for all participants to initiate a teambuilding process. The partnering will form when all team members agree. Within the stage of implementation, four main factors are critical. They are joint evaluation, escalation, continuous improvement and persistent leadership, which give rise to a successful completion of the project. They further agreed that top management support is expected to influence the entire partnering process.

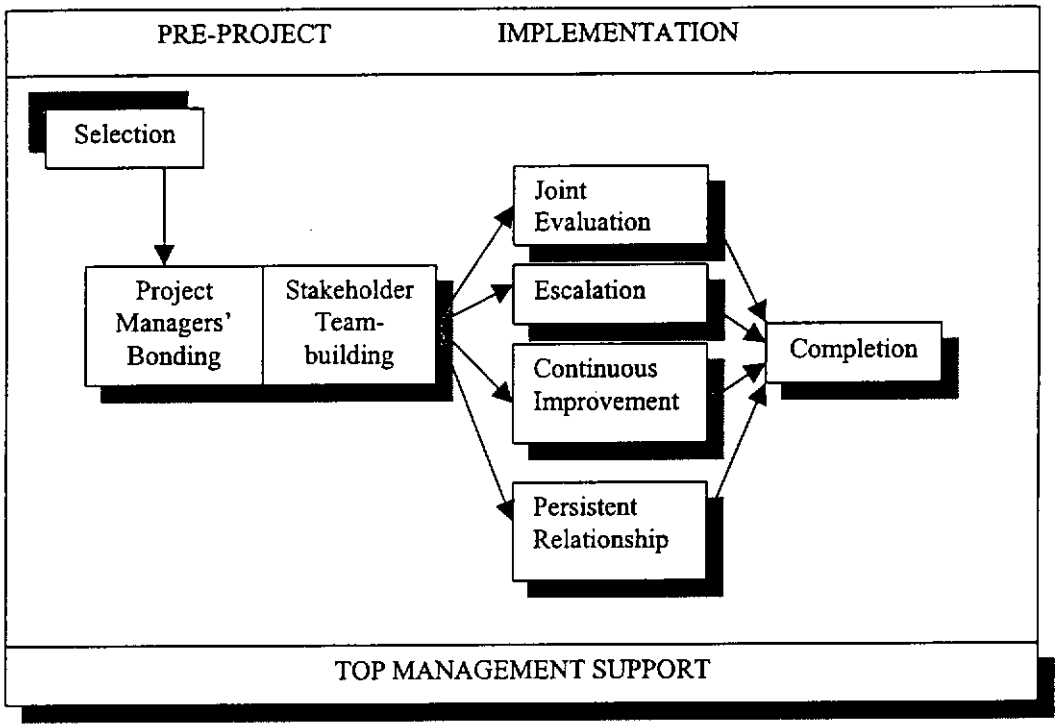


Figure 2.3: A Framework of Project Partnering

Note: Source from Cowan et al. (1992)

For identifying what factors are critical for the success of partnering, some questions must be borne in mind. Before entering into a partnering arrangement, an organisation must find out why they are doing so by specifically examining how it relates to their corporate strategy. Other pertinent questions that should be addressed include:

- Does the organisation want to increase their chances of acquiring competitive advantage so that they can "win" more contracts?
- Does the organisation want to use partnering as a mechanism to define the relationships between the different parties involved in the construction process in an attempt to reduce or eliminate claims and litigation (Abudayyeh, 1994)?

In addition, an organisation must identify with whom they want to form a partnering arrangement. Since partnering is the creation of a co-operative

relationship, making such arrangements without understanding each other's aspirations and culture could have disastrous consequences. For selecting an appropriate partner, the values, capabilities, and backgrounds of potential candidates have to be carefully examined. When the "right" organisation is identified, it will be obliged to contribute inputs (i.e., resources and support) to the partnering arrangement. Apparently, there exist some other characteristics (e.g. team building, mutual trust, joint problem solving), which are critical in establishing interdependence and self-willingness to work for the cohesive relationship. Open lines of communication and effective co-ordination are crucial to facilitate the cohesiveness. These critical characteristics form the favourable context conducive to partnering success (Abudayyeh 1994).

The case study provided by Cheng et al. (2000) also reveals that top management support, resources and trust are important factors to initiate the process of partnering formation while people with poor communication skills are able to hinder the course of formation. These elements or factors of partnering can be extended to commitment, equity, mutual goals, implementation, joint process evaluation, dispute resolution process and organisational factors (Cowan et al., 1992; Barlow et al., 1997; CIB, 1997). Workshops as a communication channel are essential in forming partnering and tracing partnering performance (CIIA, 1996; CIB, 1997). In consequence, the identification of the critical factors enables an effective allocation of limited resources and helps to form critical paths for the success of partnering. The relationships of the critical success factors and the partnering process can be proposed as:

Hypothesis 3a: There are different sets of critical success factors affecting the partnering process stages to reflect the distinctive functions of each process stage.

Hypothesis 3b: Factors of each proposed set of critical success factors exert considerable degree of influence on the respective partnering process stage.

With respect to the performance criteria of partnering, some authors have used project performance measures for assessing the degree of success of partnering (e.g. Larson, 1995). Weston and Gibson (1993) summarised the quantitative benefits of partnering on project performance. Partnering surpassing non-partnering by substantial reduction in percentage cost change, percentage change-order cost, percentage claims cost and percentage duration change and a significant improvement in percentage value engineering savings. However, their studies would only support that partnering is part of the many factors to improve project performance. Unless all of these factors are being taken into concern, it would be false to claim that project performance criteria can be used to measure partnering performance. Additionally, unless we can prove that a project performance criterion is absolutely a criterion of partnering performance, it is not correct to directly copy this criterion from measuring project performance. The work of Burgelman and Rosenbloom (1989) can help to explain these views.

Burgelman and Rosenbloom (1989) developed an evolutionary process framework for technology strategy. Hampson and Tatum (1997) argued that effective technology strategy helps to sustain a competitive edge. This framework (as shown in Figure 2.4) promotes integrative mechanisms that are under the influence of the firm's organisational context and the environment of the industry in which it operates.

In summary, the idea is that technology strategy is shaped by the generative forces of the firm's strategic behaviour and evolution of the technological environment, and by the integrative mechanisms of the firm's organisational context and the environment of the industry in which it operates. Experience with a particular strategy is expected to have feedback effects on the developing set of technical capabilities. This evolutionary perspective involves a social learning process in which strategy is inherently a function of the quantity and quality of organisational capabilities.

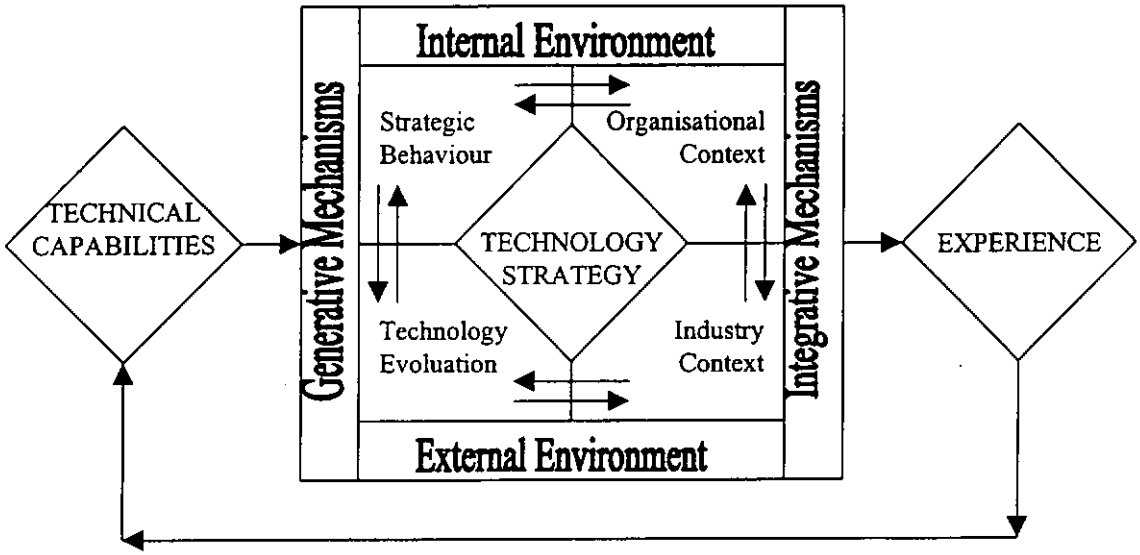


Figure 2.4: Evolutionary Process Framework for Technology Strategy

Note: Source from Hampson and Tatum (1997)

Mitropoulos and Tatum (2000) developed three main types of mechanisms – contractual, organisational and technological – to increase project integration. Table 2.1 provides a classification of these integrative mechanisms at the project level and the inter-organisational level. These mechanisms support each other to maximise the effectiveness of integration. With respect to the integration mechanisms, partnering and so called information relations are two components within the organisational mechanisms for project level and inter-organisational level respectively. In Table 2.1, there are other mechanisms, contractual and technological, as well as other management initiatives, such as TQM, within the organisational mechanisms impacting on project performance.

The degree of partnering success can be measured by the consequences of partnering (Mohr and Spekman, 1994). By determining the appropriate performance measures and relevant measurement parameters, involved parties can communicate to their staff about the objectives, priorities, criteria and values of which they should comply with (Alarcon and Serpell, 1997). These measures help to set useful monitoring, control, evaluation and correction of

variations and improvements. Performance measures can be subjective or objective. They are the positive outcomes that are accumulated during the process.

Table 2.1: Integration Mechanisms

Mechanisms	Project Level	Inter-organisational Level
Contractual Mechanisms	Design/build contracts; performance incentives	Strategic alliances and joint ventures
Organisational Mechanisms	TQM; partnering; cross-functional teams; training in group skills	Informal relations; project level TQM
Technological Mechanisms	Electronic linkages between construction applications	Electronic linkages between design-procurement-construction-vendors; electronic linkages with associations

Note: Source from Mitropoulos and Tatum (2000)

Objective partnering measures may stem from the belief that success is partly determined by some short-term project objectives. Such objectives are also known as business performance by Marosszeky and Karim, (1997), and some examples are cost effectiveness, quality, schedule, scope of work and profit (Alarcon and Serpell, 1997; Puddicombe, 1997). Most often, these project performance criteria are partnering goals. Belassi and Tukel (1996) suggested that due to the unique nature of different projects, key measures of a project might not be crucial in other projects. The use of specific project goals and objectives as the measurable partnering criteria for this study is not justified since the measures will vary depending on the goals and objectives favoured by different partnering teams. Furthermore, different partnering projects have different partnering goals and specific conditions for successful performance. That means using specific and individual partnering goals as the general partnering performance measures for this study are not justified. Therefore, it is suggested to use standardised or common measures.

Apparently, objective measures of partnering are difficult to obtain. It is because partnering performance is hard to quantify since partnering involved a social learning process. Human behaviour may drive the performance to earn perceived outcomes. Pinto and Slevin (1988; 1989) suggested that perception

from the project parties is an effective determination of project success. This conception can be extended to the study of partnering success. Crane et al. (1997) also argued that perceptions on how well the established goals and objectives are fulfilled could be used to measure the level of partnering success. In other words, it is favoured to use the subjective measures (e.g. overall satisfaction of stakeholders) rather than the objective measures (e.g. the specific partnering goals and objectives) for this thesis that is an academic research to examine a general nature of partnering.

On the other hand, in the field of project management, researchers are fond of conducting a general study of the contribution of CSFs towards the project objectives (Chua et al., 1999). In reality, different factors contribute considerably but differently to various project objectives (Jaselskis and Ashley, 1991). These objectives are in fact the performance criteria for measuring the success of a project. Thus, this thesis is intended to determine the individual effects of critical factors on the partnering objectives. Since the strength of each success-related factor on each process stage has been proposed to examine previously, it is only necessary at this point to identify the relationships between the three process stages and the performance criteria. Combining the two findings will disclose the various contributions of the success factors toward the partnering performance criteria. In consequence, the proposed hypotheses are:

Hypothesis 4a: The proposed performance criteria are important measure measuring the success of partnering.

Hypothesis 4b: The partnering process stages exert considerable degree of influence on the achievement of each of the performance criteria for measuring the success of partnering.

2.5 SCHEMATIC REPRESENTATION OF HYPOTHESES

Figure 2.5 illustrates a summary of the four groups of research hypotheses for this thesis. Although the hypotheses are somewhat related in their "contents" to examine the relevant aspects of partnering, they have their specific "missions". For example, H1a and H1b are useful in exploring the relationship between the two major types of partnering (i.e. strategic and project) using the critical factors, while H3a and H3b examine the relationship between CSFs and partnering process stages. In addition, it is likely that H2a is something of a tautology of H1a and H1b. Yet, the former is intended to examine the repetitive nature of strategic partnering that distinguishes it from project partnering, but the latter cannot. As a result, these missions are categorised as shown by their respective headings of the four boxes in the figure.

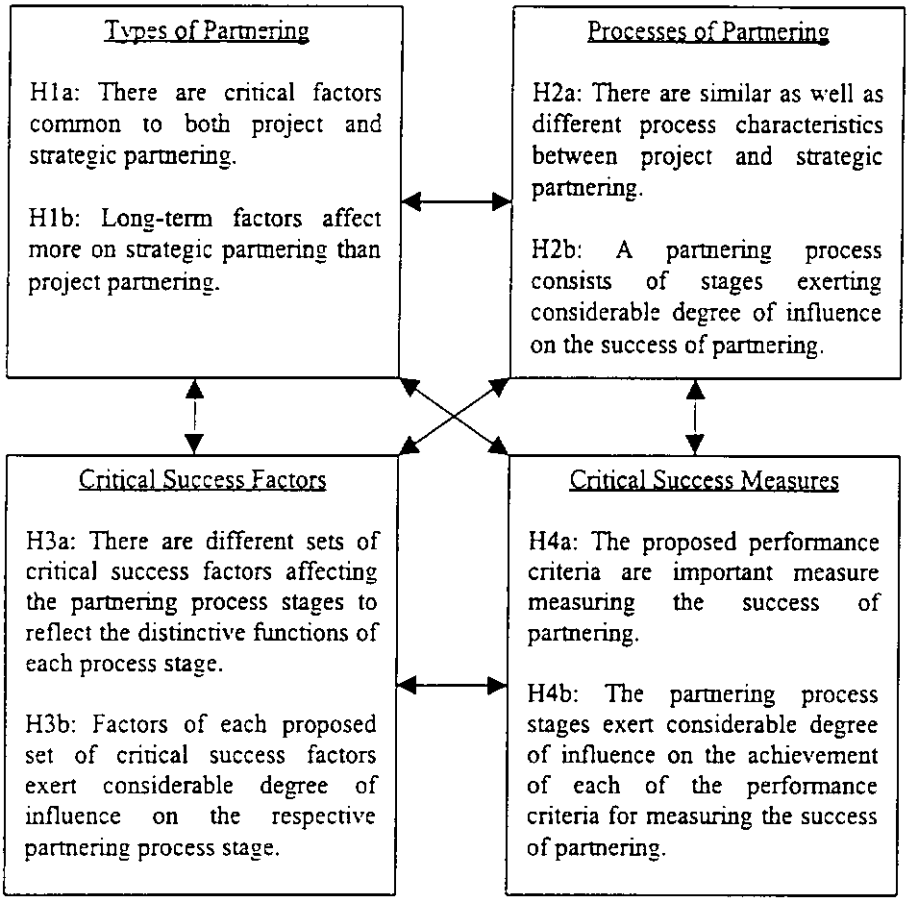


Figure 2.5: The Four Groups of Hypotheses

2.6 SUMMARY

This chapter first presented a background of the evolution of partnering. Then, definitions of project and strategic partnering were provided. Finally, a detailed reviewing of the partnering literature was presented, intending to provide penetrating insights into the formation of some proposed hypotheses to be examined.

CHAPTER 3: AHP AND CASE STUDY METHODS

3.1 INTRODUCTION

This chapter presents the main tests that were used in this thesis. Simple rating method and Analytic Hierarchy Process (AHP) were employed to develop, examine and refine the conceptual model. A case and comparative case study were used to evaluate the practical model. AHP is well known of its usefulness to identify inconsistent responses, whereas the two case study approaches are helpful to ascertain the usefulness of the practical model by means of using real-life examples. In this chapter, justification of the use of these tests was first presented. Then, the two main tests, AHP and case study, are introduced.

3.2 JUSTIFICATION OF THE USE OF TESTS

3.2.1 Research Strategies

It is important to explain how the tests were selected for this study. As stated in Chapter 1, the study of this thesis is composed of two major parts. The first part involves the determination of a conceptual model of partnering, and the second part deals with the testing of a practical model of partnering. Therefore, the basic question is what research methods have to be adopted for these different research objectives and associated activities. Generally, such research activities entail the collection and analysis of empirical evidence, which can be achieved by various means including survey, case study, experiment, etc (which are also known as research strategies). It is well understood that these research strategies are pluralistic and fit for the three general research purposes – exploratory, descriptive and explanatory (Yin, 1981a, 1981b). Although they can be used interchangeably, Yin (1994) argued that the decision of using which particular strategy depends on three conditions/situations, which are helpful to determine the one with more

advantages over the others. These conditions are:

- The type of research question posed, such as how, why, who what, etc.
- The extent of control an investigator has over actual behavioural events.
- The degree of focus on either contemporary or historical phenomena.

Table 3.1 summarises his overview of the selection of research strategies due to different requirements of the conditions. Referring back to this study, what strategies have to be adopted for the two major research objectives? In general, the two research objectives focus on partnering which is a recently developed management concept (i.e. contemporary events), whereas the investigator has no intention to control over any behavioural events. In particular, the first research objective deals with what the partnering process is, what partnering success measures are, and what factors affect the process (including how much strength these measures and factors have). The second objective aims to evaluate the usefulness of the practical model of partnering by asking how and why it is applicable. Pursuant to the table, it is easy to decide that survey is an advantageous strategy for the first research objective (as "what" and "how much" questions are dominated), while case study is appropriate for the second one (since "how" and "why" questions have to be addressed).

Table 3.1: Research Strategies due to different conditions

Research Strategy	Types of research question	Control over behavioural events	Focusing on contemporary events
Experiment	How, why	Yes	Yes
Survey	Who, what *, where How many, How much	No	Yes
Archival analysis (e.g. economic study)	Who, what *, where How many, How much	No	Yes/No
History	How, why	No	No
Case study	How, why	No	Yes
* "what" questions, when asked as part of an exploratory study, pertain to all five strategies.			

Note: Source from Yin (1989, p.17; 1994, p.6)

3.2.2 Four Basic Research Aspects

The results of a study, either qualitative or quantitative, have to be accepted with some degree of confidence. As such, validity and reliability issues are applied to the research design to control for extraneous variables. Validity is the appropriateness of a given operational definition really measures the theoretically defined concept or variable (Blalock, 1988). In general, it is the extent to which an instrument accurately measures what it is supposed to measure (Hair et al., 1998). Reliability is the degree of consistency with which an instrument measures the attribute it is supposed to measure (Polit and Hungler, 1987). According to numerous social science research textbooks, validity and reliability have to be addressed and satisfied prior to making any inferences (Yin, 1994). In this thesis, simple rating method, AHP and two case study methods are employed. It is essential to distinguish whether they are quantitative or qualitative since they may deal with both issues differently.

Colloquially, the method that is used to generate or collect data provides indication to determine whether the study can be described as qualitative or quantitative. For example, the collection of data by personally interviewing respondents can be regarded as qualitative, whereas the use of self-completion postal questionnaires is known to be quantitative. As the simple rating method uses self-completed questionnaire, it is regarded as quantitative. Additionally, the AHP method adopts a qualitative way in building the decision hierarchy but a quantitative approach in data collection and analysis (using of a self-completed questionnaire). On the other hand, although case study can be used to collect quantitative as well as qualitative data, this study used it to collect qualitative evidence (by means of interviews). Therefore, this thesis contains both quantitative and qualitative data, and so the question is how to address the validity and reliability issues for these two approaches.

In the quantitative sense, both validity and reliability issues deal with the degree of measurement error present in any measure (Hair et al., 1998). Measurement error is the degree to which the observed values cannot represent the true values. It happens when multiple variables are used and the

reliance on their combination (the variate) in multivariate techniques is focused (Hair et al., 1998). The use of simple rating method and the AHP in this study does not aim at testing any causal relationships among a group of variables, and thus the validity and reliability issues are no need to address (the absence of the problem of measurement error). However, in order to demonstrate the rigor of this study, the following issues are considered. First, to ensure validity is a matter of arrangement during research design and data collection. As Hair et al. (1998) supplemented, a good starting point is to have a clear understanding of what is to be measured in order to assure that the measurement is "correct". This is a "precaution" strategy rather than a post-data-collection testing. In this study, both of the simple rating and AHP methods have taken this into consideration. Second, in univariate statistical analysis, such as calculation of the mean in interval variables in simple rating method, distortion is a major issue to be addressed. Measure of dispersion (e.g. computing the standard deviation) is sufficient to disclose any distorting effect of the statistics. Finally, the AHP method uses a consistency test to ensure that only reliable responses are utilised.

In the qualitative sense, validity and reliability are the aspects used to judge the quality of the research design (Kidder and Judd, 1986). Because these aspects are relevant to empirical social research, case study (as one form of empirical social research) is subject to testing these aspects (Yin, 1994). Specifically, there are three kinds of validity – *construct validity*, *internal validity* and *external validity* – which, together with *reliability*, are what Kidder (1981) called the four basic quality aspects of research. They are described below:

- Construct validity refers to the establishment of operational measures that are used to measure the concepts being studied. It is argued that this quality aspect is always problematic in case study research because they may be insufficient to develop a correct set of operational measures.
- Internal validity is the confirmation of a causal relationship, whereby condition A is shown to lead to condition B, as opposed to spurious

relationships. This logic is applicable to causal or explanatory studies but not descriptive or exploratory studies that (regardless of the types of study such as case studies, surveys or experiments) are not concerned with making causal statements.

- External validity has to be tested when a study's findings need to be generalised to a larger domain. It becomes a major barrier when doing single-case studies, which are always argued the lack of generalisation.
- Reliability is the demonstration that the replication of the procedures of a study in a similar setting produces the same results. Technically, it is the degree of consistency with which an instrument measures the true value and is error free; thus it is the opposite of measurement error (Hair et al., 1998). In other words, reliability is to minimise the errors and biases in a study.

It is well understood that not all of the four basic aspects are essential in qualitative research. For example, internal and external validity would confirm the technical soundness of a research study. So, threats to them are typically found from quantitative research dealing with statistical regression and testing (Campbell and Stanley, 1963). Filstead (1970) also agreed that validity is not a serious problem in qualitative method as much as in quantitative method because the former does not proceed to the a priori assumption. According to Silverman (1973), the subjective knowing nature of qualitative research has an innate validity, which differs from the validity of the objective knowing nature of the quantitative approach.

However, if a study attempts to draw any inferences that have to sustain a certain level of confidence, a more rigorous investigation to address the problems of validity and reliability should be justified. For example, of the eight common threats to internal validity as suggested by Campbell and Stanley (1963), Guba and Lincoln (1981) and Denzin (1970) argued that although some of them do not apply to naturalistic inquiry, some others affect the qualitative research to maintain a level of confidence. On the other hand, Sandelowski (1986) argued that due to the failure of qualitative method in

addressing validity and reliability by using the statistical tests as understood in the quantitative sense for scientific rigor. Thus, three other terms (except construct validity which has not been discussed) are developed exclusively for qualitative research – credibility (replacing internal validity), applicability (replacing external validity) and consistency (replacing reliability). Yet, Yin (1994), as a case study methodologist, used the original terms but discussed in a qualitative approach. After having summarised their viewpoints, the following are some suggested guidelines:

- **Construct Validity.** In qualitative research (including case study), achieving construct validity is a matter of data collection strategy (Yin, 1994). Specifically, researchers must select the right aspects or characteristics of what is to be studied and ensure that the right measures are used.
- **Internal Validity.** Relying on theoretical propositions as a general analytic strategy can help to achieve internal validity for qualitative analysis with evaluation purpose (Campbell, 1975). Its logic is to create some propositions or criteria and compares the findings against such propositions or criteria (Yin, 1994). Moreover, Guba and Lincoln (1981) also realised that threat to internal validity can be controlled through multiple-method approach. In the case study methods, interviews and documentation are used in order to maintain a certain level of confidence.
- **External Validity.** The use of replication logic in multiple-case studies (i.e. using multiple cases to ascertain the study's findings) would be better to reason the existence of external validity for qualitative research. This study used multiple cases to test the practical model.
- **Reliability.** In order to increase the reliability in qualitative research, a protocol is the bare minimum, which states the setting for the actual inquiry. In this study, a systematic approach to comparison (i.e. an analytical framework) has been designed for contrasting the two different cases for testing the practical model of partnering. Nevertheless, Guba and Lincoln (1981) stressed that if the need for internal validity of the qualitative design is satisfied, then reliability is also accomplished.

3.3 ANALYTIC HIERARCHY PROCESS

3.3.1 Backgrounds of AHP

Empirical research is used to explain phenomena and test hypotheses, lack of which may result in minimal contribution to the existing literature. As previously mentioned, empirical research has been mainly classified as qualitative and quantitative. Due to a myriad of characteristics in construction, supporters of the two camps have raised debates about the superiority of one approach over the other in the study of construction management. For example, Seymour *et al.* (1997) was in favour of qualitative research while Runeson (1997) was in favour of quantitative. As Li et al. (2000) suggested, the two approaches have different functions. Colloquially, the qualitative approach helps to explore the nature of problems or draw inferences from the data collected (Loosemore, 1998; Loosemore & Hughes, 1998). Upon probing any emerging patterns or commonalties, a quantitative approach can be used to examine them by either rejecting or supporting the hypotheses or propositions, providing a good foundation to validate causality or produce generic, universally applicable models.

Pertaining to this thesis, a variety of factors are proposed to determine the success or failure of construction partnering, the identification of CSFs will involve the prioritisation/weighting of some factors. Those with high rating are said to be critical. Chua et al. (1999, p.143) suggested that "the AHP's systematic approach in soliciting an expert's judgement and a consistency check have also made it a reliable way to determine the priorities to a set of factors, which may then be incorporated into other evaluation systems". Therefore, pursuant to the AHP method, different levels of contribution of the factors toward partnering can be determined and separate lists of CSFs can be identified.

AHP considers both qualitative and quantitative approaches to research and

intends to "combine" them into a single empirical inquiry. AHP was introduced to the construction research in the past several years although its development could be traced back to the early 1970s in response to the scarce resources allocation and planning needs for the military (Saaty, 1980). As the methodological procedure of AHP can easily be incorporated into multiple, objective programming formulations with interactive solution process (Yang and Lee, 1997), it has been widely applied in various fields.

3.3.2 The AHP Method

The Analytic Hierarchy Process (AHP) is a decision-making theory that was developed by Thomas L. Saaty. It is a structural method that helps to elicit preference opinion from decision-makers. It is a procedure suited for resolving complex technological, economic and socio-political problems (Saaty and Vargas, 1991). In a more practical sense, it addresses issues faced by decision makers regarding problems involving risk, uncertainty, diversity of factors and varying opinions and judgements (e.g. Saaty, 1980, 1990, 1994a, 1994b; Saaty et al., 1987; Saaty and Mu, 1997; Saaty and Nezhad, 1981; Saaty and Rush, 1987). The underlying principle of AHP is that the use of factual data, knowledge and experience are equally important in decision-making process (McIntyre et al., 1999).

The decision-making process begins by defining the overall objective or goal to achieve. Pertaining to this approach, a problem is derived into a hierarchy with the goal at the top. A hierarchy is an abstraction of the structure of the system to solve the problem. It consists of several levels representing the decomposition of the overall objective or goal into a set of clusters, sub-clusters, and down to the final level that would usually be the alternatives or scenarios to be selected. Clusters represent the first level that contributes to the successful realisation of the goal. Specific sub-clusters associated with each criterion would be identified when these subsequent levels consist of elements with increasing degree of detail. Clusters or sub-clusters can be forces, attributes, criteria, activities, objectives, etc.

AHP has been used for different purposes in the construction field. For example, Paek et al. (1992) adopted the AHP method to determine the relative weights of the criteria in a fuzzy-logic system for the selection of design/build proposals. The work by Dozzi et al. (1996) and Pocock et al. (1996) also employed the method in a similar fashion. Chua et al. (1999) employed the method to weigh the relative importance of some factors to identify the CSFs for construction projects.

Although different studies have designed various stages of AHP, good AHP papers have adopted those principles set by Saaty (1980). This chapter presents a general method adapted from the one used by McIntyre et al. (1999).

As shown in Figure 3.1, this thesis uses a seven-step AHP method for prioritising the CSFs for construction partnering. It enhances the function of the consistency test by employing it right after the computation of the relative weights of the matrices. The consistency test helps to determine the usable questionnaires in a survey. It is because the inconsistent responses might contaminate the consistent responses, and thus a test of the degree of consistency is needed before combining respondents' responses for further analysis. Only those with acceptable consistency would be considered into the calculation of their mean value of the relative weights. This study first calculates individual consistency values for all questionnaires and then deletes those with low consistency. In consequence, the algorithmic procedures of AHP are presented step-by-step hereinafter.

Step 1: Decision Problem

The decision problem should be defined clearly since it drives the whole AHP method. Before the use of AHP, researchers must ensure that it is an appropriate method for their study. They should clearly explain what their problems are and why AHP has to be used.

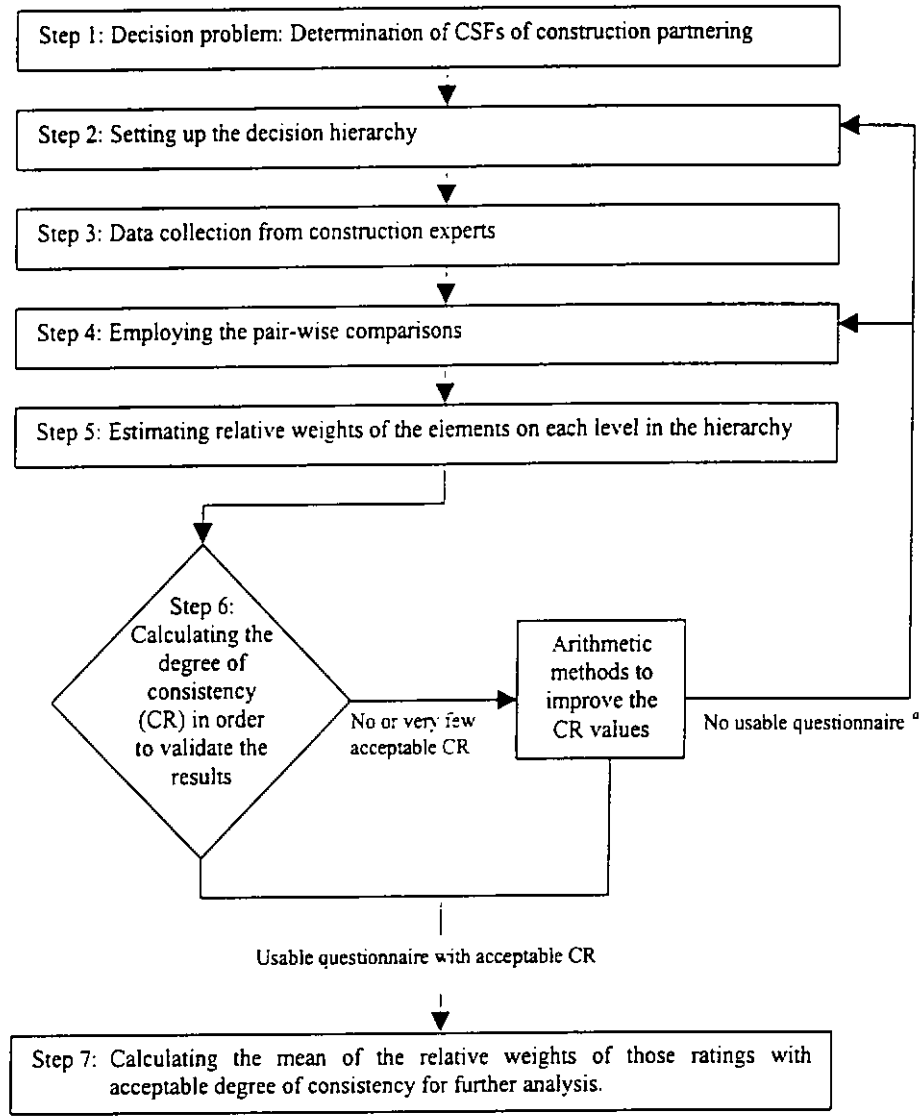


Figure 3.1: The AHP Method for Prioritising the Construction Partnering

[a] A loop jumps back to Step 4 in case of no usable questionnaire. If the "re-comparisons" still cannot reduce the consistency ratio to an acceptable level so that any usable questionnaire can be distilled out, jump back to Step 2 would be necessary.

AHP adopts a pair-wise comparison process by comparing two objects at one time to formulate a judgement as to their relative weight. Specifically, with an adequate measurement, this method is more accurate (with less experimental error) to achieve a higher level of consistency since it requires the respondents to think precisely before giving their answers. Usually, the more a person knows a situation, the more consistent the results can be expected from this person. Pair-wise comparisons can improve the consistency by using as much

information as possible. Inconsistency refers to a lack of transitivity of preferences (Saaty, 1980). Additionally, it demonstrates a consistency test, in which those respondents who could not build up their judgements logically would not achieve the consistent comparisons. The test will screen out these inconsistent respondents.

Step 2: Setting up the Decision Hierarchy

Usually, the structure for synthesising a decision hierarchy is built for a selection purpose. However, this study is not a selection problem and has no alternatives or scenarios to be compared. The decision problem of this study is to determine the key factors, process and success criteria for partnering. This kind of usage has been attempted by Tan and Lu (1993) who used AHP for prioritising the criteria and factors affecting the quality of construction engineering design projects.

Such a chain of hierarchy represents the system of the problem. This reiterates what is mentioned in the first step that a problem should be clearly defined. The formation of the system is based upon two assumptions, without which a problem cannot be dealt with using AHP:

- It is expected that each element of a level would be related to the elements at the adjacent level. AHP simply recognises the interaction between elements of two adjacent levels.
- In AHP, there is no hypothesised relationship between the elements of different groups at the same level.

Step 3: Data Collection from Construction Experts

Data are obtained by direct questioning to people who are actively involved in a construction project with partnering establishment. It is noteworthy that the AHP approach is a subjective methodology that is not necessary to involve a

large sample. For example, Lam and Zhao (1998) invited eight experts to perform the pair-wise comparisons for a quality-of-teaching research. Certainly, a small sample might only provide a very rough picture. Nevertheless, AHP is greatly useful for exploratory studies or research focusing on a small area where a large sample is not mandatory. In case of the increasing difficulties in achieving a high response rate, the application of AHP is expected to grow in the future.

Step 4: Employing the Pair-wise Comparisons

The elements of each level of the decision hierarchy are rated using a pair-wise comparison. The Saaty's scale of measurement is popular to be used to rate the intensity of importance between two elements, which is shown in Table 3.2 (Saaty, 1980). After all elements have been compared with the priority scale in pairs, a paired comparison or judgement matrix is formed.

Table 3.2: Saaty's scale of measurement in pair-wise comparison

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective.
3	Moderate importance	Experience and judgement slightly favour one over another.
5	Strong importance	Experience and judgement strongly favour one over another.
7	Very strong importance	An activity is strongly favour and its dominance is demonstrated in practice.
9	Absolute importance	The importance of one over another affirmed on the highest possible order.
2,4,6,8	Intermediate values	Used to represent compromise between the priorities listed above.
Reciprocals of above non-zero numbers		If activity *i* has one of the above non-zero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*.

Note: Source from Saaty (1980).

Table 3.3 illustrates a sample of the priority rating of a level with four elements at that level. This matrix is composed of four rows and four columns (i.e. a 4-by-4 matrix). In this table, as element A dominates over element B, a

whole number 3 is entered in row A column B, and the reciprocal (i.e. 1/3) is entered in row B column A. In addition, as the elements of A and C are expected to be equal in weight, a "1" is assigned to both positions. A "1" is also assigned when the same element is compared in row and column.

Table 3.3: A Pair-wise Comparison Matrix

Level (1)	A (2)	B (3)	C (4)	D (5)
A	1	3	1	9
B	1/3	1	1/3	4
C	1	3	1	8
D	1/9	1/4	1/8	1

Step 5: Estimating Relative Weights of Elements on Each Level in the Hierarchy

After the pair-wise comparison matrix has been developed, a vector of priorities (i.e. a proper or eigenvector) in the matrix is calculated such that for example the relative weight of A : B : C : D = Wa : Wb : Wc : Wd, and is then normalised to sum to 1.0 or 100 per cent such that for example Wa + Wb + Wc + Wd = 1. This is done by dividing the elements of each column of the matrix by the sum of that column (i.e. normalising the column). Then, obtaining the eigenvector by adding the elements in each resulting row (to obtain "a row sum") and dividing this sum by the number of elements in the row (to obtain "priority weight").

Step 6: Calculating the Degree of Consistency in Order to Validate the Results

As a result of some inconsistencies in their judgement, experts normally fail to produce the pair-wise comparison matrices accurately (Zahedi, 1986). Instead, a consistency test can be employed to compute the consistency ratio to ascertain the matrices. This is a distinct feature of AHP, which is argued to be

lacking in other approaches dealing with subjective ranking and makes it a very appealing prioritisation tool (Chua et al., 1999).

Using a three-element matrix (A, B and C) as an example, if A is twice as important as B and B is 3 times as important as C, then A will be 6 times as important as C (i.e. a perfect consistency). If A is only 5 times as important as C, some degree of inconsistency comes upon. However, logically, C cannot be more important than A. If this happens, there will be a high degree of inconsistency.

Consistency test is employed right after the computation of the relative weights of the matrices in order to enhance the AHP's function. Nevertheless, Step 5 and 6 can be interchanged with regard to what software is used. For those who use spreadsheet such as MS Excel, the design of the spreadsheet formula may favour the computation of relative weights prior to consistency ratios. For those who use the software package *Expert Choice* (1996), consistency ratios can be computed before relative weights.

Consistency test helps to determine the usable questionnaires in a survey. It is because the inconsistent responses are argued to contaminate the consistent responses, and thus a test of the degree of consistency is needed before combining respondents' responses for further analysis. Only those with acceptable consistency would enter into the calculation of their mean value of the relative weights. This study first calculates individual consistency values for all questionnaires and then deletes those with low consistency. In consequence, the AHP method with the example is demonstrated hereinafter.

It is known that people are often inconsistent in answering questions, and thus one of the important tasks of AHP is to calculate the consistency level of the estimated vector. Consistency ratio (CR) is used to measure the consistency in the pair-wise comparison. Saaty (1994b) has set the acceptable CR values for different matrix's sizes: (1) the CR value is 0.05 for a 3-by-3 matrix; (2) 0.08 for a 4-by-4 matrix; and (3) 0.1 for larger matrices. If the consistency level falls into the acceptable range, the weight results are valid. Crowe et al. (1998)

provided a procedure, which is adapted from Canada and Sullivan (1989), for calculating the consistency ratio:

1. Calculate a new vector "*C*" by multiplying the pair-wise comparison matrix "*A*" on the right by the estimated solution vector "*B*".

   In mathematical terms, the equation for multiplying the matrix A (a_{ij}), vector B (b_j) to obtain vector C (c_i) is:

$$c_i = \sum_{j=1}^{n} a_{ij}\, b_j \qquad (i = 1, 2, \ldots\ldots, n)$$

2. Calculate a proper or eigen vector "*D*" by dividing the vector "*C*" by its corresponding element in vector "*B*".
3. Calculate the maximum eigenvalue (λ_{max}) by averaging the numbers in vector "*D*".
4. Calculate the consistency index (CI) for a matrix of size n according to the formula: $CI = (\lambda_{max} - n)/(n - 1)$.
5. Calculate the consistency ratio (CR) using the formula: CR = CI/RI where RI is the random index for the matrix size, n. Table 3.4 is a random index table which is obtained by approximating random indices for matrices of order 1 to 10 using a sample size of 500 (Saaty, 1980).

Table 3.4: Average Random Index Values

Size of matrix	1	2	3	4	5	6	7	8	9	10
Average RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Note: Source from Saaty (1980).

If the CR is greater than the acceptable value, this empirically reveals excessive intransitivity of preferences. CR provides a very good estimation of the consistency of the respondents in answering the questions. This thesis adopted a procedure that those participants with low degree of consistency

would be dropped out from the analysis. The procedure was as follows:

1. If more than half of the weighting sections could not pass the consistency test, the questionnaire is said to be not usable and would be excluded.
2. Of those usable questionnaires, sections with CR greater than the acceptable value would be excluded from the analysis.
3. If there is very few or no usable questionnaires, the arithmetic methods suggested by Saaty (1980) for judgmental revision would be used to improve consistency.
4. If judgement revision cannot solve the inconsistency problem, then another recourse to reduce the CR values is by re-estimating preferences in which to improve the quality of judgements in making pair-wise comparison (i.e. move back to Step 4 as shown in Figure 3.1). If this fails, then the last resource is to jump back to Step 2 (in Figure 3.1) so that the problem has to be structured more accurately by grouping similar elements under a more meaningful attribute schema.

Step 7: Calculating the Mean of the Relative Weights of Those Ratings with Acceptable Degree of Consistency for Further Analysis

Conceptually, the basic problem with a hierarchy is to seek the answer for the ultimate goal set at the highest level from analysing the interactions of the various levels of the hierarchy. More specifically, it is a method for evaluating the composition of the relative weights or priorities of the elements on each level, except for the highest level and the alternative level (when a selection has to be made). Then, the influence of one level on the adjacent level is taken into consideration, leading to the calculation of the final composite weights. In this study, the final composite weights for the last level were not calculated. Instead, it calculated the mean relative weights estimated by the experts on each of the levels.

3.4 CASE STUDY METHODS

Case study is a common research method that intends to explore some understanding from cases. It differs from traditional measurement-based evaluation as it seeks unbounded, qualitative information rather than pre-programmed, quantifiable data (Brinkerhoff, 1983). Nelson (1996) further argued that case research is apropos if the situations are complex and not known. It tends to be exploratory since it examines situations, such as when there are relations of several variable factors, or when the pattern of variables is not known or not sure if it is consistent and predictable from one situation to another. While the holistic nature of the management role in construction leads to more complex situations and the organic forms of interaction put forth more unpredictable outcomes, the use of the case approach is more justified.

3.4.1 A Case and a Case Study

A case is not like a fiction. A fiction is made for entertainment while a case is written for serious discussion purposes. It is defined as "a genuine event (or a series of events) or a situation". "A case report is, initially, empirical evidence from the field of study, narrating a story, or describing situations. Thus, a written case is evidence of a learning experience which may enable the construction of theory or the testing of theory" (Nelson, 1996, p.23). Learning and insights can be induced from descriptive cases. He further suggested that the case materials should be examined as they may help to capture the complexity of the emerging patterns and explore their nature. A narrative, anecdotal summary of his suggestions is in Table 3.5.

A case study makes the best use of a case and brings vicarious reality, derived from accounts of practical situations and decision making, to the learning experience of a course of study. Case study is a kind of research method, which is a relatively detailed description and analysis of an individual, event, institution or other social unit (Polit and Hungler, 1987). Lincoln and Guba (1985) refer to case study as pattern theory that is an explanation developed

during naturalistic or qualitative research. According to Neuman (1991), pattern theory uses metaphor or analogies to give meanings to some relationships. It adopts an inductive approach to research to build a theory but not represent logical deductive reasoning.

Table 3.5: A Summary of Case Uses in Research

Approaches in research	• To construct theory from empirical data by inductive method. • To test the application of theory empirically by deductive method.
Benefits of case studies	• To describe examples of experience in "real" situations. • To give a topic "life" or "human" interest. • To stimulate and focus discussion and exchange experiences and views. • To develop insight into types of situation and event. • To practise analytical and decision-making skills and develop judgement in a safe environment.
Use of discussion cases	• The analysis of a practical problem or decision situation. • The judgement of the character of actors in a situation. • The proposal of a theoretical solution for a problem situation. • The anticipation of factors affecting the implementation of a proposed solution. • The application of a theoretical solution to a problem situation.

Note: Source from Nelson (1996)

However, Nelson (1996) commented that a case study can be used to test a theory ascertained based on data collected from a survey though a single case may be queried of its "credibility" and "persuasiveness". It is well accepted that an observation is not possible to obtain all of the relevant data so that more than one observation or case is necessary to formulate a theory. This may be even true that for testing theory using observations or cases, the replication of the expected outcome in a series of observations or cases may be more desirable. Yet, aged (e.g. Znaniecki, 1934, c.f. Nelson, 1996) as well as modern methodologists (e.g. Gill and Johnson, 1991) disagreed that testing a theory using a single case or observation has the problem with the desire to generalise. They qualified this by pointing out that "if well done, the study of one instance of the phenomenon of interest will suffice and no subsequent

investigations are necessary into the same phenomenon" (Gill and Johnson, 1991, p.116).

For testing a theory, a case would be focused on a system seeking evidence in support of the theory. The collection of data is structured to ensure that only relevant evidence needs to be collected. In this thesis, the system will be the key elements of the practical model.

3.4.2 Comparative Case Study

Why do we need comparative case study? The answer is that a single or a group of success cases does not purport to produce a balanced assessment, which prohibits the desire of generalisation (Brinkerhoff, 1983). In order to satisfy the requirements of external validity, two extremely different cases bare the minimum for testing the proposed model or theory. This is what Yin called "(the) "analytic generalisation", in which a previously developed theory is used as a template with which to compare the empirical results of the case study" (1994, p.31). The empirical results from two or more cases may be considered yet more potent if the cases help to support a theory but not a "rival" theory.

In general, contrasting a successful case from a failed case will provide confirming evidence. Specifically, comparing two extreme cases will generate similarities and differences, leading to accumulative insights strengthening our understanding of the subjects. Kast and Rosenzweig (1985) agreed that to compare means to examine in order to observe or highlight similarities or differences. Three major concerns of comparative case study are worth noting as follows:

(A) Strategy for Case Data Collection

Brinkerhoff (1983), in his study of the selection of success cases for training

research, suggested that there is no rigorous, scientific method to accomplish the selection of cases, and to a large extent, the selection is an intuitive and subjective process. He provided some useful techniques to select cases for training research, which are worth adapting in this thesis to be its case study strategy:

- Perceptions of those relevant people, such as those who are taking part in the partnering team or those who are closely associated with the partnering team, should be focused.
- If a structural interview is not possible, a number of quick surveys, such as asking simple questions through several phone calls or some memos of a relevant person, will suffice. Assembling these snapshot-typed collections of data will produce sequential and meaningful evidence.
- It is imperative to use workshop materials. Other than quick and short interviews, useful workshop materials can be used, which may help to identify important evidence.

Additionally, the selection of data source is very important. Yin (1994) provided six sources of data/evidence – documentation, interviews, archival records, direct observation, participant-observation and physical artifacts. A combination of these sources is called data triangulation. According to Denzin (1978) and Patton (1987), triangulation has four basic types:

- data triangulation uses one or more data sources;
- investigator triangulation involves the use of several investigators;
- theory triangulation uses multiple research designs to analyse the same data set; and
- methodological triangulation is the use of multiple methods.

Triangulation is argued to address the potential problems of construct validity by different approaches. Data triangulation, as used in this study, pertains to multiple sources of evidence to provide multiple measures of the same phenomenon, leading to the development of converging lines of inquiry (Yin,

1994). Yin et al. (1993) also found that multiple sources of information were rated more highly, in terms of their overall quality, than single source of information. "Thus any finding or conclusion in a case study is likely to be much more convincing and accurate if it is based on several different sources of information, following a corroboratory model" (Yin, 1994, p.92).

(B) Structure or System for Comparison

As previously stated, for testing a theory, a case would be focused on a system in search of evidence. Newcombe (2000) further stressed that the design of a system focusing on some "test-effective" characteristics or dimensions is a promising way in comparison. His thought supports the intention to conduct a comparative analysis of the two cases in accordance with aspects of the key elements in the practical model. Campbell (1975) referred to this as a general strategy for qualitative research to accomplish internal validity, whereby some propositions or criteria are developed to compare among cases. A cross-case analysis is established if multiple-case studies are used (Yin, 1994). Because the propositions can shape the data collection plan, it gives priorities to the relevant analytic strategies. In other words, it helps to identify useful data and ignore other data that are useless, and can be very useful in guiding case study analysis in this manner. Accordingly, it aids to plan and organise the entire case study and to define the theoretical propositions about causal relations – answers to "how" and "why" questions – to be examined (Yin, 1994).

Such an analytic framework has the advantages in achieving acceptable level of the external validity and reliability. For the former, this framework represents the template of the hypothesised or proposed theory, which becomes the main vehicle for generalisation, to compare the empirical results from the two cases. For the latter, the framework forms a protocol to be reliable to aid data analysis from further cases when necessary.

(C) Considerations for Case Study Design

In conclusion, the thesis has identified some considerations for case study design as follows:

- It is crucial to make sure that the case study provides sufficient data for analysis. Two sources of evidence (i.e. interviews and documentation) are adopted to collect useful data.
- Data are collected in the natural setting without any manipulation of the constructs.
- The interviews are undertaken with open-ended questions where the informant is free to express opinions based upon personal experience without propositions' boundary.
- An analytic framework is developed to set the criteria for comparisons to avoid the possibility of biased analysis due to non-systematic collection and interpretation of data.
- Anonymity of the informants and sensitive information (e.g. project's name) are maintained to reduce political and ethical sensitivity that may be detrimental to the validation of the data set.
- Although problems of generalisation or external validity are addressed, this comparative case study's evaluation is only a general one. However, such a general evaluation is sufficient to maintain a certain degree of confidence.

3.5 SUMMARY

This chapter used Yin's (1994) table to justify the use of research methods for the study. It was planned to use surveys, including simple rating method and AHP, to develop and test the conceptual model of partnering. On the other hand, two case study methods were used to evaluate the practical model of partnering. More specifically, this study evaluates the practice of partnering by implementing it in a real life project, and by a comparative study of two

extremely different cases. Some validity and reliability issues were addressed. Descriptions of AHP and the two case study methods were also provided.

CHAPTER 4: TEST OF THE CONCEPTUAL MODEL

4.1 INTRODUCTION

The objective of this chapter is to test the hypotheses proposed in Chapter 2. These hypotheses constitute the partnering conceptual model that specifies relationships of elements within the model including critical success factors, the partnering process and strategic or project nature. By incorporating a specific procedure for testing the conceptual model where the data are properly primed, a practical model can be established and is anticipated to be applicable widely in the construction industry. Before testing and refining the conceptual model, it is essential to clarify the concepts of a system model and a process model.

Kartam et al. (1997) referred to a system model as a model that focuses on the surrounding effects of a process but not the specific steps that constitute the process. One of the popular system models is the conversion model, which portrays a transformation process. Walker (1985) described it as an input-process-output model, and applied it to explain the processes in a construction project, such as the client's process, the construction process, etc. However, a system model is argued to be unable to differentiate between value added (processing) and non-value added (flow) activities (Kartam et al., 1997). On the other hand, Koskela (1992), stemmed from the conversion model, developed a unified model for the direct production process. The Koskela's model identifies the flow from one sub-process to another, distinguishing the value adding processing units from the non-value adding flow of materials and information. Yet, Kartam et al. (1997) argued that the Koskela's production model is only a process flow model that does not realise the system concept and ignores the interactions and inter-dependencies between processes. In other words, a process model serves to model the production process while a system model identifies the management processes that affect the production process.

The partnering conceptual model takes advantage of both model concepts. It portrays the whole partnering process into three independent stages, each of which has its own process that leads to another, highlighting the process flow. Moreover, it serves as a system that portrays the surrounding impacts on the process stages. This system-process model is the foundation for conceiving the key activities as sets of operation within a practical model. The next section will describe this model in greater details.

4.2 CONCEPTUAL MODEL OF CONSTRUCTION PARTNERING

Figure 4.1 illustrates the conceptual model of partnering in construction. This conceptual model uses a three-stage process – *formation*, *application* and *completion and reactivation*, which forms the basis for considering what factors lead to the success of each stage. Moreover, each stage of the process is likely to possess a unique set of success factors. Within each set of factors, it is proposed that the factors may vary in their strengths impeding on the process stage, which may help to explain the different natures of project and strategic partnering. This is supported by Barlow et al. (1997) who argued that although the basics of the two types of partnering (i.e. project and strategic) are similar, they still possess different functions and provide diversified benefits.

The three stages manage in a sequential process flowing from left to right, while a loop exists for another cycle of the process. This loop distinguishes a one-off relationship from a long-term co-operation. The former is project partnering, while the latter is strategic partnering. It is proposed that some conditions must be achieved in order to reactivate the partnering relationship successfully. In fact, this three-stage process is proposed based upon two considerations. Firstly, the partnering process is similar to an organisational change process (Wilson et al., 1995). It is common that a change process consists of three stages (i.e. unfreezing, process and re-freezing). For another cycle to occur, the re-freezing stage will unfreeze again. Adoption of the

concept of a "change" cycle is popular in other areas (e.g. continuous improvement, total quality management, etc.) (Love et al., 2000). Secondly, there is a common premise in the area of strategic alliance (a related concept to partnering) that the process should be composed of three key stages (i.e. creation, implementation and evaluation) (Das and Teng, 1999; Buono, 1997). Incorporating these concepts, this study is intended to propose the stages of partnering as follows:

- *Partnering formation* refers to an agreement, implicitly or explicitly, made by all key construction parties to establish an informal relationship for the purpose of accomplishing mutually agreed goals and objectives. This stage involves an independent process (or a sub-process of the whole partnering process). If the construction parties express their interests to adopt partnering, they will assign representatives to form a team to establish the partnering goals and objectives. Upon agreement with the terms and conditions, a partnering will be formed. Sometimes a written agreement or charter will be drafted and signed by all parties, which assures their commitment explicitly. Usually, a construction project is yet to commence at this stage (Abudayyeh, 1994).

- *Partnering application* refers to the execution of the informal relationship to accomplish the mutually agreed goals and objectives in line with the construction project. In other words, this stage implements the partnering concept during the project. At this stage, partnering is a management tool to facilitate the construction project. More specifically, all parties will carry out their work according to their agreed partnering goals and objectives. If any problems arise, the parties will solve them together.

- *Partnering completion and reactivation* refers to the intention of the construction parties to re-run an informal relationship with the same group of companies for a new project after the completion of the current project. A successful partnering may stimulate the parties to form another one. A feedback loop not only represents a recurrence but a new cycle that

embraces the experience from the last cycle. Reactivation of a partnering process means the same group of companies should be retained in the partnering relationship. Modification of goals and objectives may be necessary for different construction projects. However, if any of the team members is new, the partnering process is not reactivated but instead a new process is needed to establish. In other words, project partnering involves such three stages as formation, application and completion, while strategic partnering consists of three stages as formation, application and reactivation.

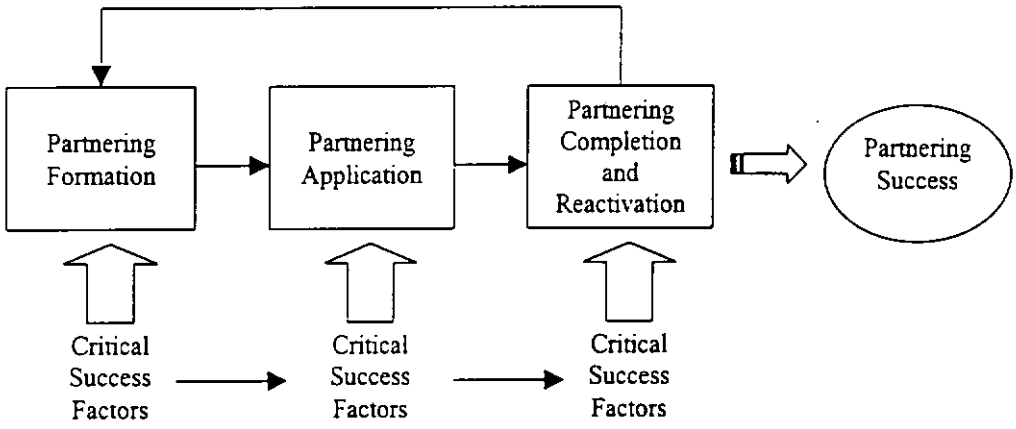


Figure 4.1: A Conceptual Model of Partnering

Moreover, while there should be individual set of critical factors affecting each of the partnering stages, some of these CSFs are likely to affect the whole partnering process. For example, organisations forming strategic partnering focus partly on broader and long-term business goals (other than specific objectives), while those with project partnering emphasise on specific objectives only (Barlow et al., 1997). The loop from completion to initialisation is therefore established for strategic partnering which is expected to work continuously and repetitively from one project to another. Experience has been accumulated where learning climate is said to be crucial. Parties are looking for continuous improvement to sustain high quality of products (Kaye and Anderson, 1999). Apart from the similar factors that the two types of

partnering encounter during partnering formation and application. there are other factors affecting the intention to reform partnering. Inasmuch as different research purposes are proposed, it is crucial to test if there are different sets of CSFs affecting the partnering process as well as the two types of partnering.

4.3 DESCRIPTION OF POTENTIAL CRITICAL SUCCESS FACTORS

The first thing to do is to develop a set of factors for the success of partnering. After a review of the major works of the partnering literature, fourteen factors were identified (see Table 4.1), which formed the basis for determining the critical factors for partnering success. Many published papers focusing on partnering have identified these factors (e.g. Cook and Hancher, 1990; Woodrich, 1993; Brown, 1994; Ellison and Miller, 1995; Dozzi et al., 1996; Crane et al., 1997; Larson, 1997; Barlow and Jashapara, 1998; Gardiner and Simmons, 1998; Black et al., 2000).

Table 4.1: Potential Factors for Partnering Success

Critical Success Factors	Partnering agreement Team building Joint problem solving Open communication Effective co-ordination Creativity Long-term commitment Mutual trust Continuous improvement Adequate resources Top Management support Learning climate Partnering experience Facilitator

According to Sanvido et al. (1992), Rockart (1982) was the pioneer to use the term "CSFs" in the study of project management. In the context of project management, the study of the effect of critical factors on the project success has been recommended (e.g. Pinto and Slevin, 1987; Belassi and Tukel, 1996; Burgess and Turner, 2000) and has also been attempted (e.g. Chua et al.,

1999). In other management disciplines, the examination of the relationships between critical factors and the success of alliance has been conducted (e.g. Parkhe, 1993). They worked on the common premise that by analysing the relationships between the CSFs and the partnering process, partnering teams would be able to identify the real critical paths conducive to the success of partnering.

The list in Table 4.1 is not exhaustive, but a shortlist of those that are common, applicable and adjustable. As Rowlinson (1988) suggested, cross-sectional study should choose factors that are well defined and studied because respondents can be able to respond easily with common or well-known factors. The fourteen factors are described below:

1) **Adequate Resources**

Adequate resources are tangible or intangible investments supplied by each involved party to share with other members in a partnering relationship in terms of knowledge, technology, information, specific skills and capital, which are sufficient to support a successful partnering. Since resources are scarce and competitive, it is not common for an organisation to share their resources with other organisations. Crowley and Karim (1995) used the term permeable boundaries to describe the flow of appropriate resources from one organisation to another and the restriction of the leakage of sensitive and confidential information. In fact, it is important to ascertain the maximum use of the shared resources. The main resources are expertise (including knowledge, technology, information, and specific skills) and capital.

Since a construction project usually requires a variety of skills and technology, the parties involved normally belong to different professional backgrounds (architects, quantity surveyors, structural engineers, etc.). Their complimentary expertise can be used to strengthen the competitiveness and construction capability of a partnering relationship if managed effectively. Nevertheless, for enhancing the sharing of resources,

mutual interaction should be emphasised (Devlin and Bleackley, 1988). Due to the fact that resources are scarce, conflicts arising from resources are common (Ulusoy and Özdamar, 1996). As Brown (1994) supplemented, adequate resources are used not only to complete the project but also to resolve disputes (Brown, 1994). Without adequate resources, the accomplishment of a successful partnering will be queried (Cheng et al., 2000).

2) Top Management Support

Another critical input is top management support. Support from top management is crucial to initiating and leading a partnering arrangement. As senior management formulate the strategy and direction of business activities, their full support and commitment is vital for partnering success. Besides, mutual agreement from senior management of involved parties is also important since the goals projected by each organisation should be compatible and aligned with one another (Rai et al., 1996).

Since top management plays the chief role in running an organisation, any changes cannot be implemented without true management involvement (Häkkinen, 1995). As Deming (1986) pinpointed, organisational change is better to be initiated at a top-down approach since top management can drive out fear from those who are affected by change (i.e. change recipients). Thus, top management support is the key to partnering. After expressing the support of a partnering arrangement, the top management will develop conditions, such as the provision of resources, to promote and induce changes (Lewis, 1994).

3) Partnering Agreement

When some construction parties agree to establish an informal partnering arrangement, a partnering agreement is formed. Usually, such an agreement is associated with a list of goals and objectives to be achieved by all agreed parties. They are usually tangible project goals, such as

quality, cost, schedule, safety and time (Cowan et al., 1992), and some intangible contextual goals, such as communication, trust, commitment, etc (Brooke and Litwin, 1997).

Although a partnering arrangement can be verbally agreed, most often it is a written statement, together with the list of common goals and objectives, signed by all parties. Some have argued that it is formed voluntarily (e.g. Loraine, 1994), but some others have seen it as the mission or motto of partnering and as the first step of a partnering process (e.g. Abudayyeh, 1994). A partnering agreement can be labelled as a partnering charter (Harback et al., 1994; Brooke and Litwin, 1997), mission statement, partnering commitment statement (CIIA, 1996) or a partnering certificate.

4) Team Building

Team building is the establishment of a partnering team which consists of members from all involved parties where these representatives are all senior executives of their organisations and possess the ability, including knowledge, skills and experience, and the authority to act on behalf of their organisations. Such a partnering team is also known as an inter-organisational team or multi-disciplinary team to reflect that the team is formed by several organisations, which possess various professional knowledge and skills in the construction industry.

These partnering representatives are called champions who are committed to making the partnering process work productively (Loraine, 1994). Nam and Tatum (1992) agreed that champions are key individuals of an organisation. They are delegated with necessary power while they have the ability to exert influence within their organisations to put forth the partnering decisions that are made.

The team is core to the partnering process as it is self-managed and is organised to monitor the achievement of the partnering goals (Matthews and Rowlinson, 1999). Moreover, the decisions made by team members

may directly affect the whole construction project. As Nielsen (1996) realised, the partnering team delivers to the partnering relationship with more than half of the potential benefits. This statement indicates how importance the team is. For the team to be effective, it has to be formed, developed and maintained by a team building process (Albanese, 1994).

5) **Joint Problem Solving**

Joint problem solving is defined as a collective decision made by the partnering team to create alternatives for problematic issues, including conflicts, disputes and claims (Cheng et al., 2000). Conflicting and disputing issues are common in construction projects and are inevitable in inter-organisational relationships (Dershimer, 1993; Kumaraswamy, 1998), especially those parties who have incompatible goals and expectations.

Recently, the construction industry, including governmental projects, favours the use of Alternative Dispute Resolution (ADR) to resolve disputes and conflicts (Treacy, 1995; Cheung and Yeung, 1998; Cheung, 1999). Dispute or conflict resolution involves terms such as negotiation, arbitration, mediation and litigation (Brown, 1994). According to Treacy (1995), arbitration was probably the earliest method of ADR and has proved to be successful over the years, attracting courts to use it in replace of the heavy load of litigation. Arbitration has advantages over litigation in terms of lower cost and speedy resolution (Steen, 1994).

However, Miles (1996) argued that any forms of dispute resolution should be considered as the last resort. It is because the impact of conflict resolution can be either productive or destructive and largely depend on the manner in which partners resolve conflict (Mohr and Spekman, 1994). Conflict resolution techniques, like coercion, confrontation and outside arbitration, are counter-productive and fail to achieve a win-win situation. As Steen (1994) stressed, it may proceed in adversarial debates, endangering partners' future relationships.

Stipanowich and Matthews (1997) then raised the use of conflict avoidance. In fact, partnering helps to avoid conflicts and disputes as it promotes mutually determined goals and shared risks so that disputes and claims can be minimised. Certainly, problems and conflicts cannot be totally avoided since construction projects involve too many parties working together. For enhancing co-operation and greater promise of long-term success, organisations are suggested to adopt the more productive escalation/resolution techniques (e.g. joint problem solving). Especially when the environment is more uncertain and dynamic, engaging in joint problem solving is seen to be a rescue strategy for partnering. During joint problem solving, parties gather together and share with each other their own views on the conflict issues and their resolving tactics. Such a high level of participation among parties may help to create their commitment to the mutually agreed solution.

6) Facilitator

Facilitator is an expert who possesses strong partnering and construction background recruited for a partnering team externally to facilitate the formation of partnering. It is well accepted that independent facilitator is one of the essential components of partnering (CIIA, 1996). Schultzel and Unruh (1996) agreed that in most cases, the most successful partnering co-operative projects used a facilitator to provide the required knowledge, materials, training, support and discipline. A facilitator is hired to lead the workshops for the establishment of the partnering agreement. This expert explains what is going to be achieved in the session and serves as a mediator during the ensuing group discussions (Abudayyeh, 1994). Once the partnering agreement is signed, the facilitator's work is complete. Then, the partnering team organises workshops for themselves and takes over all the partnering duties. Sometimes, the facilitator will act as a temporary external consultant for the partnering team.

7) Open Communication

Open communication in partnering refers to the free flow of resources in terms of ideas, knowledge, information, specific skills and technology by means of different effective communication channels. Since resources are scarce and competitive, it is not common to share resources among organisations. Crowley and Karim (1995) used the term permeable boundaries to describe the flow of appropriate resources from one organisation to another and the restriction of the leakage of sensitive and confidential information.

In fact, it is important to ascertain the maximum use of the shared resources. The main resources are expertise (including knowledge, technology, information, and specific skills) and capital. Since a construction project usually requires a variety of skills and technology, the parties involved normally belong to different professional backgrounds (architects, quantity surveyors, structural engineers, etc.). Their complimentary expertise can be used to strengthen the competitiveness and construction capability of a partnering relationship if managed effectively. Nevertheless, for enhancing the sharing of resources, mutual interaction should be emphasised (Devlin and Bleackley, 1988).

Other than sharing and exchange of resources, open and flexible communication does help to promote better understanding among members. In addition to the importance of establishing open communication between client and other professional parties such as project manager, consultant designers and surveyors, Love (1997) pinpointed that subcontractors rely heavily on the general contractor for developing open communication. It is therefore essential to create a web of open communication for all involved partnering parties.

8) Effective Co-ordination

To co-ordinate is to arrange or organise so as to achieve a desired or effective combination of parts. Co-ordination in partnering can be defined as the perception of one party toward the expectation of other parties on it

in fulfilling a set of tasks (Mohr and Spekman, 1994). So, co-ordination is said to be effective when one party has successfully completed the tasks and has satisfied the expectation from others.

Hinze and Tracey (1994) realised that co-ordination is a determining factor in the subcontracting success of a construction project. Halman and Braks (1999) also argued that co-ordination problems are more common in international projects as the geographical dispersion of project parties creates such differences as legal practices, culture, language, etc. Greater co-ordination may achieve stability in an uncertain environment (Pfeffer and Salancik, 1978) and mutually fulfilled expectations (Frazier et al., 1988). The worst situations associated with poor co-ordination are often a loss of trust and commitment, which may stimulate adversarial relations.

To attain effective co-ordination, more contacts between parties and the exchange of expectations from each other are crucial. Moreover, partnering parties must have clear workflow structure to specify and organise the tasks and activities for the partnering project (Raghu et al., 1998). These tasks and activities are preferred to be pre-defined and coded (i.e. standardisation) so that a common language is created for smooth exchange or sharing of expectations (Nassimbeni, 1998).

9) **Creativity**

Creativity refers to the ability to generate new ideas. In search of breakthrough opportunities to leap forward so that performance can be greatly enhanced is a creative process (Schultzel and Unruh, 1996). Creativity becomes the common theme in partnering as it may encourage innovative work and management practices. Viewing that partnering is formed for undertaking a single construction project may limit its usefulness to the partnering parties. In addition to reducing adversarial relationships and expensive litigation, partnering can help organisations improve their performance and achieve continuous growth when it can expand its utility as a strategic function. Creativity is then expected to be a

norm in the partnering team (Nielsen, 1996; Cheng et al., 2000) Creativity implies innovation and so is always alongside with terms such as continuous improvement, TQM, value engineering/management, benchmarking, re-engineering, etc.

10) Long-term Commitment

Partnering literature is rife with suggestions to create commitment (e.g. Moore et al., 1992; Woodrich, 1993; Loraine, 1994; Crowley et al., 1995). Both old and new beliefs agreed that a co-operative system could not run well without the willingness of those who are able to contribute efforts to the system (Barnard, 1968; Cook and Hancher, 1990). This is what Brewer (1993) called the organisational commitment that has been a keen interest of organisations for half a century.

Organisational commitment is defined as "the relative strength of an individual's identification with and involvement in a particular organisation" (Porter et al., 1974). It involves the extent of an individual's belief in and acceptance of organisational goals and value, desire to maintain organisational membership and willingness to exert considerable work effort on behalf of the organisation (Mowday et al., 1982). Other than the use of commitment to express one's willingness (loyalty and intent) to stay in an organisation, it can be related to other things. For example, Crosby and Deming (who are known as "Quality Gurus") emphasised management commitment and argued that management who pays serious attention to quality are highly committed to improve quality (Goffin and Szwejczewski, 1996).

This study focuses on long-term commitment to partnering or what Cook and Hancher (1990) called the commitment to long-term partnering relationship. According to Cook and Emerson (1978), commitment is the extent to which selection of current partners is predicted from previous partnership. This definition links to inter-organisational commitment. King and Ehrhard (1997) also realised that commitment not only is essential for

individuals, but is also important for organisations. Yet, a more appropriate meaning of long-term commitment to partnering can be the extent of the willingness of one party to maintain the current partnering relationship with other parties to weather unanticipated problems based on some positive aspects. As Sharma (1998) complements, commitment shows a desire by the alliance partners to rely on "voice" rather than "exit", to resolve differences through discussions rather than by leaving the alliance. More committed parties are expected to balance the attainment of short-term objectives with long-term goals and achieve both individual and joint missions without raising the fear of opportunistic behaviour (Mohr and Spekman, 1994; Parkhe, 1993).

11) Mutual Trust

"Partnering is about trust" (Lazar, 2000, p.81). The formation of a trust-based relationship is what partnering parties anticipate (Matthews et al., 2000). Trust may lead to co-operation or vice versa (Rosseau et al., 1998). Trust has been defined ubiquitously. Pruitt (1981) referred to trust as the belief of both parties on each other that it is reliable in fulfilling its obligation in an exchange relationship.

A more general definition of trust has been provided by Hosmer (1995) who defined it as "the reliance by one person, group or firm upon a voluntarily accepted duty on the part and interests of all others engaged in a joint endeavour or economic exchange". The term "reliance" here implies that "the party relying on another will forbear to act defensively until it is proven with reasonable certainty that the other party has become no longer trustworthy" (Lazar, 1997). Hence, trust has to be mutually established, leading to terms like mutual satisfaction (Lazar, 2000) and mutual confidence (Munns, 1996).

Lazar (2000) has extensively studied trust for project partnering and concluded that trust can grow over time, emerge spontaneously and pre-exist. Mutual trust is critical to "open" the boundaries of the relationship as

it can relieve stress and enhance adaptability (Williamson, 1985), increase information exchange and joint problem solving (Zand, 1972), and promise for better outcomes (Mohr and Spekman, 1994).

12) Continuous Improvement

Continuous improvement is seen as a long-term change process (Atkinson, 1994; Chapman and Hyland, 1997). It is defined as an organisation-wide process of focused and on-going incremental innovation (Bessant et al., 1994). In the area of quality management, it is defined as the long-lasting success in improving quality (Kaye and Anderson, 1999). It is a key component in the framework model for re-engineering at a construction project level as described by Love and Li (1998) while it is a concept embodied in total quality management (TQM).

Continuous improvement involves continuous learning (Garvin, 1993) devoted to gradual process improvement (TQM), radical process improvement (BPR) and learning process improvement (a learning organisation) (Kilmann, 1995). For striving in the turbulent environment to maintain a competitive position, organisations are becoming a learning organisation, pursuing the strategy of continuous improvement in their knowledge assets (Senge, 1990). Once an organisation has experienced a number of successful improvement cycles, the knowledge gained will spread throughout the entire organisation (Nonaka, 1991).

13) Learning Climate

In a strategic approach to partnering, learning is undoubtedly a means to achieve competitive advantage. How to benchmark the best practices and motivate employees to learn have become common strategies of organisations. In order to build such an organisation-wide learning strategy, organisations should be aware of the importance of a building block of human learning interaction (Sims, 1992).

Although learning is more often considered as a process of "getting", "giving" is said to be equally important since the total learning concept is embedded in a reciprocity process that emphases mutual and equal balance. This raises the need for developing a learning climate, which can be defined as a habit to acquire the knowledge, skills and competence established within a group of people. The term "learning climate" is seldom used in the current and past publications. One example of using this term is from Sims (1992) who attempted to develop a learning climate in public sector training programs.

14) Partnering Experience

Whether people "learn from experience" (Burgoyne, 1995) or "learn by experience" (Mumford, 1994), learning is seen to be a kind of development at an individual level where experience creates the opportunity to learn (Riley, 1994). Experience and learning are two popular topical issues covered by most of the present disciplines. Notwithstanding, some profound theories, such as Kolb's (1984) Learning Cycle and Argyris' (1977) Double Loop Learning, have been established, and some best-selling references have become the blueprints for everyone, such as The Lessons of Experience from McCall et al. (1988) and The Fifth Discipline from Senge (1990).

In this study, experience is accumulated to become some new knowledge or skills or custom of practices that one has developed due to one's previous participation in some partnering events. Accumulative experience is synonymous with terms such as "emerging knowledge" (Hidding and Catterall, 1998) and "intellectual capital" (Bontis, 1998). According to Stewart (1997), knowledge and experience are the intellectual material that creates intellectual capital. Bohn (1994) argued that if knowledge is capital, it must be managed. Thus, experience has to be managed too. As experience is accumulated from time to time, it is essential to structure the intellectual assets (Bontis, 1998). That is to structure an organisation to become a learning organisation (Hidding and Catterall, 1998). It is well

understood that experience should be first accumulated at the individual level. The term "human capital" from Hudson (1993) is another way of expressing such accumulated experience from individual learning. Such human capital becomes capital of a learning organisation.

4.4. EXPLANATION OF THE USE OF METHODOLOGY

The study is designed to test the conceptual model of partnering step by step. In contrast to published studies that mainly focus on local cases, this study would like to examine the views and opinions from both local and overseas construction professionals. Considering the problems of collecting responses from overseas, this research used several electronic resource databases that could be subscribed by construction professionals around the world through Internet. This is a kind of "convenience samples", which are common to use in most organisational research (Dipboye and Flanagan, 1979). As Sackett and Larson (1990) commented, a convenience sample cannot attain representativeness that was conceived as solely achieved by a random sampling method. However, it is not correct to say that in such circumstances, generalisability cannot be guaranteed. In fact, relevance and prototypicality are two appropriate criteria for addressing the issues of generalisation other than representativeness (Sackett and Larson, 1990). A convenience sample is said to be relevant when its members come from the intended target population. For constituting a prototypic sample, the key members of the target population should be chosen. In this study, professionals of the construction field were invited to take part in this research, and thus they represented a relevant and prototypic sample.

The research applied the concept of triangulation to use multiple surveys to examine the conceptual model. Triangulation is effective to increase the degree of confidence in research (Yin, 1994). More specifically, Yin (1994) suggested that in contrast to a random sampling to ensure generalisation to the population, triangulation is appropriate to increase our confidence in the generalisability of the results. The strategy to use multiple surveys that

represent different samples is consistent with the theory of triangulation (Sackett and Larson, 1990). Conducting a sequence of tests to achieve the research objectives is popular in construction (e.g. Weston and Gibson, 1993), as well as in other areas (e.g. Coad, 1999). The purposes of this kind of empirical research are twofold. On one hand, they might use different research methods to achieve their different research objectives separately, while, on the other hand, they might use two or more surveys to address the issues of reliability and validity resulting in improving the degree of confidence of the research. Although they have different purposes, their proposed methodological strategy serves to address the research problems that may exist differently across various studies.

Using respondents around the world may raise the concern of cultural differences between professionals that may affect the answers of the questions. However, examining cross-cultural differences is a difficult task (Bhagat et al., 1990). It is due to not only the different dimensions of culture (Hofstede, 1980, 1983; Glenn and Glenn, 1981) but also several methodological pitfalls (Bhagat and McQuaid, 1982). The former makes it difficult to choose which dimension(s) is/are more likely to produce the variance in responses (Triandis and Albert, 1987), while the latter increases the obstacles in testing a cross-cultural research (Bhagat et al., 1990). As Triandis (1994, p.114) commented, "when we are showing a cultural difference, the difficulties are immense. There are so many rival hypotheses that must be checked and "controlled" that unless we are able to devote substantial resources to testing them, we should probably not even attempt to show such a (potential cultural) difference". This helps to avoid inappropriate tests of cultural variances.

In a more optimistic view, the evolution toward a global economic and socio-political system gives rise to the convergence of organisational cultures so that the cultural problems today may not be so acute as those in the older days (Triandis, 1994). On the other hand, it is believed that asking these questions to such a great detail may sharply reduce the response rate. As stated previously, this study is intended to develop a general model of partnering, and thus cross-cultural issues would be avoided by studying the elements with a

more consistent view around the world (i.e. testing common factors, general criteria, known process stages, simple measures, etc).

Rather than the use of multiple-item measures, single-item measures were employed in this survey. It is due to three main reasons. Firstly, the authors could not find any partnering papers having attempted to empirically develop measures of the tested factors. Most of the corresponding literature that focuses on critical success factors is known to be conceptual and descriptive papers. Secondly, the use of measurable instruments of variables developed from other areas might not be appropriate due to different study contexts (Oshagbemi, 1999). Thirdly, a single item is usually easier to understand than a multiple-item scale (Wanous et al., 1997; Hair et al., 1998). Although it is often emphasised that multiple-item scales have more detail in terms of aspects or attributes, single-item measures are argued to be suited in research (Scarpello and Campbell, 1983; Sackett and Larson, 1990).

Several studies have judged that single-item measures are acceptable. Wanous et al. (1997) and Wanous and Reichers (1996) completed two studies respectively (a meta-analysis and a survey) in the United States to compare single-item measure and multiple-item scale of job satisfaction (as an independent variable) to justify the one being more superior. Both studies concluded that single-item measures have acceptable reliability. Oshagbemi (1999), on the other hand, conducted a similar research in the United Kingdom. One of his conclusions is that both measures can be used independently although using them collectively is argued to be the best alternative. As he supplemented, "the choice of which method to use would depend largely on the objectives of the research" (Oshagbemi, 1999, p. 401). Job satisfaction is conceptualised as an attitudinal construct, and measuring its effect using a single item would render it a general nature (Oshagbemi, 1999; Wanous et al., 1997). Thus, the results can also be extended to other attitudinal variables when subjective scales are employed (Wanous and Reichers, 1996). Owing to the simplicity of single-item measure, some advantages are highlighted:

1. It is particularly useful for collecting data from respondents with different backgrounds. Multiple-item scales for different occupations or types of organisation may be difficult to design and administer (Oshagbemi, 1999).
2. It can be best applied to comparative studies (Oshagbemi, 1999). For example, comparing respondents with various occupations, or comparing findings with different aspects.
3. It is chosen when some constraints limit or prevent the use of scales (Wanous et al., 1997). For example, when measuring overall changes in an attitudinal construct, a single-item measure might be preferable to a scale.

As Wanous et al. (1997, p.250-251) emphasised, "if the use of a single item is indicated, researchers may do so in the knowledge that they can be acceptable. The use of single item measure should not be considered fatal flaws in the review process (of academic research)". It is worth noting that multiple-item scales of attitudinal variables are not perfect because they are unable to achieve retest reliability (e.g. Schneider and Dachler, 1978). Thus, single-item measures have been used extensively in research examining attitudinal variables (e.g. Wanous and Reichers, 1996). The use of single-item measures can also be found in partnering research (e.g. Weston and Gibson, 1993; Larson, 1995; Badger and Mulligan, 1995; Larson, 1997; Black et al., 2000; DeVilbiss and Leonard, 2000).

4.5 METHODOLOGY

Description of the three surveys is shown in Figure 4.2. The use of surveys for examining the conceptual model had been justified in Chapter 3 and previous sections. These surveys were undertaken consecutively (i.e. one by one). One additional benefit of this strategy was that each successive survey could be designed based upon the experience and respondents' advice gained from the preceding survey. For example, additional factors were added to study in the second survey with reference to the suggestions from respondents of the first survey. As a result, a conceptual model of partnering had been examined, and all the hypotheses were addressed. These efforts involved data collection from

three independent surveys. In order to avoid bogging down into meaningless facts, the data should be primed properly. The processed data (i.e. information) forges a strong link between the proposed hypotheses and the real practices. The three surveys were described briefly as follows:

- The first survey (the first questionnaire as shown in Appendix 1) used a detailed questionnaire to collect data regarding perceptions of construction professionals toward the partnering process stages, factors and criteria. . It tested hypothesis 1a, 1b and 2a.

- The second survey (the second questionnaire as shown in Appendix 1) used a short questionnaire to identify a group of success factors. It tested hypothesis 3a and 3b.

- The final survey used an AHP questionnaire (as shown in Appendix 1) to test the attributes of the model. It examined hypothesis 2b, 4a and 4b. The eight-step AHP method, described in Chapter 3, was adopted.

4.6 THE FIRST SURVEY: DESIGNING A CONCEPTUAL MODEL

4.6.1 Sample, Questionnaire Design and Data Collection

This first survey focused on checking the strengths of the posited factors on the partnering process in order to ascertain their criticality and collect more opinions to elicit omitted factors. As an initial stage of the study, all of these factors are tested with each of the three process stages (i.e. free to establish relationship with the stages) according to the data collected from the first questionnaire. This first survey was intended to examine the following hypotheses:

- Hypothesis 1a: There are critical factors common to both project and strategic partnering.

- Hypothesis 1b: Long-term factors affect more on strategic partnering than project partnering.
- Hypothesis 2a: There are similar as well as different process characteristics between project and strategic partnering.

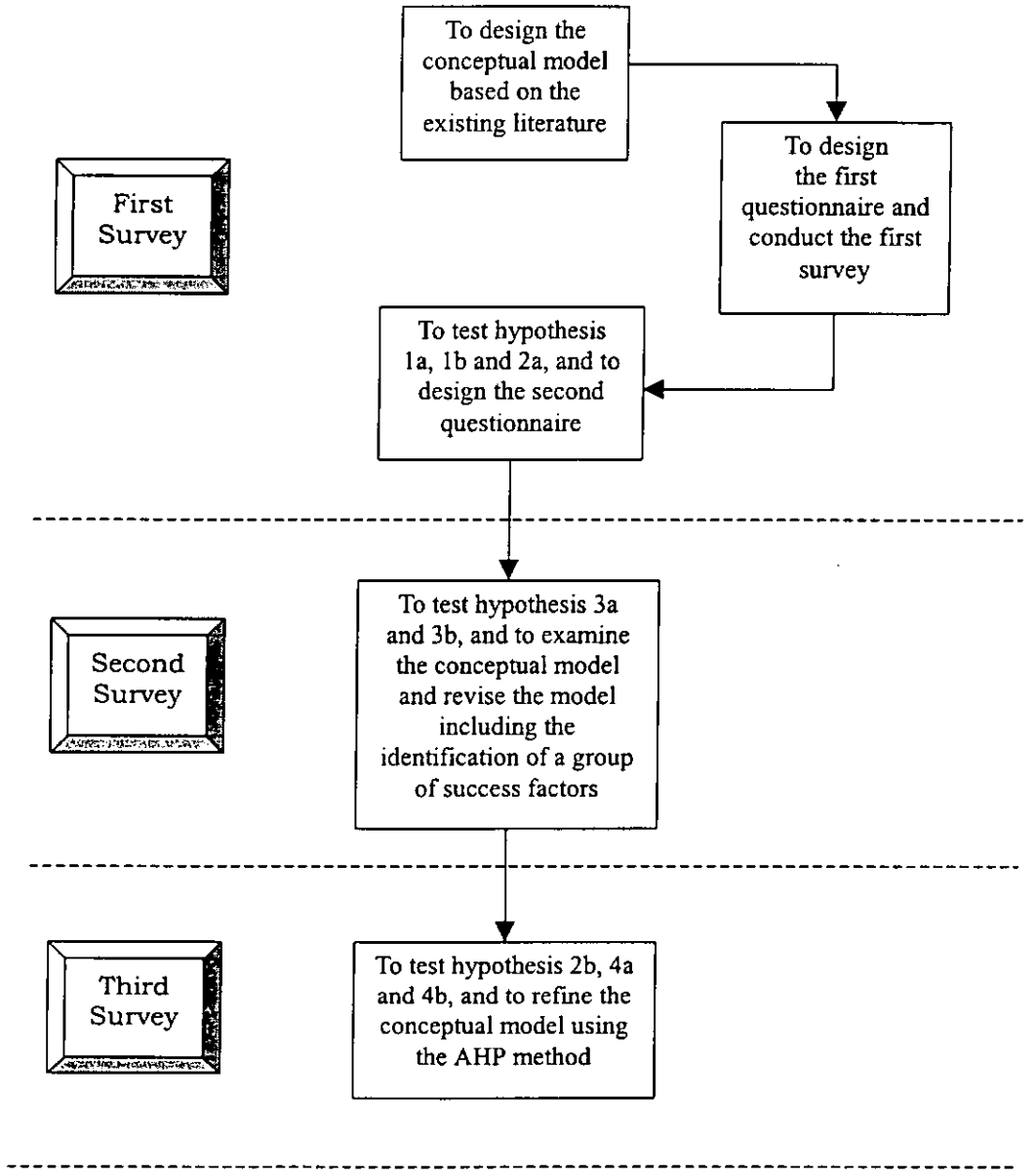


Figure 4.2: Three Stages to the Test of Conceptual Model

A questionnaire was purposely designed for testing these hypotheses (as shown in Appendix 1). It was divided into two parts to test the factors on

project and strategic partnering. The questionnaire was sent by email to academics and practitioners in the field of construction found in several resource databases. Those having the knowledge of partnering were invited to fill in the questionnaire (as shown in the sample cover message in Appendix 1). Since some of these databases did not disclose the total number of subscribers while some others did not guarantee that the message would be forwarded to the subscribers, a response rate could not be computed. Nevertheless, the response rate was not relevant to validate the effectiveness of this study. In fact, this study adopted a descriptive approach to research for the first two surveys and an integrative approach to research using the AHP method for the last survey. Altogether there were 34 replies. 7 replies were excluded due to incomplete responses, non-target respondents, etc., resulting in 27 responses for analysis.

27 professionals including architect, surveyors, structural engineers, civil engineers, etc., who were involved in construction projects, were participated in this survey. Demographic information shows that almost half of the respondents worked directly in the construction industry (48.1%), while others include Government (18.5%) and service industry (7.2%). This reflects that the participants were all working in organisations more representing their industry or field of work. More than half of the respondents worked in medium-sized organisations with a capacity less than 1000 employees (66.7%), while the remaining worked in organisations with a size of more than 1000. Most of them held a bachelor degree (except one who was a diploma holder) and had some years of work experience (no respondents were younger than 25 years old), representing a group of experienced professional. The respondents were composed of 26 males and 1 female, reflecting the structure of the construction professions, which were still dominated by masculine gender.

4.6.2 Findings and Discussions

For examining the hypotheses, the mean scores of all factors were calculated

and compared to determine their importance level on the three partnering process stages and the two types of partnering (project or strategic). T-test was therefore employed. Its procedure was to compare the mean scores of two factors for a single sample (Hair et al., 1998). It was used to test the null hypothesis that difference in means was zero. The analyses of the factors tied to three basic rules:

Rule 1. For a research rigor, factors with value > 4.00 were considered to be critical.

Rule 2. Comparing factors between the different process stages of the same type of partnering. Difference in mean scores is computed by subtracting the earlier stage from the later stage for the same type of partnering. Factors with significant difference in mean scores were selected for analysis.

Rule 3. Comparing factors between the same process stage of the two types of partnering. Difference in mean scores is computed by subtracting the project partnering from the strategic partnering for the same process stage. Factors with significant difference in mean scores were selected for analysis.

All analyses were subject to the above three rules. Rule 1 and 2 must be satisfied before a further account of the factors could be made. Rule 3 was used to cross check the effects of the factors between project and strategic partnering. Moreover, the evaluation of the level of satisfaction of rule 1 and 2 is subject to two further conditions as follows:

- If the value of a factor was larger than 4.00 in all three stages (i.e. rule 1), then the factor was deemed to be critical in all stages, regardless of the results of the test of difference in mean scores (i.e. rule 2).
- Conversely, if the value of a factor was not larger than 4.00 in all three stages, then the factor was deemed to be not critical in all stages, regardless of the results of the test of difference in mean scores.

Table 4.2 shows the mean scores (and associated standard deviation), which determine the importance level of the factors on the three partnering process stages and the two types of partnering. This table provides the information supporting the evaluation based on rule 1. As shown in the table, the fourteen factors were on the most left-hand side. The top row shows the three process stages; under each of them, there are two columns where one lists the mean scores of each factor for project partnering, and the other lists the mean scores for strategic partnering.

Due to the commonality of the posited factors, checking for gainsaying that the respondents are affected by the order of the factors during rating is important in rigorous research. The surveys of this thesis have addressed this by arbitrarily listing the factors for study. Moreover, the results of the ranks of factors in Table 4.2 were all different indicating that the responses were not influenced by the order in which the factors were listed. Therefore, the order of rating was not a problem in this survey.

Table 4.3 lists the results of T-test. This table compared the mean scores of different stages of the two types of partnering. Under each process stage, there are three columns (difference scores, T-statistic and probability level). "H0" is the null hypothesis, stating that there is no difference between the mean scores of the two types of partnering. To achieve a research rigor, the significance level was set to $p < .01$. Analysis of the findings is shown in Table 4.4 and 4.5. The former is for project partnering and the latter for strategic partnering.

Table 4.2: Mean Scores of the Factors

	Partnering Formation		Partnering Application		Partnering Reactivation	
	P.P.	S.P.	P.P.	S.P.	P.P.	S.P.
	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)	Mean (S.D.)
Adequate resources	3.41 (1.01)	3.37 (1.08)	4.30 (0.91)	4.37 (1.04)	3.56 (1.09)	3.63 (1.08)
Top management support	4.26 (0.86)	4.56 (0.58)	4.52 (0.70)	4.44 (0.75)	4.30 (0.67)	4.59 (0.57)
Partnering agreement	4.07 (1.04)	4.26 (0.90)	3.37 (1.08)	3.22 (1.19)	2.96 (1.06)	3.30 (1.03)
Team building	4.33 (0.78)	4.41 (0.80)	4.00 (0.96)	3.89 (0.97)	3.70 (0.95)	4.00 (0.83)
Open communication	4.52 (0.75)	4.67 (0.68)	4.70 (0.67)	4.52 (0.70)	3.96 (0.76)	4.19 (0.88)
Effective co-ordination	4.56 (0.64)	4.67 (0.55)	4.67 (0.62)	4.52 (0.75)	4.04 (0.81)	4.15 (0.86)
Creativity	3.52 (0.85)	3.70 (0.87)	3.70 (1.03)	3.56 (0.80)	3.11 (1.22)	3.30 (1.03)
Joint problem solving	3.93 (0.83)	3.93 (0.83)	4.67 (0.48)	4.52 (0.75)	3.63 (1.21)	3.70 (1.03)
Long-term commitment	3.11 (1.25)	4.70 (0.47)	2.85 (1.20)	4.26 (0.71)	3.44 (1.01)	4.59 (0.57)
Continuous Improvement	3.48 (0.89)	4.37 (0.69)	3.19 (1.14)	3.96 (0.65)	3.30 (0.91)	4.19 (0.79)
Mutual trust	4.70 (0.47)	4.78 (0.42)	4.78 (0.42)	4.70 (0.61)	4.26 (0.66)	4.56 (0.58)
Learning climate	3.44 (0.85)	4.04 (0.94)	3.30 (0.95)	4.04 (1.06)	3.33 (0.73)	4.04 (0.94)
Partnering experience	3.33 (1.00)	3.93 (1.14)	3.07 (1.04)	3.81 (1.08)	3.33 (1.07)	3.89 (1.15)
Facilitator	4.04 (1.02)	3.85 (0.99)	3.37 (1.08)	3.04 (1.06)	2.70 (1.17)	2.67 (1.18)

Note: (1) N = 27
(2) P.P. = Project Partnering; S.P. = Strategic Partnering; S.D. = Standard Deviation

Table 4.4 lists the analysis based on rule 1 and 2 for project partnering. The *italic* cells indicate that the factors had successfully passed rule 1 and 2 and supported for entering into the second survey. Table 4.5 shows the same analysis but for strategic partnering. These results are elaborated in more details in later paragraphs.

Table 4.3: Comparison between Partnering Process Stages

	Project Partnering			Strategic Partnering		
		H0: Diff=0			H0: Diff=0	
	Diff	T	P	Diff	T	P
Formation to Application Stage						
Adequate resources	0.89	5.18	0.00	1.00	4.68	0.00
Top management support	0.26	1.27	0.21	-0.11	-0.62	0.54
Partnering agreement	-0.70	-2.70	0.01	-1.04	-3.46	0.00
Team building	-0.33	-1.61	0.12	-0.52	-2.33	0.03
Open communication	0.19	1.55	0.13	-0.15	-1.07	0.29
Effective co-ordination	0.11	1.00	0.33	-0.15	-1.07	0.29
Creativity	0.19	0.96	0.35	-0.15	-1.07	0.29
Joint problem solving	0.74	5.04	0.00	0.59	3.31	0.00
Long-term commitment	-0.26	-1.66	0.11	-0.44	-3.31	0.00
Continuous Improvement	-0.30	-2.30	0.03	-0.41	-3.70	0.00
Mutual trust	0.07	0.81	0.42	-0.07	-1.00	0.33
Learning climate	-0.15	-1.00	0.33	0.00	0.00	1.00
Partnering experience	-0.26	-1.43	0.17	-0.11	-0.62	0.54
Facilitator	-0.67	-3.61	0.00	-0.81	-3.94	0.00
Application to Reactivation Stage						
Adequate resources	-0.74	-3.31	0.00	-0.74	-3.06	0.01
Top management support	-0.22	-1.36	0.18	0.15	0.85	0.40
Partnering agreement	-0.41	-2.66	0.01	-0.22	-0.40	0.69
Team building	-0.30	-1.35	0.19	0.11	0.46	0.65
Open communication	-0.74	-4.73	0.00	-0.33	-1.88	0.07
Effective co-ordination	-0.63	-4.13	0.00	-0.37	-2.43	0.02
Creativity	-0.59	-2.75	0.01	-0.26	-1.27	0.21
Joint problem solving	-1.04	-4.40	0.00	-0.81	-3.41	0.00
Long-term commitment	0.59	2.84	0.01	0.33	2.08	0.05
Continuous Improvement	0.11	0.62	0.54	0.22	1.24	0.23
Mutual trust	-0.52	-3.58	0.00	-0.15	-1.00	0.33
Learning climate	0.04	0.23	0.82	0.00	0.00	1.00
Partnering experience	0.26	1.19	0.24	0.07	0.44	0.66
Facilitator	-0.67	-4.42	0.00	-0.37	-2.18	0.04

Notes: 1. $P < .01$; Diff = Difference in mean scores; T = T-statistic
2. H0: Difference in mean scores is zero.

Table 4.4: Analysis for Project Partnering

	Rule 1: Critical?	Rule 2: Comparison (only significant differences presented)
Adequate resources	*Stage 2*	Increase from stage 1 to 2 & decrease from stage 2 to 3
Top management support	*All stages*	No significant difference
Partnering agreement	*Stage 1*	Decrease from stage 1 to 2
Team building	*Stage 1 and 2*	No significant difference
Open communication	*All stages* *	Decrease from stage 2 to 3
Effective co-ordination	*All stages*	Decrease from stage 2 to 3
Creativity	None	Decrease from stage 2 to 3
Joint problem solving	*Stage 2*	Increase from stage 1 to 2 & decrease from stage 2 to 3
Long-term commitment	None	Increase from stage 2 to 3
Continuous Improvement	None	Decrease from stage 1 to 2
Mutual trust	*All stages*	Decrease from stage 2 to 3
Learning climate	None	No significant difference
Partnering experience	None	No significant difference
Facilitator	*Stage 1*	Decrease from stage 1 to 2 & decrease from stage 2 to 3

Note: * Open communication is marginally critical at the reactivation stage (mean = 3.96).

Table 4.5: Analysis for Strategic Partnering

	Rule 1: Critical?	Rule 2: Comparison (only significant differences presented)
Adequate resources	*Stage 2*	Increase from stage 1 to 2 & decrease from stage 2 to 3
Top management support	*All stages*	No significant difference
Partnering agreement	*Stage 1*	Decrease from stage 1 to 2
Team building	*Stage 1 and 3*	No significant difference
Open communication	*All stages*	Decrease from stage 2 to 3
Effective co-ordination	*All stages*	Decrease from stage 2 to 3
Creativity	None	Decrease from stage 2 to 3
Joint problem solving	*Stage 2*	Increase from stage 1 to 2 & decrease from stage 2 to 3
Long-term commitment	*All stages*	Increase from stage 2 to 3
Continuous Improvement	*All stages* *	Decrease from stage 1 to 2
Mutual trust	*All stages*	Decrease from stage 2 to 3
Learning climate	*All stages*	No significant difference
Partnering experience	None	No significant difference
Facilitator	None	Decrease from stage 1 to 2 & decrease from stage 2 to 3

Note: * Continuous improvement is marginally critical at reactivation stage (mean = 3.96).

Table 4.6 compared the mean scores between project and strategic partnering at each of the three process stages, and the T-test was also employed. This provides information for assessment based on rule 3. This helps to identify the factors that are more important to either type of partnering. In this table, long-term commitment, continuous improvement, learning climate and partnering experience were all critical to strategic partnering. This implies that these four factors are long term factors. One interesting point is that top management support was significantly crucial to partnering reactivation. This may be explained by the fact that supporting a long term partnering is a strategic decision that has to be made by the top management. Without top management supports totally to a long term partnering, it would not be successful.

Table 4.6: Comparison between Project and Strategic Partnering

	Partnering Formation			**Partnering Application**			**Partnering Reactivation**		
		H0:Proj=Stra			**H0:Proj=Stra**			**H0:Proj=Stra**	
	Diff	**T**	**P**	**Diff**	**T**	**P**	**Diff**	**T**	**P**
Adequate resources	-0.04	-0.27	0.79	0.07	0.53	0.60	0.07	0.44	0.66
Top management support	0.30	2.30	0.03	-0.07	-0.70	0.49	**0.30**	**2.84**	**0.01**
Partnering agreement	0.19	1.10	0.28	-0.15	-0.81	0.42	0.33	1.56	0.13
Team building	0.07	0.47	0.65	-0.11	-1.14	0.26	0.30	2.30	0.03
Open communication	0.15	1.28	0.21	-0.19	-1.73	0.10	0.22	1.80	0.08
Effective co-ordination	0.11	0.90	0.38	-0.15	-1.44	0.16	0.11	1.14	0.26
Creativity	0.19	0.78	0.45	-0.15	-0.72	0.48	0.19	0.93	0.36
Joint problem solving	0.00	0.00	1.00	-0.15	-0.94	0.36	0.07	0.42	0.68
Long-term commitment	**1.59**	**6.47**	**0.00**	**1.41**	**5.35**	**0.00**	**1.15**	**5.43**	**0.00**
Continuous Improvement	**0.89**	**5.77**	**0.00**	**0.78**	**4.53**	**0.00**	**0.89**	**4.74**	**0.00**
Mutual trust	0.07	1.00	0.33	-0.07	-0.57	0.57	0.30	2.13	0.04
Learning climate	**0.59**	**2.94**	**0.01**	**0.74**	**2.99**	**0.01**	**0.70**	**3.12**	**0.00**
Partnering experience	**0.59**	**2.84**	**0.01**	**0.74**	**3.22**	**0.00**	**0.56**	**2.43**	**0.02***
Facilitator	-0.19	-0.87	0.39	-0.33	-2.21	0.04	-0.04	0.27	0.79

Notes: 1. P < .01; Diff = Difference in mean scores; T = T-statistic
2. H0: Mean scores of factors in project partnering = those in strategic partnering.
3. Factors with bolded figures are significant in the test at P < .01.
4. * Partnering experience is marginally significant at the reactivation stage (P < .02).

Taking all the analyses into consideration, some general implications can be drawn as follows:

- There were four factors affecting all the three process stages with respect to both types of partnering with similar strength (*Hypothesis 1a is supported*). These are top management support, mutual trust, open communication and effective co-ordination.
- Partnering agreement and facilitator were critical at partnering formation stage with respect to project partnering, while partnering agreement is critical at the formation stage with respect to strategic partnering.
- Adequate resources and joint problem solving were critical at the stage of partnering application with respect to both types of partnering.
- Team building was critical at partnering formation stage with respect to both types of partnering, while it was critical at the application stage with respect to project partnering and the reactivation stage with respect to strategic partnering.
- As opposed to project partnering, long-term commitment, continuous improvement and learning climate were critical in all the three process stages with respect to strategic partnering. Although partnering experience was failed in the tests for rule 1 and 2, it was supported to be a long-term factor (test as shown in Table 4.6). Thus, it is included for further study. As stated, these four factors were shown to be critical in strategic, but not project, partnering (*Hypothesis 1b is supported*).
- In general, the effects of other factors in project partnering are about the same as in strategic partnering. All differences in mean scores were not significant.
- With the above viewpoints, it was possible to combine the processes with respect to the two types of partnering together. Partnering formation and application are common to both types of partnering. The four long-term factors govern the possibility to transform from project to strategic partnering. *Hypothesis 2a is therefore supported.*

4.7 THE SECOND SURVEY: TEST OF THE CONCEPTUAL MODEL

4.7.1 Sample, Questionnaire Design and Data Collection

The first survey formed a preliminary study of the factors. For embracing other possibilities that might omit or suppress the influence of important factors, a more loosely standard was adopted to select the factors for testing in the second survey. That is factors with value larger than 3.5 were included in the second questionnaire. There were also some other changes made due to comments from respondents judged to be useful. First, the item "workshops" was included as a factor because many respondents had suggested. Second, the item "partnering goals' achievement" was added as a factor affecting partnering. These two new items were described below:

- **Workshops** – These are places for the partnering team members to meet periodically for discussing and solving problems. It is a place mainly for effecting open communication. Partnering workshops are held in almost every partnering arrangement. Sometimes they are called partnering meetings or informal meetings (CIIA, 1996). Such a workshop or meeting may be organised in any involved parties' office or a public place such as a conference room in a hotel. Workshops varied greatly in length (from a half-day to four-day) (CIIA, 1996) and for different purposes (Harback et al., 1994). Workshops can be organised to introduce team members and train them with appropriate partnering knowledge and problem-solving skills; promote change and teamwork (Loraine, 1994); and monitor goal achievement and facilitate joint effort to solve problems. So, workshops are planned occasionally, regularly or even frequently within the whole partnering process.

- **Partnering Goals' Achievement** – Partnering goals' achievement involves the monitoring of the progress of achieving partnering goals and the evaluation of the achievement level of the goals. Weston and Gibson (1993) suggested that monitoring of goals is a key to partnering success.

The study of CIIA (1996) also found that all respondents agreed that periodical monitor of the mutually agreed goals is necessary for evaluating the extent of success of partnering. Matthews and Rowlinson (1999), Cowan et al. (1992) and Weston and Gibson (1993) referred to it as joint evaluation of the partnering goals as stated in the partnering charter.

In addition, team building was excluded from the last two process stages because its meaning tied to partnering formation only. The conceptual framework was designed to test the following hypotheses:

- Hypothesis 3a: There are different sets of critical success factors affecting the partnering process stages to reflect the distinctive functions of each process stage.
- Hypothesis 3b: Factors of each proposed set of critical success factors exert considerable degree of influence on the respective partnering process stage.

A second questionnaire was then designed (as shown in Appendix 1) and was also sent by email to the previous mentioned databases. As this questionnaire was simple to complete and so it attracted 85 responses. 79 replied questionnaires were used because the other six were deleted due to wrong use of the rating scale or unexpected respondents. Test of any statistically significant relationships existed between various groups of respondents (according to Question 4 of the questionnaire) was performed using chi-square statistics. Four groups are used – *academic research*, *practical application*, *learned partnering* and *a combination of them*. Non-parametric method was used as the statistical test due to the type of data collected (Blalock, 1988). A chi-square procedure was used to compare observed frequencies and expected frequencies for each item related to the independent variables. Only four out of thirty cross-tabs have chi-square value with $p < .05$ (no chi-square value with $p < .01$). Results indicate that there was no significant bias among the four groups of respondents. All responses could be combined for analysis.

4.7.2 Findings and Discussions

For analysing the findings, the first of the two basic rules as shown in the first survey was still applied here (i.e. factors with value > 4.00 are said to be critical). Table 4.3 ranks the factors for the three process stages. Checking of gainsaying that the order of rating was a problem in this survey was performed. Ranks of the three sets of factors in the table shows that the order of rating was not a problem because the levels of importance of the factors were different in the three sets of factors. Other than those factors with value > 4.00 being treated as critical, three other factors having values > 3.90 are said to be marginally critical and are also included for analysis. They are "facilitator" in partnering formation (3.95), "resources" in partnering application (3.90) and "partnering experience" in partnering reactivation (3.99). Pursuant to this table, some patterns are identified:

- Four common CSFs were determined, which were top management support, mutual trust, open communication and effective co-ordination.
- Partnering agreement, team building and facilitator were functional CSFs for partnering formation. Joint problem solving, partnering goals' achievement and adequate resources were functional CSFs for partnering application. Long-term commitment, continuous improvement, learning climate and partnering experience were functional CSFs for partnering reactivation. In consequence, Hypothesis 3a is supported.
- Ranks of factors also reveal that the factors exerted various degree of influence on the process; i.e. some were more important than the others (Hypothesis 3b is supported). Ranks of factors would also be undertaken using AHP in the third survey to re-affirm hypothesis 3b.
- Unexpectedly, creativity and workshops were both not critical. The low perceived value of creativity might be due to the perception that seeking breakthrough opportunities to a leapfrog of performance is not easy so that respondents had a stronger tendency toward more realistic factors. On the other hand, Schultzel and Unruh (1996) classified workshop as a hygiene factor to partnering so that the more of it does not improve performance

but without it the performance will be brought down. Other factors, such as communication or top management support, are motivators that are highly correlated with partnering performance. This explains why workshop has a very low score.

These analyses form the basis for establishing the decision hierarchy for the final survey.

Table 4.7: Ranks of the Factors for the 3 Stages of Partnering

Factors in Partnering Formation	Mean (S.D.)	Factors in Partnering Application	Mean (S.D.)	Factors in Partnering Completion & Reactivation	Mean (S.D.)
Top management support	4.62 (.84)	Open communication	4.41 (.71)	Mutual trust	4.59 (.67)
Open communication	4.43 (.65)	Mutual trust	4.39 (.94)	Top management support	4.47 (.73)
Mutual trust	4.41 (.86)	Effective co-ordination	4.37 (.75)	Long-term commitment	4.37 (.76)
Effective co-ordination	4.26 (.82)	Top management support	4.29 (.92)	Continuous improvement	4.12 (.98)
Team building	4.19 (.82)	Joint problem solving	4.14 (.80)	Learning climate	4.10 (.82)
Partnering agreement	4.17 (.93)	Partnering goals' achievement	4.11 (.89)	Open communication	4.05 (.77)
Facilitator	3.95 (1.30)	Adequate resources	3.90 (1.00)	Effective co-ordination	4.05 (.88)
Joint problem solving	3.80 (.89)	Creativity	3.15 (.99)	Partnering experience	3.99 (1.12)
Creativity	3.16 (.97)	Workshops	2.81 (.88)	Joint problem solving	3.74 (.93)
Workshops	2.97 (.77)			Adequate resources	3.38 (1.06)
				Workshops	2.81 (.74)

Note: Ranks in descending order.

4.8 THE THIRD SURVEY: THE AHP METHOD

4.8.1 Utility of AHP

It is well accepted that a variety of factors determine the success or failure of construction partnering, the identification of CSFs will enable the parties to manage their partnering resources in terms of skills, knowledge, technology,

competence and information more effectively and to facilitate the partnering process. AHP is well known of its usefulness to prioritise a set of elements and hence helps to identify the key elements. Moreover, the AHP method is adopted to solicit consistent subjective expert judgement, and has been widely used for multi-criteria decision making. The use of AHP to identify CSFs for project success has been attempted by Chua et al. (1999) who provided arguments for the use of AHP:

- Researchers for CSFs identification have been conducted using quantitative measures of various factors (e.g. Jaselskis and Ashley, 1991; Chua et al., 1997; Kog et al., 1999). These quantitative studies are argued to be only confined to the project management efforts, do not cover intangible factors, and are difficult to apply when hard performance data are not available.
- AHP seeks to collect experts' opinions. Yet, who are the experts to hold the parcel when the music stops? It is well recognised that the experience possessed by project participants would exert great influence in a project toward project outcomes (Jaselskis and Ashley 1991; Sanvido et al., 1992). It would be more legitimate then to assume that experienced practitioners are the real experts to compose a set of CSFs after testing against their experience.

Furthermore, Chua et al. (1999), after reviewing several completed surveys, suggested two possible ways employed to capture expert opinions:

1. To assure the quality of the data, all respondents should be individually given a brief presentation about the object and methodology of the study. Questions can be asked to clarify points and terms so that answers given would be most accurate and valid without any misinterpretation and/or misunderstanding.
2. To ensure the usability of the data, respondents are reminded to pay attention to the importance of observing consistency in their answers. An example can be demonstrated to illustrate how to obtain consistent answers

in a matrix.

4.8.2 Sample, Questionnaire Design and Data Collection

For testing the remaining hypotheses, a more detailed prioritisation of such tested elements as critical factors, process stages and success criteria were necessary to reveal the real partnering context. Due to the difficulties in obtaining a raft of participants, it was planned to collect data from some experts who had the experience in applying the partnering concept in construction projects. AHP was then chosen to perform the prioritisation of the elements. In order to search the partnering "players", a question in the second survey asked the respondents if they were involved in partnering. An invitation message was then sent by email to those who were involved in construction projects that incorporated the concept of partnering. Fifteen construction professionals replied and expressed their interests in providing their opinions on the final questionnaire. Noteworthy, AHP is a subjective method that is not necessary to involve a large sample. For example, Lam and Zhao (1998) invited eight experts to perform the pair-wise comparisons for a quality-of-teaching survey. In fact, experts provide penetrating insights that are highly valuable to an empirical study. AHP is greatly useful to research focusing on a specific area where a large sample is not mandatory. In case of the increasing difficulties in achieving a large sample or high response rate, the application of AHP is an alternative.

Data are obtained from people who are actively involved in a construction project with partnering arrangement. Pursuant to previous suggestions to secure usable and good quality data, the design of the questionnaire has considered the following (as shown in Appendix1):

- A brief explanatory note was given to introduce the pair-wise comparison method, the three partnering process-stages and the three success criteria.
- Another brief note was enclosed to remind respondents with regard to the

importance of observing consistency in their answers. An example was given to demonstrate the logic of response to the matrices.

- A section of demographic data, such as gender, work experience, education, etc., was included to trace the structure of respondents.

For designing the paired comparison matrices, some decision hierarchies were formed. Figure 4.3 and 4.4 are used to re-affirm the results of the second survey in testing the Hypothesis 3b, which states that the success factors exert considerable degree of influence on their respective partnering process stage. Prioritising them is crucial for better allocation of resources to the partnering process and more productive in managing the partnering arrangement. Figure 4.3 depicts the decision hierarchy of the common success factors for all three stages. Figure 4.4 depicts the decision hierarchy of the functional success factors for each of the three stages.

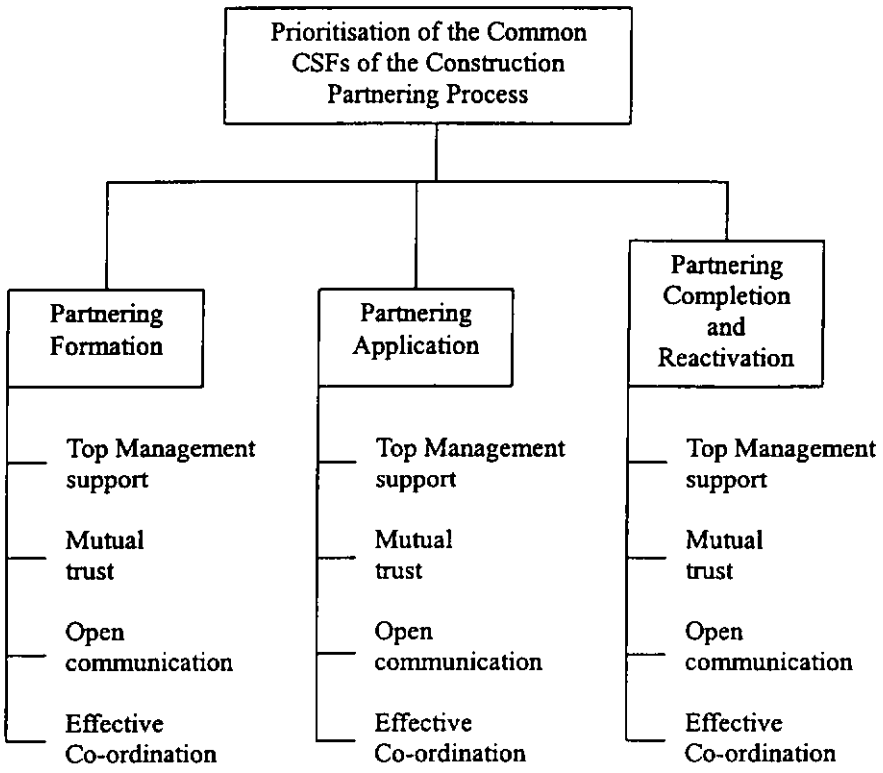


Figure 4.3: Hierarchy of the Common CSFs

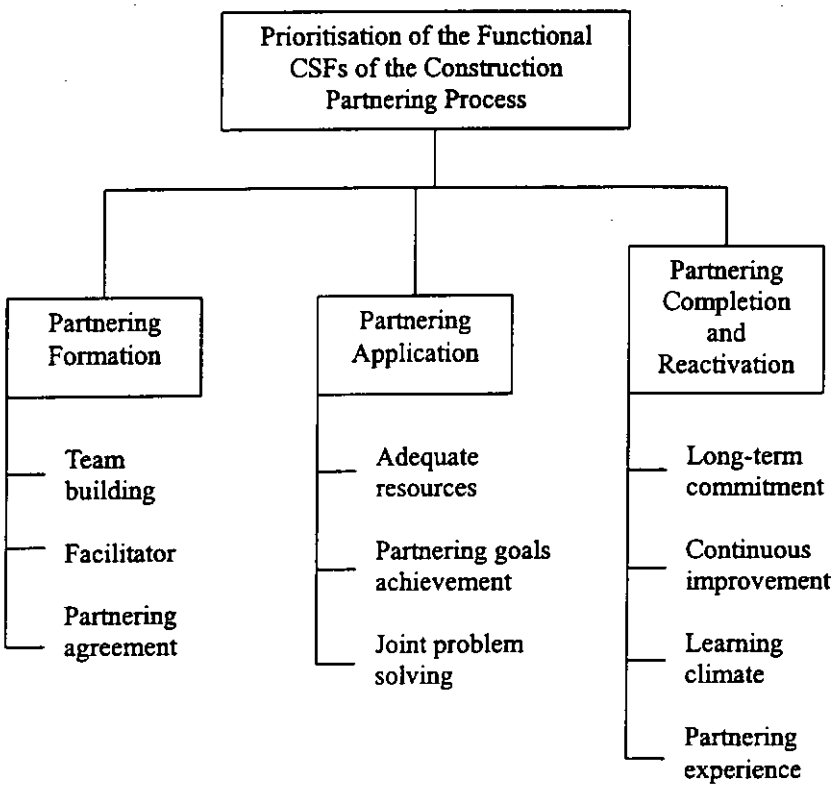


Figure 4.4: Hierarchy of the Process Stages' Functional CSFs

The three-stage partnering process identified is intended to achieve a successful partnering. Each of these stages is likely to affect the success of partnering. In other words, if any of these stages is not managed properly, there will be a destructive effect on partnering.

However, the whole partnering process is said to be successful if partnering criteria satisfy the stakeholders. It is borne in mind that the criteria of partnering success are different from those of the project success (usually measured by means of objective project performance in terms of quality, cost and time) despite their possible correlation. The success of partnering, in this thesis, refers to the perceptive effectiveness of partnering by involved parties. In other words, if the parties perceive that partnering helps to obtain positive outcomes, then this partnering arrangement is said to be successful (i.e. achieved effectiveness).

In the first survey, two criteria (Overall Satisfaction of Stakeholders and Compatible Goals) were identified and tested (as shown in Appendix 1). Since these two criteria have broad and abstract meanings, two scales with representative items were developed. Results (as shown in Table 4.4) indicate that the two criteria were important for both types of partnering (project and strategic). Alpha reliability is computed for the scales of the two criteria (Hair et al., 1998). As shown in the table, the two scales have acceptable values of coefficient alpha. Therefore, they are reliable for measuring their respective criteria.

Table 4.8: The Level of Importance of Subjective Criteria on Partnering

Partnering Criteria and their representative items	Project Partnering	Strategic Partnering
Overall satisfaction of stakeholders:		
• Partners praised each other when they complete their part of work successfully.	4.26 (0.86)	4.22 (0.85)
• Partners must fulfil their task commitments conforming to their partners' expectations.	4.44 (0.64)	4.41 (0.80)
	Mean = 4.35 α = 0.58	Mean = 4.32 α = 0.83
	Final α = 0.724	
Compatible goals:		
• Partners' organisational goals are in line with the partnering goals.	4.22 (0.97)	4.56 (0.75)
• Partners' organisational goals have no conflict with the partnering goals.	3.56 (1.12)	3.85 (1.13)
	Mean = 3.89 α = 0.68	Mean = 4.20 α = 0.78
	Final α = 0.717	

Notes: (1) Number in parentheses is standard deviation
(2) α = coefficient alpha

Referring to the comments from respondents of the first survey, a criterion "improved work relationship" was added because the prime concern of partnering was to improve work relationships between co-operated parties. As a result, the three accessible criteria for measuring partnering success are described below:

- **Improved work relationship** – It is clear that partnering is used to

improve work relationship between construction parties (CII 1991; Cowan et al., 1992; CIIA 1996; Barlow et al., 1997; CIB 1997). Cementing this link by partnering is a common premise. Work relationships are improved if partners are more relying on each other in a construction project. It is also likely that the nature of the relationship between project team members gives rise to different degrees of partnering (Barlow et al., 1997). The extent to which the work relationship is improved is undoubtedly a valid criterion for measuring partnering success.

- **Compatible goals** – Another success criterion is the measure of the extent to which the partnering goals are compatible with organisation's internal goals. Compatible goals are those strategic goals of individual organisations that can be converged to form the goals of the alliance (Brouthers et al. 1995). These common goals help to glue the organisations together and establish the direction, value and related activities. A mismatch of the internal and external goals may result in conflicts occurred within individual organisations or the partnering team. As Lynch (1990) stated, failure of partnering is attributed to ambiguous goals and poor co-ordinated activities. Clarity of focus is therefore vital to the success of partnering (Cheng et al., 2000). Brouthers et al. (1995, p.21) complemented that "to (*sic*) avoid the pitfall of ambiguous or different goals, participants should make sure they have synchronous goals to begin with, then review what has been accomplished in terms of their original goals at least every three to six months. The alliance is less likely to lose sight of objectives if frequent assessments are made".

- **Overall satisfaction of stakeholders** – Perceived satisfaction of the stakeholders of a project is a reliable measure of partnering success (Mohr and Spekman, 1994; Cheng et al., 2000). It is defined as the level of the general performance of each party expected by the others (Parkhe, 1993). Partnering is said to be satisfactory when the expectations of the involved parties have been attained (Anderson and Narus, 1990; Mohr and Spekman, 1994). It also reflects the level of attainment of the critical

characteristics in the partnering context, such as mutual trust, co-ordination, commitment, etc. Instead of rating the level of attainment of specific partnering goals that may vary among different projects, parties can rate how well they perceive the level of overall satisfaction (i.e. the difference between the actual achievement of the partnering goals and the required achievement of these goals). Larson (1995), in his empirical study of project partnering, found that satisfaction of participants is a success criterion for measuring partnering. Lascelles and Peacock (1996) examining a framework of managing change also revealed that customer satisfaction is a key measure of the outcome of a change process.

As there are three general criteria for measuring the degree of success of partnering, the three stages may exert various degree of impact on achieving these criteria. By knowing the relationships between the process stages and the success criteria, it is possible for partnering parties to develop appropriate mechanisms for achieving partnering. The important factors determined in each of the three process stages would also help in the design of the system conducive to the success of partnering. Figure 4.5 depicted the decision hierarchy of the process stages for the three success criteria of construction partnering.

In consequence, this section was constructed to test the following three hypotheses:

- Hypothesis 2b: A partnering process consists of stages exerting considerable degree of influence on the success of partnering.
- Hypothesis 4a: The proposed performance criteria are important measures measuring the extent of the success of partnering.
- Hypothesis 4b: The partnering process stages exert considerable degree of influence on the achievement of each of the performance criteria for measuring the success of partnering.

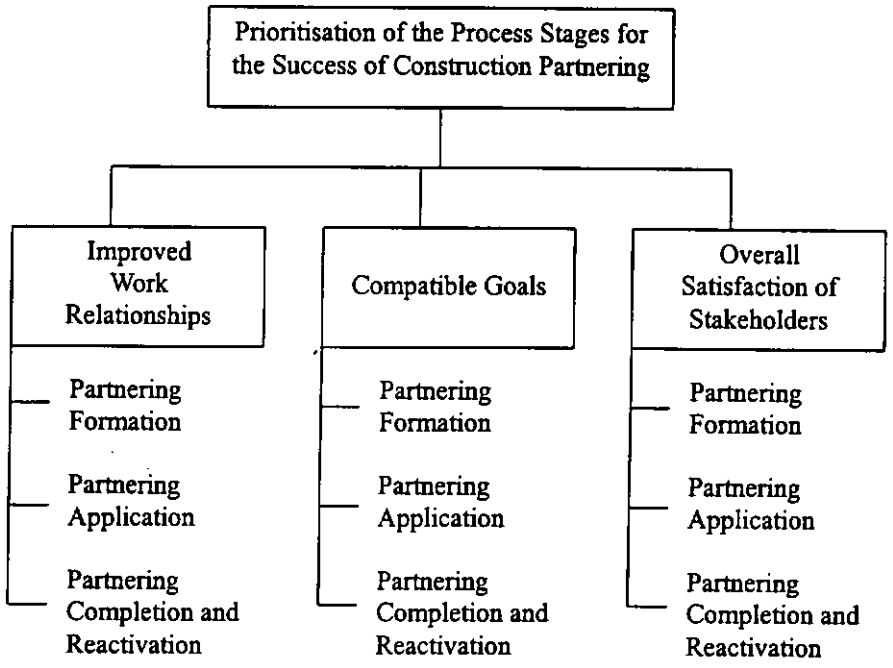


Figure 4.5: Prioritisation of the Process Stages for Partnering Success

This study adopted a procedure so that those participants with low degree of consistency would be dropped out from the analysis. The procedure was as follows:

1. If more than half of the weighting sections could not pass the consistency test, the questionnaire is said to be not usable and would be excluded.
2. Of those usable questionnaires, sections with CR greater than the acceptable value would be excluded from analysis.
3. If there are very few or no usable questionnaires, the arithmetic methods suggested by Saaty (1980) for judgmental revision will be used to improve consistency.
4. If judgmental revision cannot solve the inconsistency problem, then another recourse to reduce the CR values is by re-estimating preferences for improving the quality of judgements in making pair-wise comparison (i.e. move back to Step 4 as shown in Figure 3.1). If this fails, then the last resort is to revert back to Step 2 (in Figure 3.1) so that the problem has to be structured more accurately by grouping similar elements under a more meaningful attribute schema.

Subsequently, there were eleven responses. After the consistency test, nine questionnaires were shown to have acceptable consistency (as shown in Appendix 2). Nine professionals, including surveyors, project managers and civil engineers, who were involved in construction projects with partnering implementation, were participated in this survey. Demographic information (n = 8) shows that all respondents worked directly in the construction industry in different fields such as general contractor, quantity surveying, civil engineering and maintenance. More than half of the respondents worked in medium-sized organisations with a capacity less than 1000 employees (75%) while the remaining worked in organisations with a size of more than 1000. No respondent reported that the size of the organisation was less than 100. All of them held at least a bachelor degree and had some years of work experience (no respondent was younger than 25 years old). The respondents were composed of 8 males and 1 female, reflecting the structure of the construction professions, which re-affirmed that the industry was still male-dominated.

4.8.3 Findings and Discussions

For analysing the findings, two procedures were adopted:

- Computing the mean weights of the elements in each matrix to indicate their relative importance. The higher the mean weight, the more the relative importance. This helps to distinguish the more important elements from the less important elements.
- Computing the values of % Change to reveal the weight distance of an element from the element with the highest weight in each matrix. The larger the value, the more the weight distance. Researchers have to pay attention to those % Change with an extremely large value (e.g. > 50%).

The pertinent findings (as shown in Table 4.5) reveal that each group of factors or criteria have different prioritisation according to the mean weights of the respondents, from the lowest of 0.1837 to the highest of 0.5232.

Additionally, most values of % Change were not large. Exceptionally, in the matrix of compatible goals, the relative importance of partnering formation was 65% more than that of partnering completion and reactivation. However, the relative importance of partnering completion and reactivation was 0.1837, which was still accepted to be of considerable importance. The range of relative importance and the values of % Change imply that the factors were critical and comparable. In other words, none of the success factors and criteria can be sacrificed, and emphasis should be accorded to each of them. Yet, some specific implications can be distilled out hereinafter.

Evidently, ranking of the three success criteria (i.e. Overall Satisfaction of Stakeholders, Compatible Goals and Improved Work Relationship) shows that:

1. These subjective criteria are important in measuring the partnering performance (*Hypothesis 4a is supported*).
2. Overall satisfaction of stakeholders was the most important criteria, followed by improved work relationship and compatible goals.

Moreover, respondents prioritised the relative importance of the three process stages of partnering (i.e. Partnering Formation, Partnering Application and Partnering Completion and Reactivation) for achieving each of the success criteria differently but substantially (*Hypothesis 4b is supported*). According to Table 4.5, some results are shown below:

1. Overall satisfaction of stakeholders was likely to be more associated with partnering application, followed by partnering completion and reactivation and partnering formation.
2. Improved work relationship was linked more to partnering application rather than the other two stages, followed by partnering formation and partnering completion and reactivation.
3. Compatible goals had greater impact on partnering formation, followed by partnering application and partnering completion and reactivation.
4. The results of % Change indicate that the three success criteria were associated with the three process stages since most values of % Change

were not large.

Table 4.9: Mean Weights of the Matrices

Matrix	Mean Weight	% Change
Improved Work Relationship:		
Partnering Formation	0.3029	32%
Partnering Application	0.4458	0%
Partnering Completion and Reactivation	0.2513	44%
Overall Satisfaction of Stakeholders:		
Partnering Formation	0.2782	32%
Partnering Application	0.4109	0%
Partnering Completion and Reactivation	0.3109	24%
Compatible Goals:		
Partnering Formation	0.5232	0%
Partnering Application	0.2931	44%
Partnering Completion and Reactivation	0.1837	65%
Partnering Criteria:		
Improved Work Relationship	0.3432	4%
Overall Satisfaction of Stakeholders	0.3565	0%
Compatible Goals	0.3003	16%
Common Factors of Partnering Formation:		
Top Management Support	0.2276	22%
Mutual Trust	0.2607	11%
Open Communication	0.2924	0%
Effective Co-ordination	0.2193	25%
Functional Factors of Partnering Formation:		
Facilitator	0.3356	12%
Team Building	0.3833	0%
Partnering Agreement	0.2811	27%
Common Factors of Partnering Application:		
Top Management Support	0.2079	28%
Mutual Trust	0.2677	8%
Open Communication	0.2902	0%
Effective Co-ordination	0.2342	19%
Functional Factors of Partnering Application:		
Partnering Goals' Achievement	0.2674	42%
Joint Problem Solving	0.4628	0%
Adequate Resources	0.2698	42%
Common Factors of Partnering Completion and Reactivation:		
Top Management Support	0.2493	13%
Mutual Trust	0.2328	18%
Open Communication	0.2326	19%
Effective Co-ordination	0.2854	0%
Functional Factors of Partnering Completion and Reactivation:		
Long-term Commitment	0.2185	20%
Continuous Improvement	0.2652	3%
Learning Climate	0.2442	10%
Partnering Experience	0.2722	0%

Note: % Change is the weight distance of an element from the element with the highest weight in an individual matrix. Using a matrix with two elements, A and B, as an example, where weight of A is larger than weight of B. Then, % Change of A = (weight of A – weight of A)/weight of A * 100% (When A compares with itself, it will always get a 0%). % Change of B = (weight of A – weight of B)/weight of A * 100%. So, the larger the % Change, the higher the weight distance of an element from the highest weighting element.

The common success factors are dissimilar in their relative importance on the three process stages, whereas the functional success factors have different level of importance peculiar to individual process stage. Yet, they are shown to be of considerable importance (*Hypothesis 2b is supported*). Noteworthy, the findings in AHP were partly different from those of the second survey. The second survey used a larger sample size (n = 79) including construction professionals with or without partnering experience, while AHP used data from nine respondents who were all involved in partnering during their previous construction projects. Thus, both sets of findings are worthwhile to be shown in this thesis.

Although they have different findings, they have a common premise that the factors are all crucial and comparable. AHP's findings are presented below:

1. Team building was the most important factor in partnering formation, followed by facilitator and partnering agreement.
2. As expected, joint problem solving was the most important factor at the stage of partnering application, while adequate resources and partnering goals' achievement had similar effect.
3. Different from the results of the second survey, partnering experience and continuous improvement were more important than learning climate and long-term commitment in reactivating partnering.
4. As shown in Table 4.6, top management support, unexpectedly, had the lowest overall prioritisation, while open communication was the highest, followed by mutual trust and effective co-ordination.

Table 4.10: Common Factors for the Whole Partnering Process

	Partnering Formation	Partnering Application	Partnering Reactivation	Overall Mean	% Change
Top Management Support	0.2276	0.2079	0.2493	0.2283	16%
Mutual Trust	0.2607	0.2677	0.2328	0.2537	7%
Open Communication	0.2924	0.2902	0.2326	0.2717	0%
Effective Co-ordination	0.2193	0.2342	0.2854	0.2463	9%

4.9 A REFINED CONCEPTUAL MODEL

Figure 4.6 depicts a refined conceptual model to summarise what have been done in this chapter. Along the partnering process there are sets of factors impeding on each stage. This refined conceptual model forms the basis to derive a set of core practices and activities in the next chapter, which takes into account of the contributions of the success-related factors and the process stages toward the partnering performance criteria (i.e. measures). This intends to design the practical model for partnering.

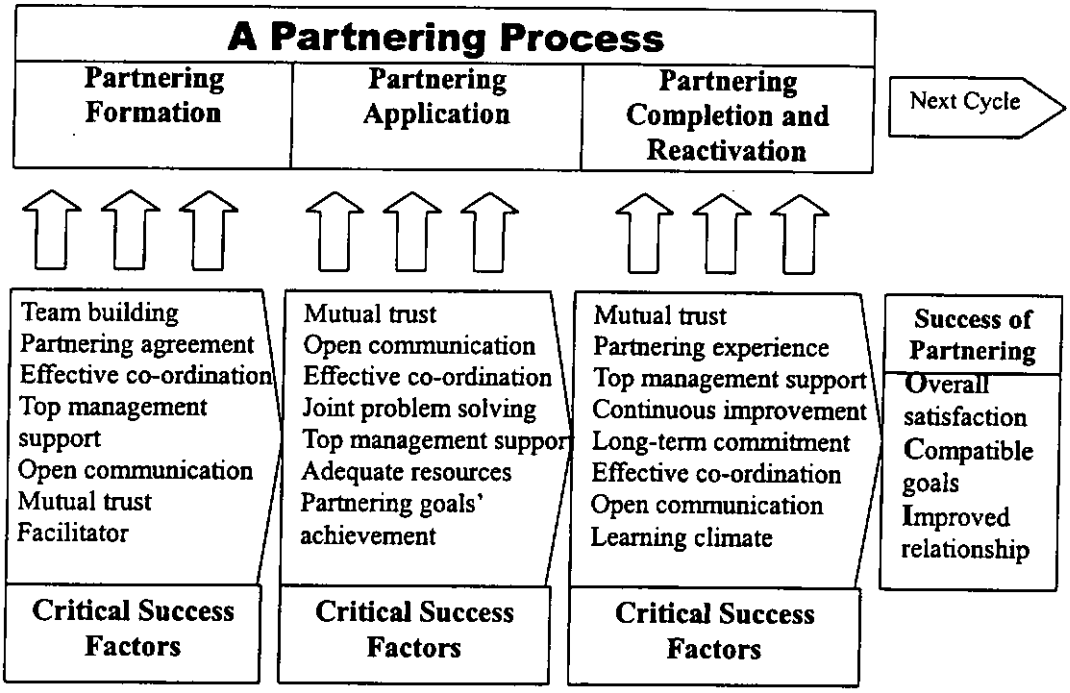


Figure 4.6: A Refined Conceptual Model

4.10 SUMMARY

This chapter used three surveys to develop, test and refine a conceptual model of partnering. Moreover, those hypotheses proposed in Chapter 2 had been tested separately by the three surveys. Finally, a refined conceptual model of partnering was developed.

CHAPTER 5: PRACTICAL MODEL OF PARTNERING

5.1 INTRODUCTION

In Chapter 4, the conceptual model for the success of partnering was tested. The conceptual model was refined in accordance with the findings from the three surveys. The refined conceptual model forms the basis for designing a practical model for partnering espousal. This chapter presents the development of the practical model and describes the processes and associated steps of the model. The chapter is organised to first describe the logic for developing the practical model of partnering. Three general models for the three partnering process stages and three outline models for the three criteria of partnering are created. A modelling technique is then used to identify the key elements of partnering. Finally, a practical model is developed and described.

5.2 FRAMEWORK FOR PRACTICAL MODEL DEVELOPMENT

To design the practical use of the partnering model, the contributions of the findings of the conceptual model are taken into account. During such a transformation from a conceptual to a practical stage involves a set of establishments. As illustrated in Figure 5.1, the practical model of partnering (PMP) is generated step by step according to the following prescribed arrangements:

1. Three general models are created, which specify the proposed relationships between the success factors and the three-stage process and among the success factors. It is suggested that these relationships should be considered when the core practices and activities are being designed.
2. Three outline models are formed, which describe the roadmaps to achieve the three criteria of partnering. These models take into account of the contributions of the success-related factors and the process stages toward

the partnering performance criteria (i.e. measures).

3. A modelling technique, the workmapping model of Kartam and Ibbs (1996), is used to develop a system model that is called the procedural mapping model (PMM). This PMM summarises the core elements of the general models and outline models to establish a system model of partnering. In other words, it adopts a more systematic approach to modelling the practical application of the general and the outline models.
4. PMM describes the partnering processes and related elements to finally develop a practical model that identifies the key practices and activities. The CPR System Models of Kartam and Ibbs (1996) has been adapted to design the core components of the practical model.

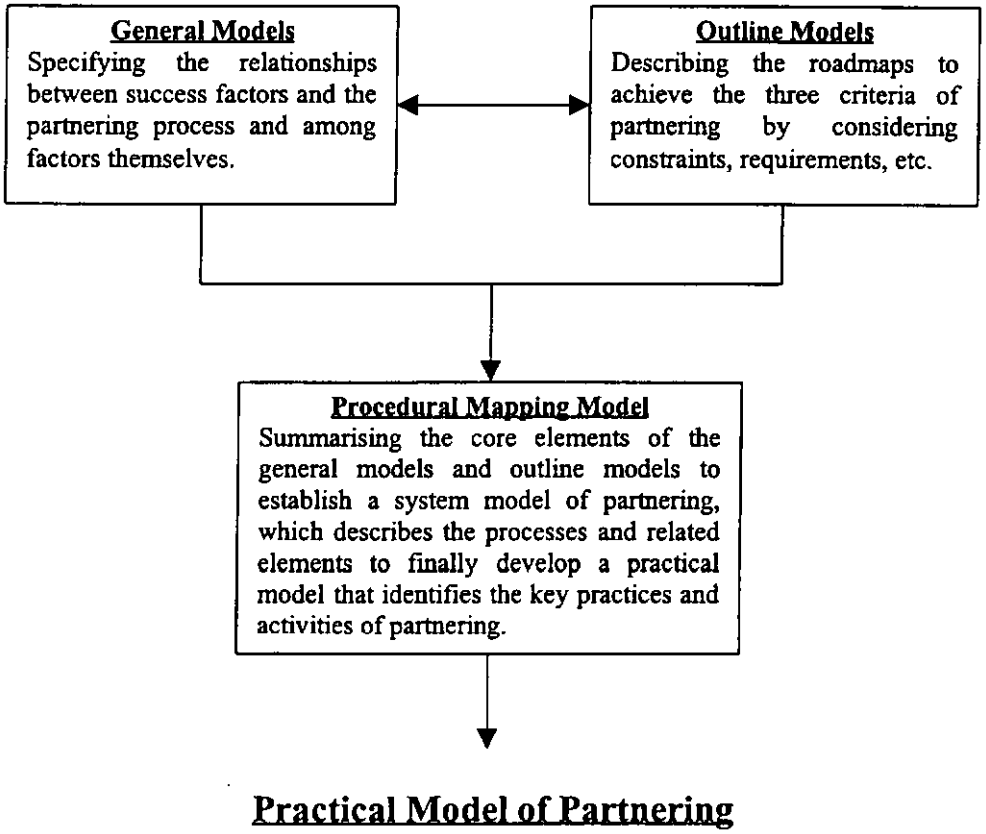


Figure 5.1: A Framework for Developing the Practical Model of Partnering

The models mentioned above are created with different schematic representations so that they can be distinguished easily. For example, the general models have used simple flowcharts, while the outline models have used the graphics from Kamara et al. (2000). In addition, procedural mapping model has used the graphics that were used in the workmapping model. The practical model of partnering has used a distinctive set of diagrams to avoid any confusion caused to other models.

5.3 GENERAL MODELS OF PARTNERING PROCESS

The general models specify all the relationships between the CSFs and the three-stage process. These general models can be illustrated by using simple flowchart graphics consisting of boxes, diamonds and arrows. A sharp corner box represents a factor. A round corner box represents the end of a stage. A diamond represents a decision. A one-way arrow represents a process flow or a direction of impact. A two-way arrow represents an inter-dependent relationship. Solid lines represent critical relationships while dotted lines represent non-critical relationships. Three figures are developed for the three process stages (as shown in Figure 5.2, 5.3 and 5.4).

Figure 5.2 is the context diagram for Partnering Formation. Critical success factors identified include top management support, teambuilding, facilitator, partnering agreement, open communication, mutual trust and effective co-ordination. Adequate resources, although not perceived to be critical, are still needed in the formation of partnering, such as provision of manpower and time (the arrangement of representatives and employees' attending workshops and meetings).

The diagram indicates that after the top management expresses support of the formation of partnering, and assigns adequate resources, such as manpower, time and finance, to the first workshop which is a place for open and free communication, a facilitator is hired to organise workshops for inducing open communication. With sufficient mutual trust, a team is then established.

Further workshops are organised to improve mutual understanding and expectation (i.e. to create co-ordination). Having achieved effective co-ordination, the partnering team establishes a partnering agreement.

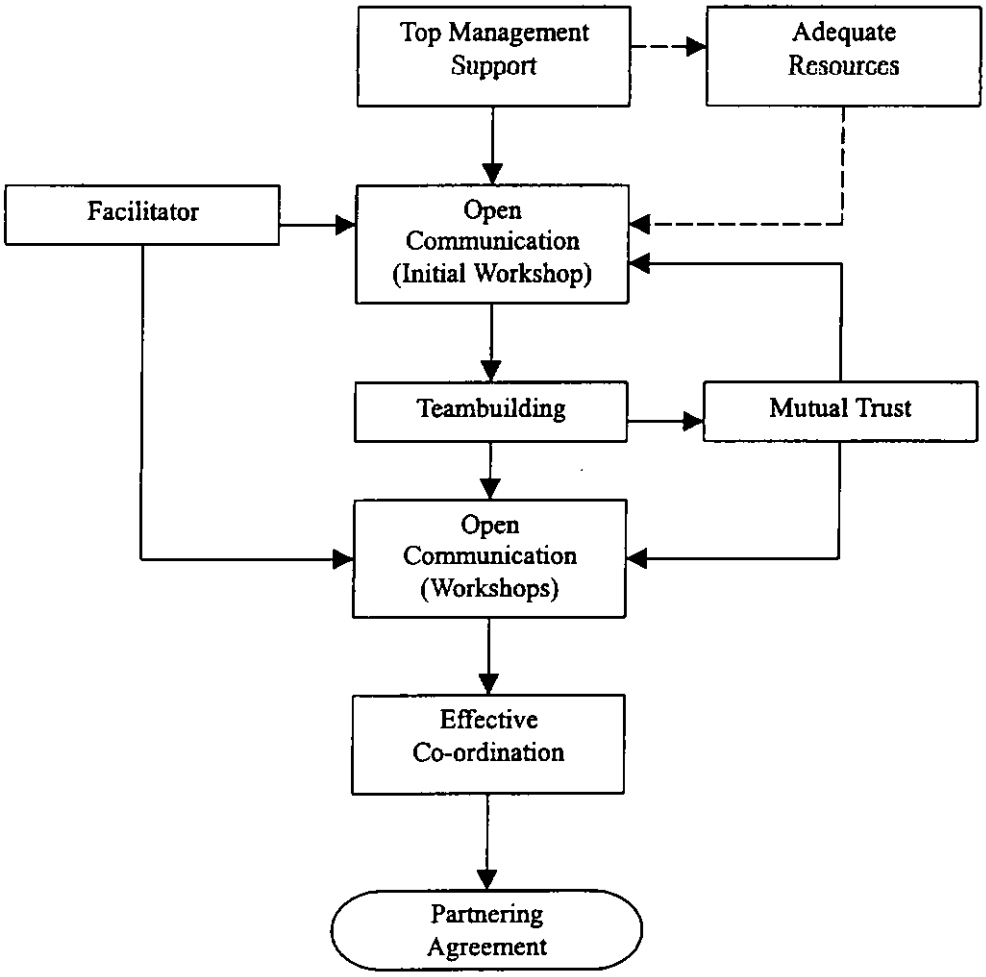


Figure 5.2: General Model for Partnering Formation

Figure 5.3 represents the context diagram for Partnering Application. Critical success factors include top management support, mutual trust, open communication, effective co-ordination, joint problem solving, partnering goals' achievement and adequate resources.

At this stage, top management is still influential by supplying adequate

resources in terms of information, knowledge, manpower, time, etc. The team members must build up mutual trust. Workshops are still organised for open communication in order to achieve effective co-ordination for duties that are basically assigned to attain the mutually agreed partnering goals. If problems are encountered, they can be solved by joint problem solving tools. Problems are being solved persistently until the partnering goals are achieved.

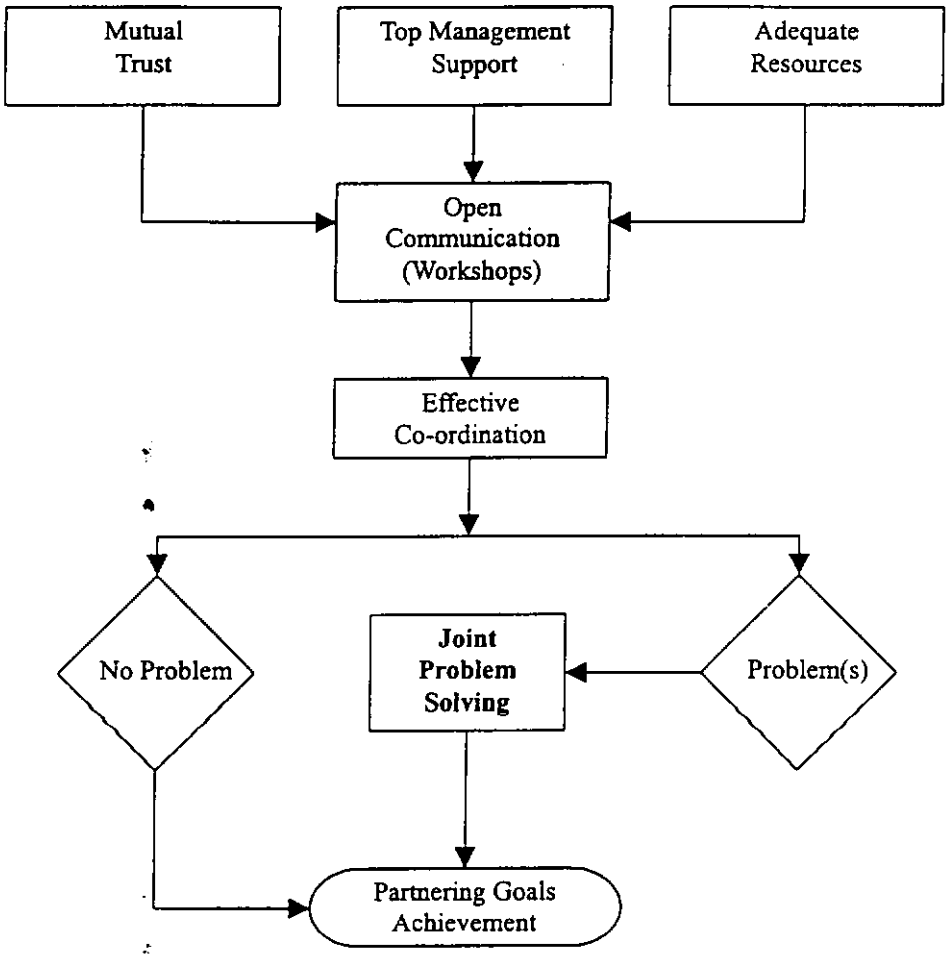


Figure 5.3: General Model for Partnering Application

Figure 5.4 represents the context diagram for Partnering Reactivation. Critical success factors include top management support, mutual trust, open communication, effective co-ordination, partnering experience, long-term

commitment, continuous improvement and learning climate.

As shown in the diagram, a partnering relationship cannot be reactivated unless the top management has such an intention. This can only be achieved if there is long-term commitment, mutual trust, continuous improvement, partnering experience and learning climate. Moreover, partnering is reactivated right after the emergence of open communication and effective co-ordination.

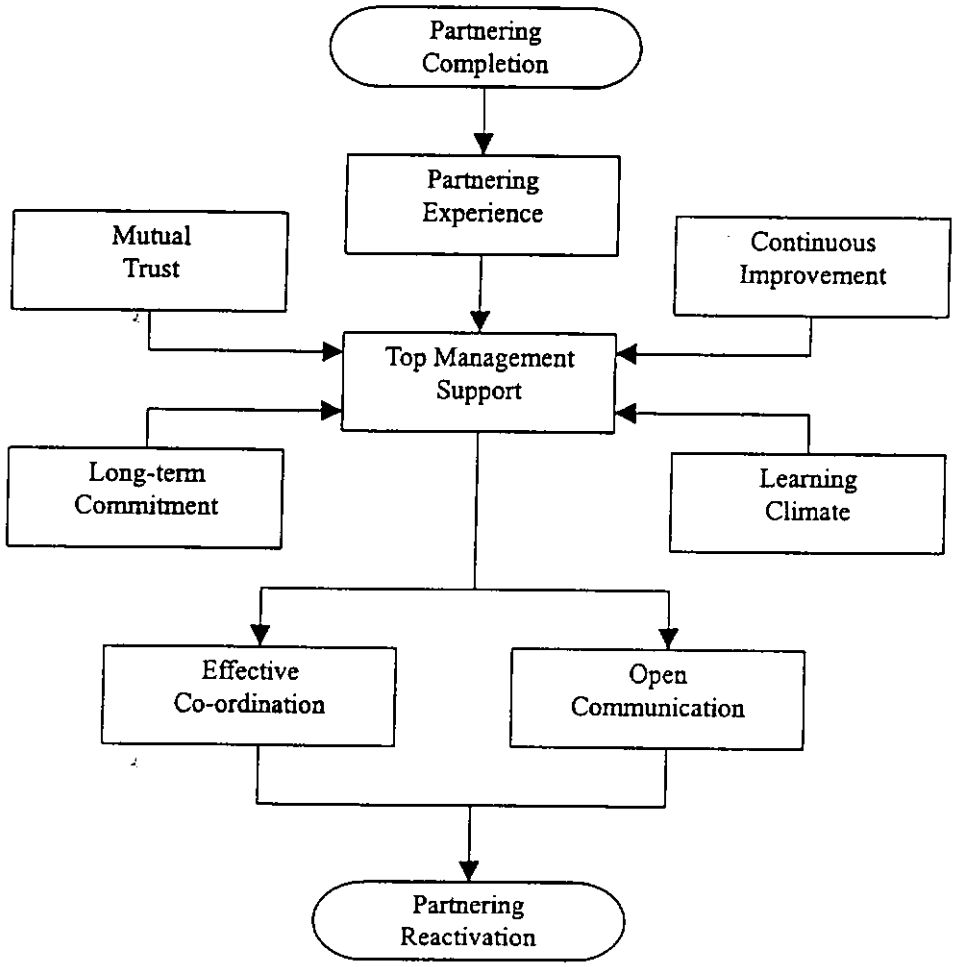


Figure 5.4: General Model for Partnering Reactivation

5.4 PARTNERING CRITERIA OUTLINE MODELS

In this study, partnering is proposed to be measured by three subjective criteria – overall satisfaction of stakeholders, compatible goals and improved work relationship. The surveys presented in Chapter 4 supported that these criteria were important measures (but with different degree of importance) of the success of partnering. The findings help to develop models for illustrating how to achieve the success of partnering. Specifically, these criteria are likely to measure the extent of the requirements, needs, preferences and expectations of the influential people or groups at the individual and organisational levels. Major influences at the individual level come from the top management and representatives in the partnering team. The influence of organisational factors (e.g. the internal organisation or the project itself) further embeds into the realisation of the requirements of the aforementioned individuals. Due to the different perspectives based on their impressions and biases, this creates complexity in the processes. The complexity would increase as more constraints are added during the processes (constraints such as contextual requirements or impacts). Taking all these aspects into consideration, three outline models are created. The graphics used are adapted from Kamara et al. (2000). Block arrow callout shows different kinds of input requirements or expectations. Pentagon indicates different processes, while small circle shows the actual outcomes. The three criteria outline models are described below:

1. Overall satisfaction of stakeholders is likely to be associated with all three stages of the partnering process (i.e. Partnering Formation, Partnering Application and Partnering Reactivation). This is true because requirements and needs exist throughout the whole process. Their satisfaction stems from every activity or task to be performed within each process stage. The measure of the overall satisfaction of stakeholders is likely to be a prerequisite for another partnering cycle. Figure 5.5 illustrates these concerns while Table 5.1 summarises the meanings of different types of requirements.

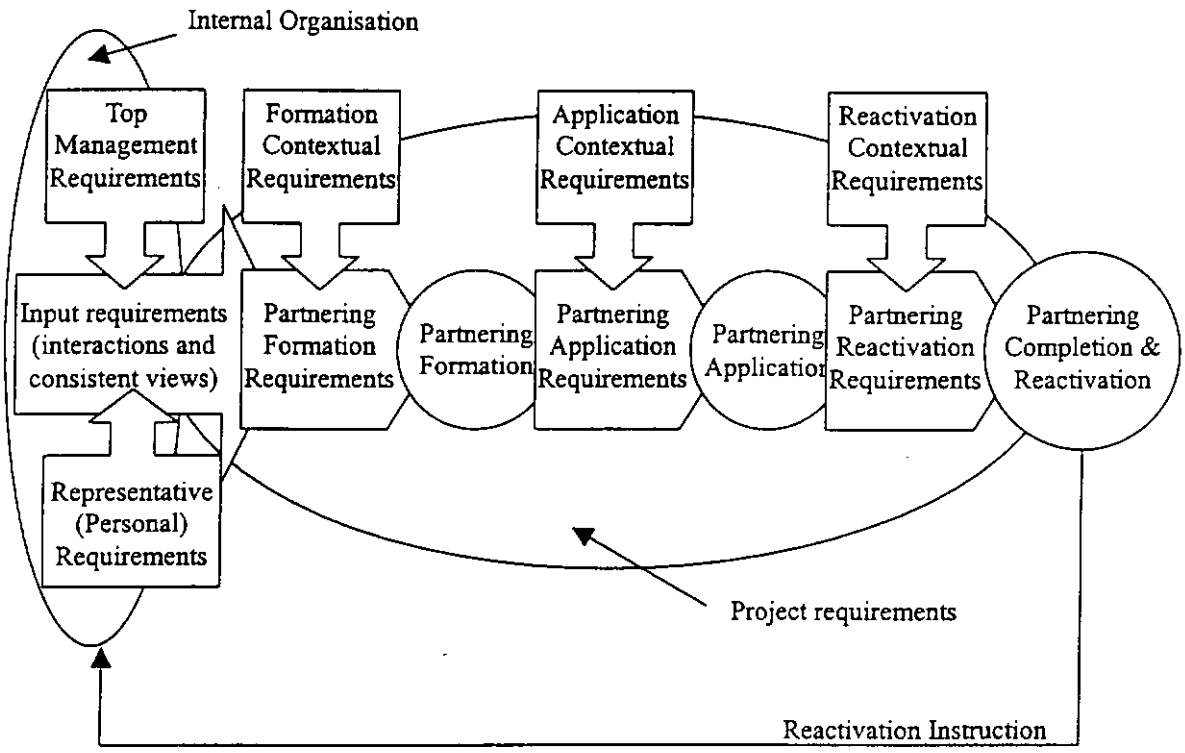


Figure 5.5: Overall Satisfaction Outline Model

Table 5.1: Different Requirements Represented in Partnering

Type of Requirements	Meaning
Internal organisation's requirements	Requirements from senior people and interest groups within individual organisations, intending to influence others to satisfy their own needs.
Top management requirements	Requirements from the top management that satisfy the business need.
Representative requirements	Requirements of those who represent the organisation to form the partnering team, which satisfy their expectations.
Project requirements	Requirements that are in line with the project that poses constraints to other requirements.
Input requirements	Requirements that result from the interactions and consistent views from all interest groups and other internal considerations, including resources.
Partnering formation requirements	Requirements, resulting from negotiation of the various perspectives of different involved parties, for partnering formation.
Partnering application requirements	Requirements for maintaining the various perspectives of the partnering team in partnering application.
Partnering reactivation requirements	Requirements for reactivating another partnering after the completion of a partnering relationship.
Formation contextual requirements	Surrounding impacts that pose constraints to the process of partnering formation.
Application contextual requirements	Surrounding impacts that pose constraints to the process of partnering application.
Reactivation contextual requirements	Surrounding impacts that pose constraints to the process of partnering reactivation.

2. Compatible goals' attainment is likely to be more associated with the expectations from the top management and the preferences from the partnering team members. These goals involve the transformation of the expectations from individual organisations to the partnering goals and objectives. Achievement of these goals and objectives forms an integral part in line with the achievement of internal goals and objectives. Figure 5.6 illustrates these concerns while Table 5.2 summarises the meanings of these components.

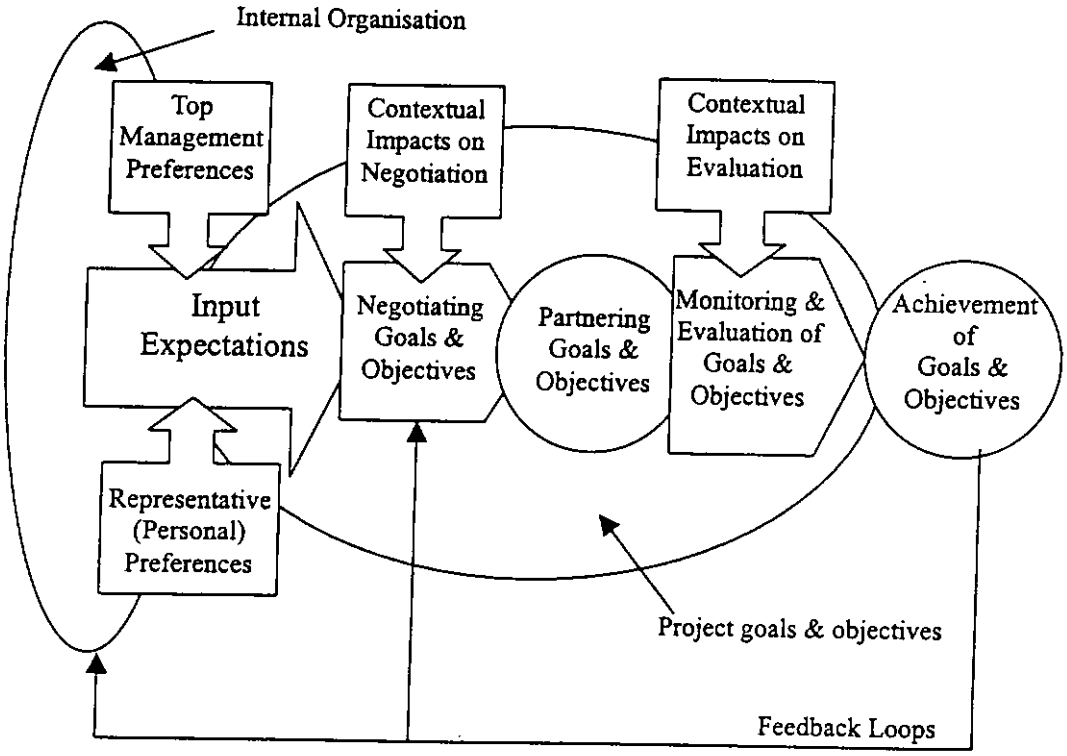


Figure 5.6: Compatible Goals' Attainment Outline Model

Table 5.2: Different Components of Compatible Goals Attainment

Different Components	Meaning
Internal organisation's impacts	Mainly the internal organisation's goals and objectives.
Top management expectations	Expectations from the top management that are in line with the business targets.
Representative preferences	Preferences of those who represent the organisation to form the partnering team, which are mostly in line with their own interests, including those from other internal interest groups.
Project goals and objectives	These goals and objectives from the project posing constraints to partnering goals and objectives formation.
Input expectations	Tangibly, a set of prescribed goals and objectives, or intangibly, a set of implied expectations.
Negotiating goals and objectives	Converging the different views of goals and objectives from different involved parties.
Contextual impacts on negotiation	Surrounding impacts that pose constraints to the negotiating process.
Monitoring and evaluation of goals and objectives	A process that traces the actual achievement levels of the partnering goals and objectives and compares the expected and actual achievement levels.
Contextual impacts on evaluation	Surrounding impacts that pose constraints to the monitoring and evaluation process.
Feedback loops	Adjusting and regulating the compatibility of the internal organisation's goals and objectives, including expectations, with the partnering goals and objectives.

3. Improved work relationship is the core value of partnering. Although work relations exist in every moment of a partnering process, workshops in particular would be the place where the team representatives actually experience the relationships between partnering parties. The measure of the overall improved work relationship may be more meaningful to provide evidence for reactivating another partnering relationship. However, the implication for improving work relationship involves understanding and resolving the conflicts existing between the parties. Figure 5.7 illustrates these concerns while Table 5.3 summarises the meanings for all related components.

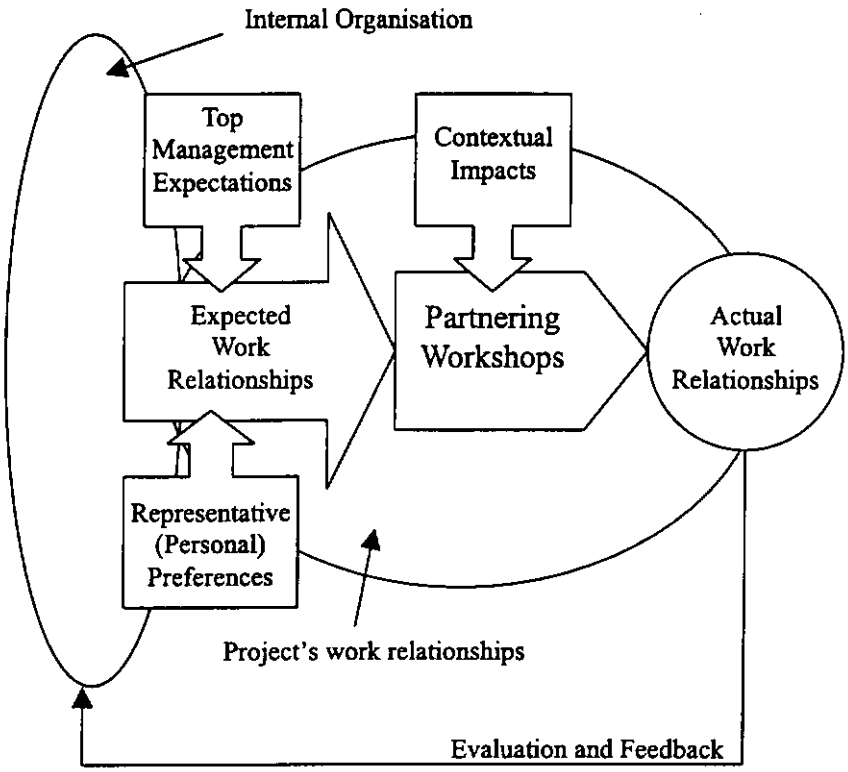


Figure 5.7: Improved Work Relationship Outline Model

Table 5.3: Different Components of Improved Work Relationship

Different Components	Meaning
Internal organisation's impacts	Constraints posed from the internal organisation, including influences from internal interest groups.
Top management expectations	Expectations from the top management that are in line with the business targets.
Representative preferences	Preferences of those who represent the organisation to form the partnering team, which are mostly in line with their own interests.
Project's work relationships	Constraints posed from the project to the partnering relationship.
Expected work relationships	Expectations of the level of the work relationship.
Contextual impacts	Surrounding impacts that pose constraints to the workshops.
Partnering workshops	Implied to be places that perform and undergo the work relationships.
Evaluation and feedback	Comparing the expected and actual work relationships and adjusting the expectations of the involved parties respectively.

5.5 PROCEDURAL MAPPING MODEL (PMM)

This and the next section describe how the practical model can be developed. The practical model is different from the general model, in which the general model specifies the relationships between the critical factors and the whole partnering process, while the practical model underlines the real contributions of the factors toward the process. This is not a conceptual expression but the procedural conducts that the parties have to behave and act. A practical model is argued to be clearer and more effective when its design has made use of modelling techniques (Kartam et al., 1997). There are several modelling concepts for construction, which provide various functions to applications.

Basically, there are two types of model – system and process (Kartam and Ibbs, 1996). A system model gives a different perspective and accordingly serves a different purpose to a process model. A system model focuses on the process surroundings including constraints, environment, etc, portraying the process with its inputs, outputs, directives, feedback loops and interactions with other processes, but neglects the steps that constitute the process.

A process model, on the other hand, highlights a set of consecutive steps or activities leading to an end product or service to be delivered. It distinguishes the value adding activities from the non-value adding ones, but forgets about the surrounding impacts on the process. Walker (1996), Sanvido (1984) and Chung (1989) are all typical system models and Koskela (1992) is simply a process model, whilst Kartam and Ibbs (1996) produced one that combines both types. They briefly described below:

- Walker (1996) used the conversion model to develop an input-process-output model for portraying the construction process.
- Sanvido (1984) made use of the Alexander's (1974) dynamic model, which modified the PERT diagrams, to form his overview model of construction.

- Chung (1989) developed an integrated building process model (IBPM) from the perspective of the client of the facility, based on a graphic language technique, developed by SofTech Inc., called the structure analysis and design technique (SADT). SADT is one of several modelling tools developed in the software engineering discipline (SofTech Inc., 1979).
- Koskela (1992) created a process flow diagrams to highlight processing and non-processing units. This is a process flow model different from the above system models.
- Kartam and Ibbs (1996) used the workmapping model, which is rooted in the conventional conversion model and the SADT. They claimed that their model, while retains the conversion process (i.e. input-process-output), adds the concept of SADT in which data is divided not only into inputs and outputs but also to mechanisms and controls.

The workmapping model of Kartam and Ibbs (1996) is likely to be the most useful among the rest since it combines the system and process flow concepts in modelling. This model is a systematic approach to modelling a process embraced with a general view of the functions for control, feedback, interactions and flows, and produces a logical precursor to automation (Kartam et al., 1997). The concept of the workmapping model (as shown in Figure 5.8) is easy to understand and use. It avoids the use of complicated graphic language, like flow charts, but retains a sufficient number of graphic vocabulary to portray the relationship between different types of systems, such as planning, resource management, evaluating and controlling.

To bring in the life elements of such an abstract mapping model, Kartam and Ibbs (1996) established an integrated approach to modelling the project's planning phase, namely the CPR System Models. They gave the CPR System a medical acronym due to the various successful case studies of it in reviving management systems. The CPR System has four components: the Workmapping System Model, the Process Interaction Model, the Communication Model and the Responsibility Matrix. These components are

able to portray management systems, processes and communication channels, as well as responsibilities respectively. While the Workmapping System Model is appropriate for modelling an input-transformation-output process, it is useful to a change process such as the conceptual model in this study.

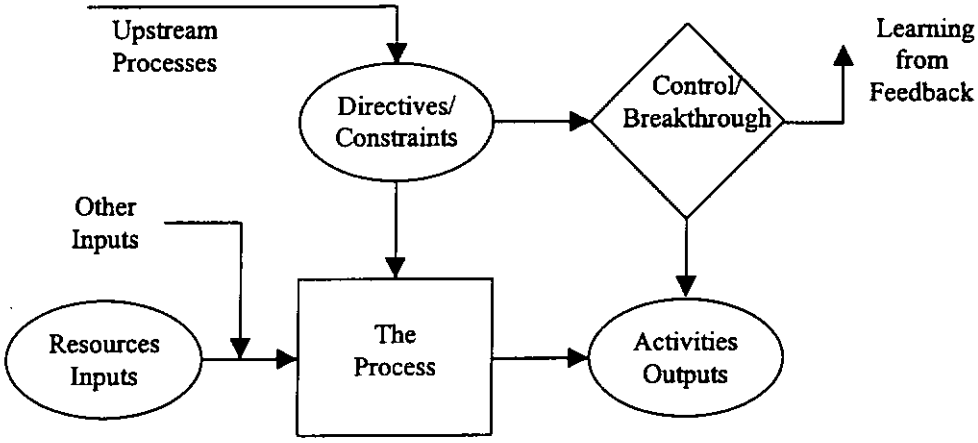


Figure 5.8: General Format of Workmapping Model

Note: Adapted from Kartam and Ibbs (1996) and Kartam et al. (1997)

Workmap portrays the system perspective, whereas the CPR (other components of the CPR System) has more practical contributions. Kartam and his colleagues (Kartam and Ibbs, 1996; Kartam et al., 1997) referred to the interaction process matrix and the communication process model as the process charts which can be applied to system design, improvement, training and orientation. These process charts are good for distinguishing between value adding and non-value adding activities in the process. The final component is the responsibility matrix, which indicates how management assigns responsibilities.

As stated previously, both of the original and refined conceptual models of

partnering actually contain the elements of a system model, as well as a process flow model. The four components of the CPR System have the ability to apply to the development of the partnering model for this study. They provide tools to model the whole process of partnering with the various steps to plan and roles to play, as well as the existed interactions. However, these components are all tailor-made for a construction project process. Adapting them to address the partnering issues requires considerable redesign of their features and enhancement of their capabilities. The modified components are described as follows:

1. Procedural Mapping Model (PMM) – Adapting the mapping system model to identify the general process system, including the inputs, outputs, mechanisms, controls, interactions and certainly the overall process flows.
2. Interactive Process Description (IPD) – Adapting the concept of the interaction process matrix to form the action procedures, detailing all the necessary steps within each of the sub-processes identified in the mapping model.
3. Supporting Mechanisms (SMs) – Applying the communication model to not only simulate the communication channels but also enhance the comprehension of the co-ordination, commitment, continuous improvement and learning climate mechanisms for partnering. Monitoring of these mechanisms is needed.
4. Goals' Assessment Matrices (GAM) – Using the concept of responsibility matrix to create the assessment matrices to monitor the overall goals' achievement performance as well as individual goal attainment level. GAM is to provide traceability, and hence control.

The PMM is described in this section, while the others will be dealt with in the next section. The workmap tool is particularly useful for illustrating the system perspective, specifically in drawing the whole picture of the partnering process, which forms the foundation to establish the necessary procedures. In order for the PMM to portray the system of the partnering practical model, it adapts the workmap concept by using the four basic graphic shapes as follows:

- A rectangular box – represents the processing units. Processing units are value-added activities, which can be processes for selection, decision making, problem- solving and monitoring.
- A circle – represents the inputs, outputs or directives/constraints. Inputs are resources and necessities. Outputs are completed tasks and activities or deliverables. Directives can be plans, expectations or objectives while constraints can be trust, commitment, etc.
- A diamond shape – represents the feedback loop for control and breakthrough purposes. It also represents the learning capability inherent by the system.
- An arrow – represents the flow of processes and learning from feedback.

The whole PMM is depicted in Figure 5.9. It portrays six integrative processes (sub-processes) within the partnering process. Representative Selection Process (RSP), Team Building Process (TBP) and Partnering Agreement Process (PAP) are in the process stage of partnering formation. Goals Attainment Process (GAP) and Joint Problem Solving Process (JPSP) are in the stage of partnering application. Reactivation Decision Process (RDP) is in the stage of partnering completion and reactivation.

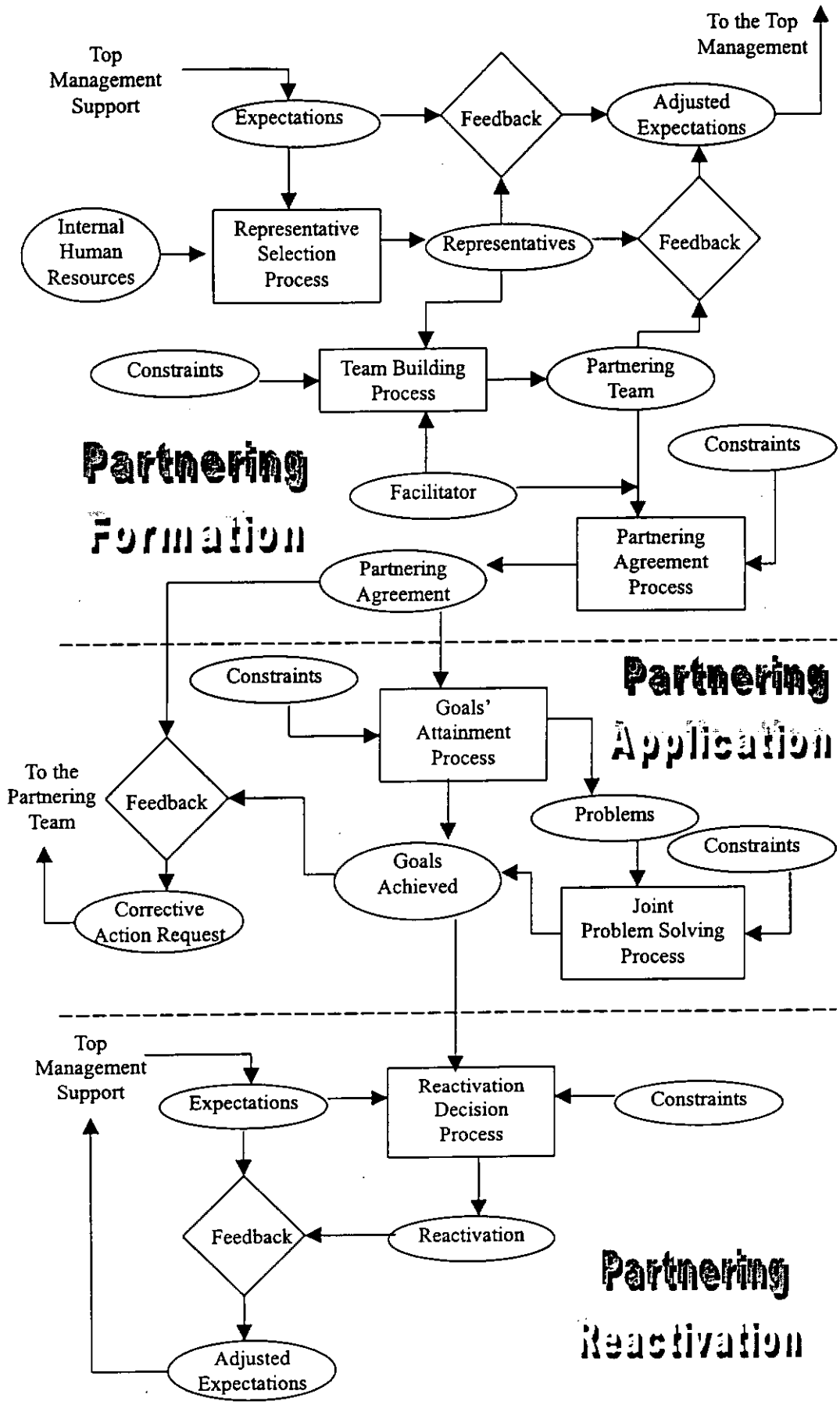


Figure 5.9: Procedural Mapping Model for Partnering

5.6 PRACTICAL USE OF PMM (PRACTICAL MODEL OF PARTNERING)

Figure 5.10 represents the Practical Model of Partnering (PMP), which is derived from the PMM. The PMP has three main components – Interactive Process Description (IPD), Supporting Mechanisms (SMs) and Goals' Assessment Matrices (GAM).

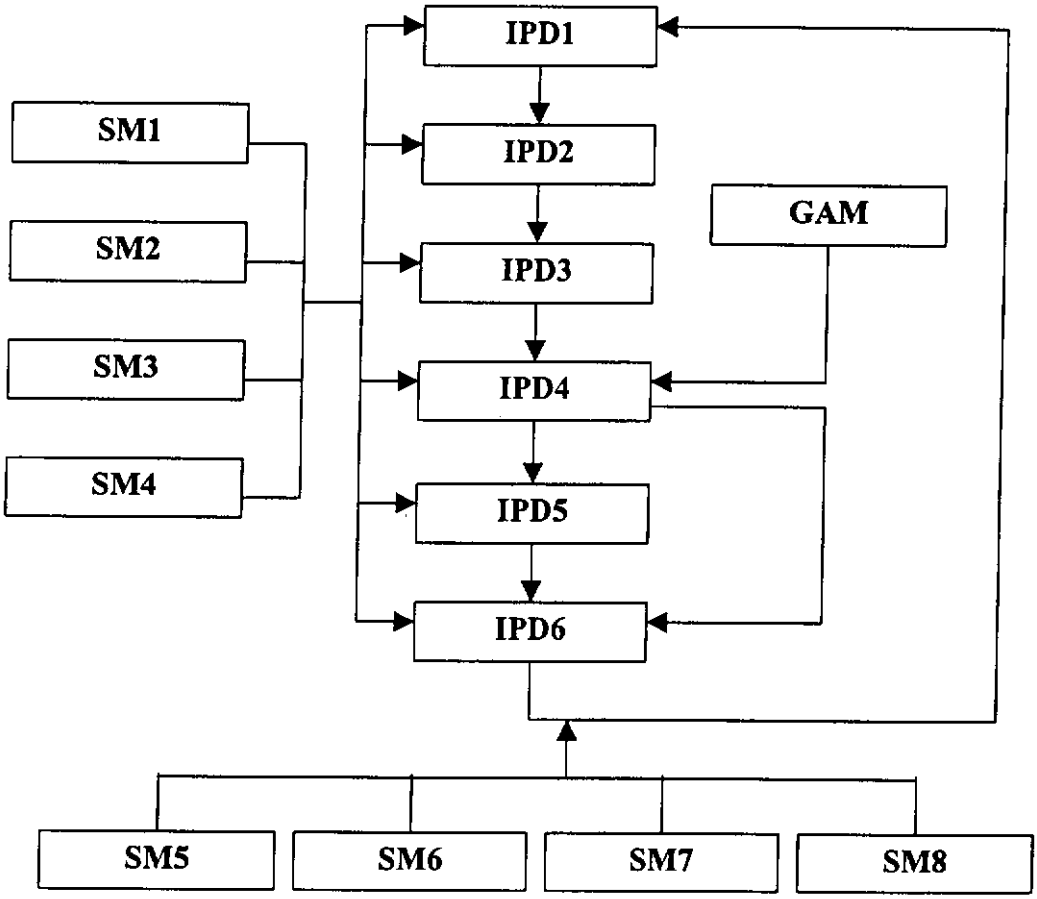


Figure 5.10: Practical Model of Partnering (PMP)

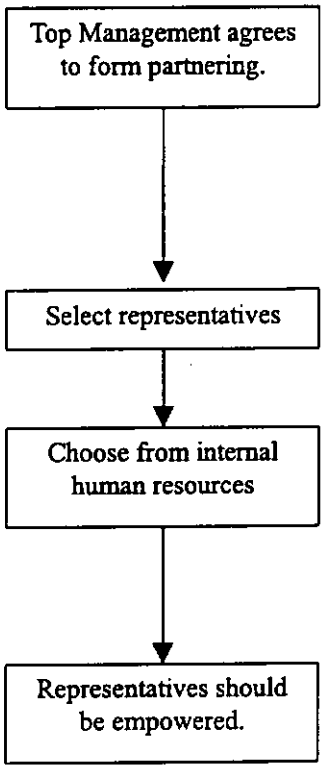
Notes: IPD = Interactive Process Description; IPD1 = Representative Selection Process; IPD2 = Team Building Process; IPD3 = Partnering Agreement Process; IPD4 = Goals' Attainment Process; IPD5 = Joint Problem Solving Process; IPD6 = Reactivation Decision Process; GAM = Goals' Assessment Matrices; SM = Supporting Mechanism; SM1 = SM for Open Communication; SM2 = SM for Effective Co-ordination; SM3 = SM for Mutual Trust; SM4 = SM for Top Management Support; SM5 = SM for Learning Climate; SM6 = SM for Continuous Improvement; SM7 = SM for Partnering Experience; SM8 = SM for Long-term Commitment.

The PMM is used for representing the system perspective and forms the basis for developing the IPD, SMs and GAM. These three elements provide the practical contributions derived from the PMM and form the Practical Model of Partnering (PMP). The PMP represents what should be done for the success of partnering. The key elements of the PMP in terms of the IPD, SMs and GAM are summarised in the following paragraphs.

5.6.1 Interactive Process Description (IPD)

The IPD (as shown in Figure 5.10) outlines all the necessary procedures and/or steps for each of the six interactive processes, including the roles, responsibilities, decisions to be made, precautions, constraints, the time consumed and the logical sequence. Due to this logical sequence adding all elements along the vertical axis, the non-value adding activities can be eliminated easily. The IPD can also serve to analyse the time spent in each step and avoid overlapping steps. An efficient timetable specifying the effective steps matches the increasingly tight and taut construction projects. The IPD for the six interactive processes are described in the following figures:

1. Figure 5.11 depicts the procedures for Representative Selection Process.
2. Figure 5.12 depicts the procedures for Team Building Process.
3. Figure 5.13 depicts the procedures for Partnering Agreement Process.
4. Figure 5.14 depicts the procedures for Goals' Attainment Process.
5. Figure 5.15 depicts the procedures for Joint Problem Solving Process.
6. Figure 5.16 depicts the procedures for Reactivation Decision Process.



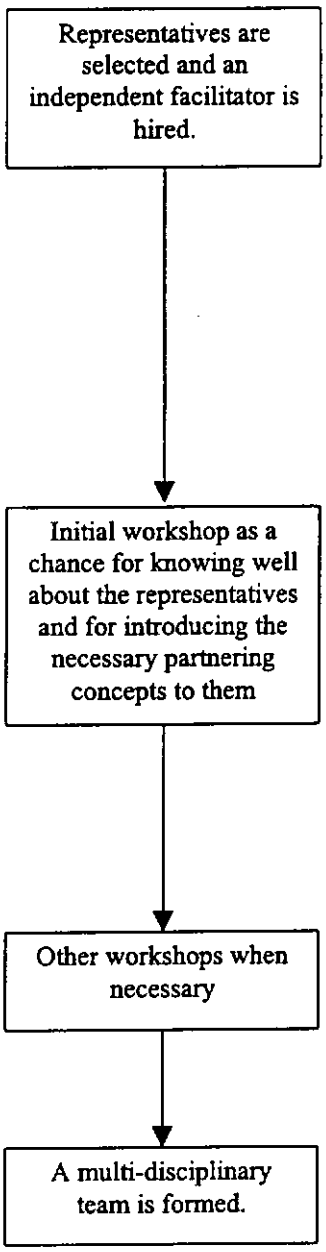
Top management of the key project parties agrees to form partnering. At the same time, they expect that partnering will bring certain benefits, such as improved relationships, improved project performance, enhanced communication, etc. Figure A3.1 in Appendix 3 lists the role of top management in partnering arrangement.

Top management is required to first select representatives to participate into the partnering activities.

Top management should choose the senior executives who should have the complete knowledge of the project and act on behalf of the company as spoken person. These key executives should favour innovative ideas and possess strong interpersonal and communication skills.

Representatives should be delegated with sufficient authority to make decisions on behalf of the company. They must have close contact with the top management so that the latter can still keep track of the progress of partnering despite their indirect involvement.

Figure 5.11: Representative Selection Process



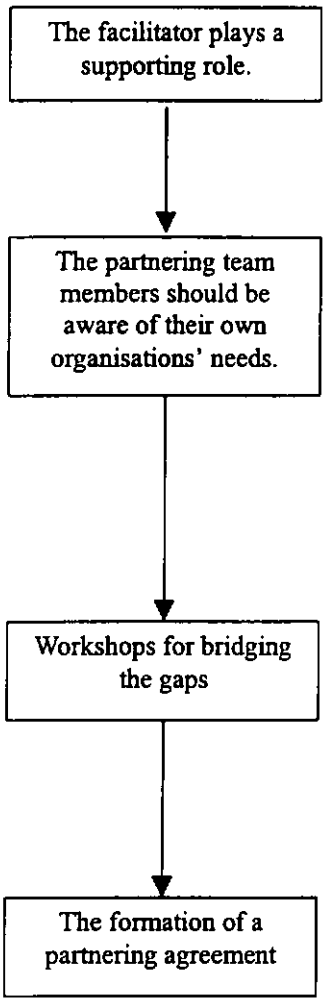
After representatives of the key project parties have been selected, an outside/external facilitator should be hired to facilitate partnering formation, and acts as a neutral party to the process. Such an independent facilitator should have a construction background and be familiar with partnering issues, and possesses strong interpersonal and management skills including communication and problem solving skills. A facilitator's duties include the provision of expertise, taking care of the involved parties' interests, problem solving, elimination of misunderstanding among parties, etc. Figure A3.2 in Appendix 3 lists the expected capabilities of a facilitator.

The facilitator organises the first meeting where the representatives from all involved parties will be nursed. This initial workshop allows the people to get to know each other. The facilitator makes use of this workshop to understand what these people want from partnering, to identify any conflict of interests, etc., in order to establish rapport. The facilitator should also introduce the concepts of partnering at this first meeting to allow them to understand what partnering is all about and how they can be benefited from it.

For building a long-term partnering team, one workshop may not be enough. Other workshops may be needed to give rooms for adaptation, to solve any conflicts, to increase mutual understanding, to establish trust, and to provide appropriate training.

A multi-disciplinary team is formed when all representatives really understand what is partnering and are willing to discuss in detail about the partnering agreement. A checklist for how to hold a successful workshop is provided in Figure A3.3 in Appendix 3.

Figure 5.12: Team Building Process



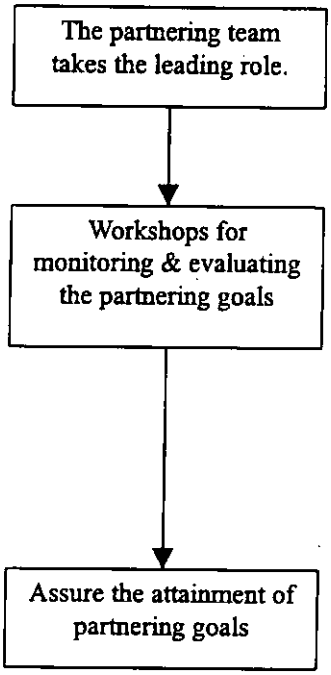
After having helped the creation of the partnering team, the facilitator should take a supporting role to assist the formation of a partnering agreement, such as organising and managing workshops, solving problems and conflicts, etc.

The partnering team represents diversified interests from various parties. Some of these interests can be shared while some are exclusive. Team members should be well aware of the expectations from the top management and other interest groups of the organisation. They should ensure that the goals of their own organisations (internal goals) must be compatible with those of the team and the project. The facilitator may guide them about these issues in the workshops.

Workshops are useful for adjusting and regulating the partnering goals with the internal goals as well as the project goals to ensure that they are compatible. Most often, the partnering goals consist of some tangible project goals, such as quality, cost, schedule, safety and time, and some intangible contextual goals, such as communication, trust, commitment, etc.

A written partnering agreement is formed, which outlines all the partnering goals to achieve. Sometimes, the agreement includes a partnering mission. In most cases, this agreement is signed by all involved parties to show explicitly their commitment to the team. The goals in the agreement become the foundation for tracing the partnering performance. After the partnering agreement is formed, the role of the facilitator is finished and released because further involvement may not be appropriate when more confidential information starts to be shared among members.

Figure 5.13: Partnering Agreement Process

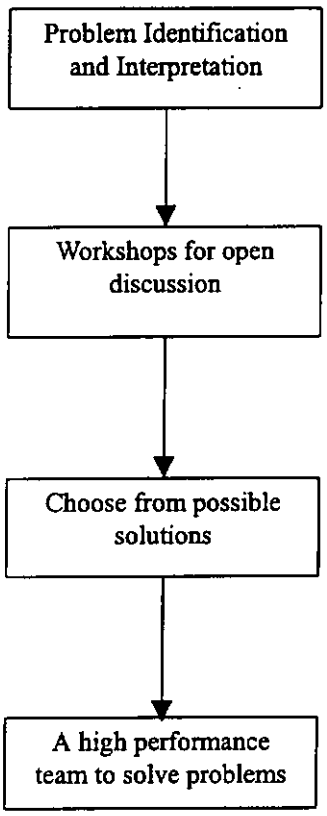


After the release of the facilitator, the partnering team will take the leading role for partnering application. They are responsible for monitoring and evaluating the achievement of the partnering goals and resolving problems.

Workshops are organised to monitor and evaluate the achievement levels of the partnering goals. Usually, monthly workshops are sufficient. In case of emergency, such as poor partnering performance or serious problems, additional workshops are organised. Some devices, such as performance matrices and graphs, are needed to assess the partnering performance (will be described in detail later). An example of a partnering workshop report is shown in Figure A3.4 in Appendix 3.

The partnering team must assure that the partnering goals are attained. Sometimes, the facilitator may act as an external consultant for assisting them further when necessary.

Figure 5.14: Goals' Attainment Process



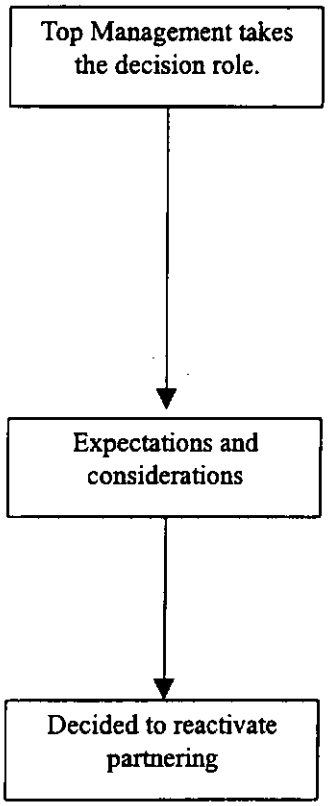
The partnering team should identify and interpret the problems correctly. They should be aware that they are not only responsible in solving mutually encountered problems but also the problems of individual parties. They work as a team to share any interests as well as risks.

Workshops are organised to solve problems by encouraging open discussions for brainstorming of possible solutions. Resolving techniques should be adopted to solve the problems. A real life case of problem resolving is presented in Figure A3.5 in Appendix 3.

In some cases, it is easy to determine which solution is the most appropriate. Whilst, for complicated issues, devices, such as evaluation matrices and weighting methods, are used to rate and prioritise the possible solutions. The team should be careful in selecting the criteria (the rating items) for prioritisation.

The partnering team should try to avoid problems that are destructive to all kinds of performance. When they encounter problems, they should accept the challenge to solve them in order to reflect the spirit of partnering.

Figure 5.15: Joint Problem Solving Process



The long-term objective of partnering effort is to establish the reactivation of a partnering relationship. The top management of involved parties is responsible to make such a decision based on their expectations and past experience. It is important to state that a partnering relationship has to be reactivated by the same group of involved parties or a reduced number of members of the group. If there is any addition of new group member, a new partnering is formed, which is not a reactivated partnering.

Whether or not to reactivate a partnering relationship, the top management has to make such a decision based on relevant reasons. Other than the consideration of the internal goals, some common reasons are the favourable past experience, policy of continuous improvement, high level of long-term commitment and a build-in learning climate.

When the top management of the involved parties has decided to reactivate partnering, they can restart the partnering process to firstly select representatives to form the partnering team. It may use members of the old team; however, due to turnover or redeployment of staff or new expectations from individual organisations, team members often change.

Figure 5.16: Reactivation Decision Process

5.6.2 Supporting Mechanisms (SMs)

The Communication Process Model of Kartam and Ibbs (1996) is useful to streamline the communication requirements for partnering. Such a model demonstrates the communication channels between parties for sharing of information. As all parties are treated equally in the context of partnering, they are encouraged to share information and knowledge. Thus, a model, which can portray the formal pipelines for information flows and indicates communication barriers, fits the requirements. In fact, both intra- and inter-organisational communication requirements should be considered for the design of a supportive communication mechanism. The idea of establishing

mechanisms for project and inter-organisational integration has been raised by Mitropoulos and Tatum (2000). The term "mechanism" is used because it implies that the course of action has a strong sense of practical application, which is not only a knowledge framework or structure, but also is a method embodied managerial or technical skills.

In addition to a communication mechanism, the design of mechanisms extends to other CSFs. For a successful partnering, a series of mechanisms should be built up and sustain a high positive level of a group of common and functional CSFs. In the PMP, eight Supporting Mechanisms (SMs) are developed. Specifically, they are four basic SMs that are essential for all partnering stages and four functional SMs that are particularly designed for long-term co-operative partnering.

Appendix 4 provides a list of examples of eight untested mechanisms. These mechanisms are designed by adapting from existing published mechanisms or models, or from the concepts of relevant literature. They are able to be reference for partnering arrangement. Since their usefulness and effectiveness have not been tested, they are not included in the content of this chapter but presented in the appendices. One should also bear in mind that what works for one organisation may not work for others (Golden, 1994; McCune, 1994). This may be due to the differences in the nature of the organisations, their environment, cultures and histories and industries (Golden, 1994) or the various strengths and weaknesses of the organisations (McCune, 1994). Therefore, some mechanisms may be fully applied, while the others may require modification.

The mechanisms specify the steps and procedures for establishment. However, they have not clearly explained the method to audit the performance level of the success factors. Clarke and Manton (1997) suggested an audit model, which uses a matrix to obtain score or rating in order to carry out an audit for the success factors. This model is useful to keep track the performance of the mechanisms that are actually the methods to establish the success factors. Prior to the beginning of this audit, key criteria for assessment have to be

established. Table 5.4 shows an example of the audit matrix. A five-point scale is used for the eight success factors although a three-point scale (Fleming and Kippelman, 1996) and a six-point scale (Clarke and Manton, 1997) might also be useful.

Table 5.4: Audit Matrix

Four Common Success Factors		
Score	**Open Communication**	**Effective Co-ordination**
5	*Excellent communication* – No complaint of communication problems; communication channels have been used extensively.	*Very well co-ordinated* – No complaints of problems in co-ordination.
4	*Good communication* – A few trivial complaints and have been solved quickly; most of the communication channels have been used very well.	*Well co-ordinated* – A few complaints of problems in co-ordination; team members are rarely faced with problems such as misunderstanding, misleading concepts and misinterpretation.
3	*Average communication* – Some trivial complaints and have been solved in reasonable time; some communication channels are well used but others are not.	*Sometimes co-ordinated* – Some complaints; sometimes members are faced with misleading concepts, misunderstanding and misinterpretation.
2	*Limited communication* – Many complaints while some are serious and could not be solved; most of the communication channels are not used	*Seldom co-ordinated* – Many complaints; many co-ordination problems as listed above.
1	*Poor communication* – Frequently complaints of serious communication problems; most of the channels are not used while the used channels are not effectively used.	*Poor co-ordinated* – Always complaints; members hardly understand each other.
	Mutual Trust	**Top Management Support**
5	*Trust each other totally* – Rely on each other totally to complete their part of work; all information provided by team members are serious dealt with.	*Support fully* – Partnering has been added to the firm's mission; partnering representatives are all senior executives; resources are very well allocated.
4	*Often trust each other* – Often rely on each other to complete their part of work; most of the information provided by team members are serious dealt with.	*Often support* – Partnering has been added as a strategic affair; those representing the company are at least middle management; resources are well allocated.
3	*Sometimes trust each other* – Sometimes query the work of others; some information provided by other members is never used.	*Sometimes support* – Partnering is an operational affair; representatives are mostly low level managers led by one or two middle managers; resources are partly supplied.
2	*Seldom trust each other* – Usually complain about the work of others; most of the information provided by other members is perceived to be not important and is never used.	*Seldom support* – Partnering is seldom recognised within company; representatives are low level managers without adequate authority; resources are rarely supplied.
1	*Not trust each other* – Always query the work of others; never use others' information for work; always generate information on their own.	*Poorly support* – Partnering is not recognised in house; just one or two representatives who seldom attend the meetings or workshops.

Table 5.4 (continued)

Four Functional Success Factors		
Score	**Long-term Commitment**	**Continuous Improvement (CI)**
5	*Total commitment* – Fully realise the importance of long-term relationship; Very well prepared to form long-term relationship with other members.	*Fully committed to CI* – Fully awareness of the need for continuous improvement; fully understanding partnering promoting continuous improvement.
4	*Good commitment* – Knowing the importance of long-term relationship and well prepared.	*Usually committed to CI* – Accept continuous improvement; knowing that partnering promotes continuous improvement.
3	*Some visible commitment* – Accept that long-term relation is an alternative for signing contracts with others.	*Some committed to CI* – Realise that continuous improvement is not a must; committed to it may not be harmful to the organisation.
2	*Limited commitment* – Realise that long-term relation is not what they want.	*Limited committed to CI* – Believe that improvements might not necessary be continuous or there are other things better than continuous improvement.
1	*Poor commitment* – Believe that long-term relation is hazardous to the company.	*Poorly committed to CI* – Believe that continuous improvement will be harmful to the organisation.
	Partnering Experience	**Learning Climate**
5	*Always used* – Management always encourage learning the experience from partnering; employees are fully aware of the partnering progress and are convinced to use what they learnt from the workshops back to their workplace.	*Very keen to learn* – The habit of learning can be found everywhere inside the organisation; top managers encourage employees' discussions and are actively involved; top management always looks for innovations, ideas and improvement.
4	*Often used* – Learning from partnering experience is often encouraged; partnering experience is encouraged to use in their workplace.	*Keen to learn* – Learning is encouraged by management; top managers encourage employees' discussions and are sometimes involved.
3	*Sometimes used* – Learning from partnering experience is sometimes encouraged; employees determine for themselves what to learn.	*Sometimes keen to learn* – Learning is good to employees but not widely promote; discussions are limited during groups' meetings.
2	*Seldom used* – Management seldom encourages their staff to learn from experience; no learning perspective is found within the organisation.	*Seldom keen to learn* – Learning is not encouraged in company; no spare time and place for discussions; organisation is satisfied within the status quo.
1	*Never used* – Management do not believe that partnering is worth of learning; management is concerned other things rather than learning.	*Never bother to learn* – Organisation sticks to the status quo; never accept new things or new ideas; learning is seen as a devil rather than a hero.

Clarke and Manton's (1997) model highlights four major audit components. This audit model is valuable to compare between partners regarding the level of the four common success factors (i.e. open communication, effective co-ordination, mutual trust and top management support). It is also helpful to check within each organisation about the level of the four functional success factors (i.e. long-term commitment, continuous improvement, learning climate

and partnering experience). Figure 5.17 is an audit model for supporting mechanisms, which adapts the four components and describes below:

- The valuable first step is to design a score card (usually in table form) for team members or individual organisations to assess the performance level of the success factors. This score card must be based on the audit matrix that has been constructed. Team members or individual organisations must discuss what the key criteria are, which can help not only to assess the maturity level of the factors' performance but also indicate what has to improve.
- The completed score cards are then plotted to form graphs or charts, such as radar chart audit. In this example, two four-axis radar charts are plotted. The first radar chart is to compare the performance level of the four common success factors between partners. Thus, the results (i.e. the mean scores) from the score cards of all organisations are then plotted on the chart. The second radar chart is to check the level of attainment of the four functional success factors for evaluating the level of intention capable for reactivating another cycle of partnering (i.e. strategic partnering). So, the results from the score cards of each organisation are plotted against the previous performance to indicate the gap with the desired scores.
- The third step is to compare these charts against the expected performance (as shown in the audit matrix) to disclose the performance gaps and identify the areas for improvement. As Clarke and Manton (1997) suggested, a holistic approach to attain an overall balanced performance is essential because the performance of one factor may be achieved at the expense of the others due to economically scarce resources. Team members or individual organisations are responsible to determine such desired scores. Furthermore, respective target scores may be plotted on the same chart to illustrate the degree of improvements. Yet, such targets must be realistic and a relatively immature organisation is affordable to aim for this and improves incrementally.
- The audit matrix reveals the good practices to copy. Moreover, the eight mechanisms (in Appendix 4) comprise good action plans and methods.

The fourth step involves drawing up a priority action plan that specifies the pre-determined targets, which are considered based on the mechanisms and checklists.

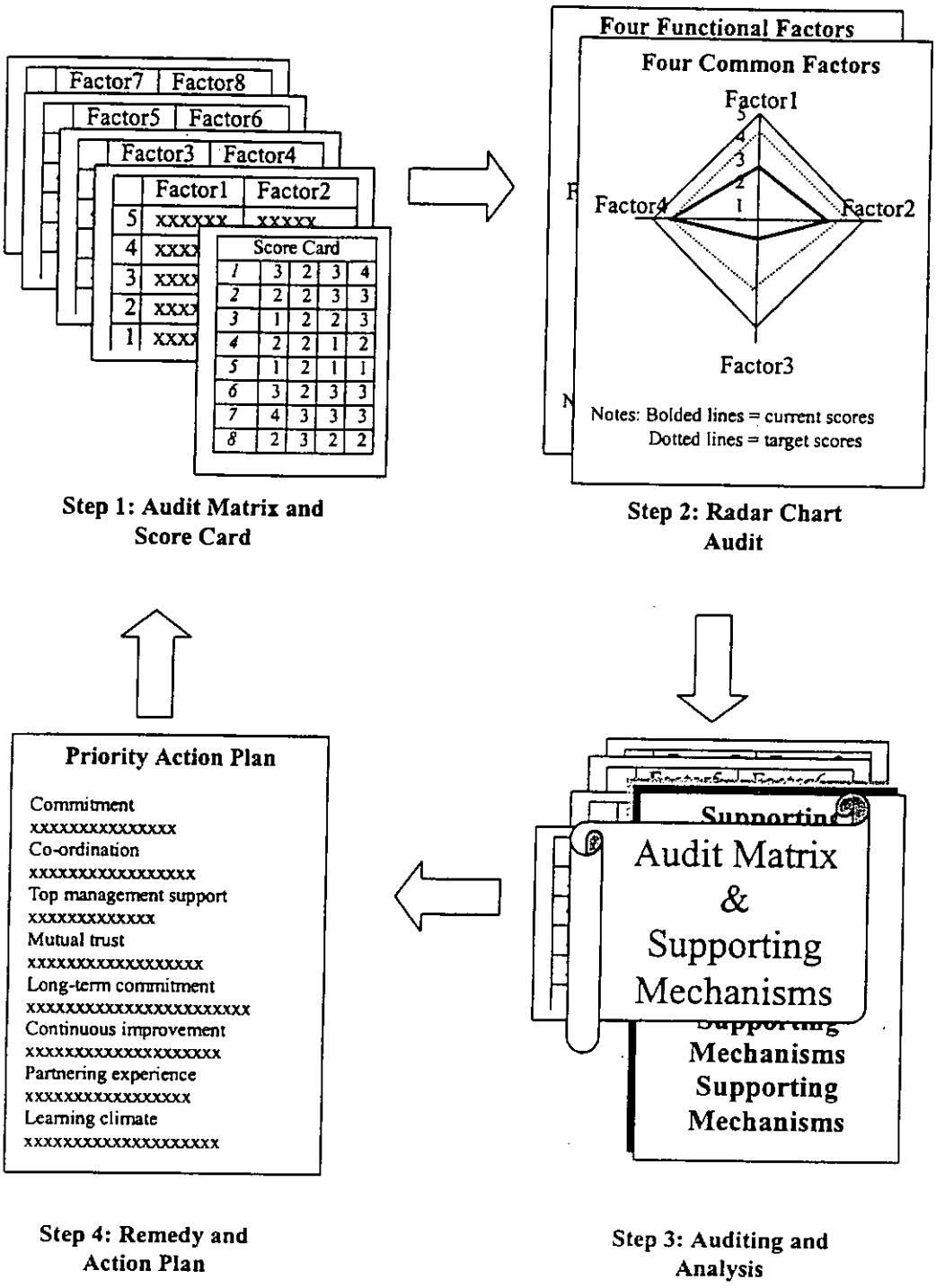


Figure 5.17: Audit Model of Supporting Mechanisms

Note: Adapted from Clarke and Manton (1997)

5.6.3 Goals' Assessment Matrices (GAM)

Goals' Assessment Matrices (GAM) are derivatives of the Responsibility Matrix. The latter indicates how management assigns responsibilities and correlates these assignments to performance (Kartam and Ibbs, 1996; Kartam et al., 1997). Matrix is a kind of rating format satisfying a wide range of utility, including evaluation of performance (Clarke and Manton, 1997) and prioritisation of relationship (Kamara et al., 2000). Stephenson (1996) suggested that evaluation of partnering goals is one of the three critical elements essential to a project partnering system. The other two elements are a project charter and an issue resolution system.

Pertaining to partnering, GAM has several features that are used to audit the level of attainment of the partnering goals. GAM consists of tools to identify the performance gap and is solely made for the GAP (Goals' Attainment Process). Again, the audit model of Clarke and Manton (1997) is adapted here. GAM not only helps to obtain the current performance of the parties but also monitors the performance from time to time when comparing all previous matrices. It has four basic components, which are described with examples as follows:

1. A partnering score sheet (as shown in Figure 5.18) is designed to collect the opinions about the level of attainment of the partnering goals from team members at each workshop. It is self-reported evaluation in which the score sheet lists out the goals to be achieved and allows members to assess their level of maturity in progress based on a pre-approved scale. In this example, a five-point scale, from 1 (= very poor) to 5 (= very good), is used. The last "Remark" column allows members to state their reasons for their answers.

Partnering Score Sheet

Project's Name: _____ Workshop No.: _____

Company's Name: _____

Performance of each goal to be assessed using the following scale:
1 = Very poor; 2 = Poor; 3 = Average; 4 = Good; 5 = Very good

	Partnering Goals' Description	Score 1-5	Remark
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Signature: _____
Full Name: _____
Date: _____

Figure 5.18: Partnering Score Sheet

2. The data from team members are recorded in an overall assessment table for each assessment (as shown in Figure 5.19) with a spreadsheet format. The column headings list those team members who express their opinions, whilst the rows list the partnering goals that have to be rated. Total scores and mean scores are calculated while the scores from last assessment are also listed. The mean scores are compared to those of last assessment by means of a radar chart audit (as shown in Figure 5.20) to trace the need for improvement. Target scores are then set to achieve.

Overall Assessment Table for Workshop No. ____

Project: _____

Date: _____

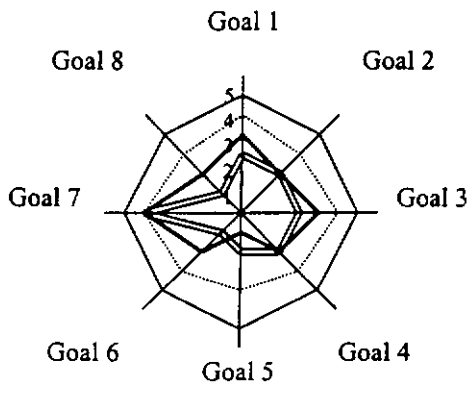
Goal	Name of Attendant										Total Score	N	Mean Score	Last Score
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Note: 1 = Very poor; 2 = Poor; 3 = Average; 4 = Good; 5 = Very good
N = Number of Attendants

Prepared by:

Figure 5.19: Overall Assessment Table for Each Assessment

Radar Chart Audit of Workshop No. __



Notes: Bolded lines = current scores
Dotted lines = target scores
Parallel lines = last scores

Figure 5.20: Radar Chart Audit

3. The data from each assessment will be added to an overall spreadsheet to file and keep track of all evaluation results. Such a spreadsheet can be called the progress assessment table (as shown in Figure 5.21). This table's column headings list all workshops with their numbers and dates, whilst the rows are the mean scores of all those partnering goals. Since the table also indicates how many and how often workshops were organised, it provides more information for analysis. The progress assessment table plots a bar chart in order to track performance of individual goals (as shown in Figure 5.22).

Progress Assessment Table

Project: _____

Goal	Number and Date of Workshop															
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																

Note: Mean scores are recorded.

Prepared by:
Date:

Figure 5.21: Progress Assessment Sheet

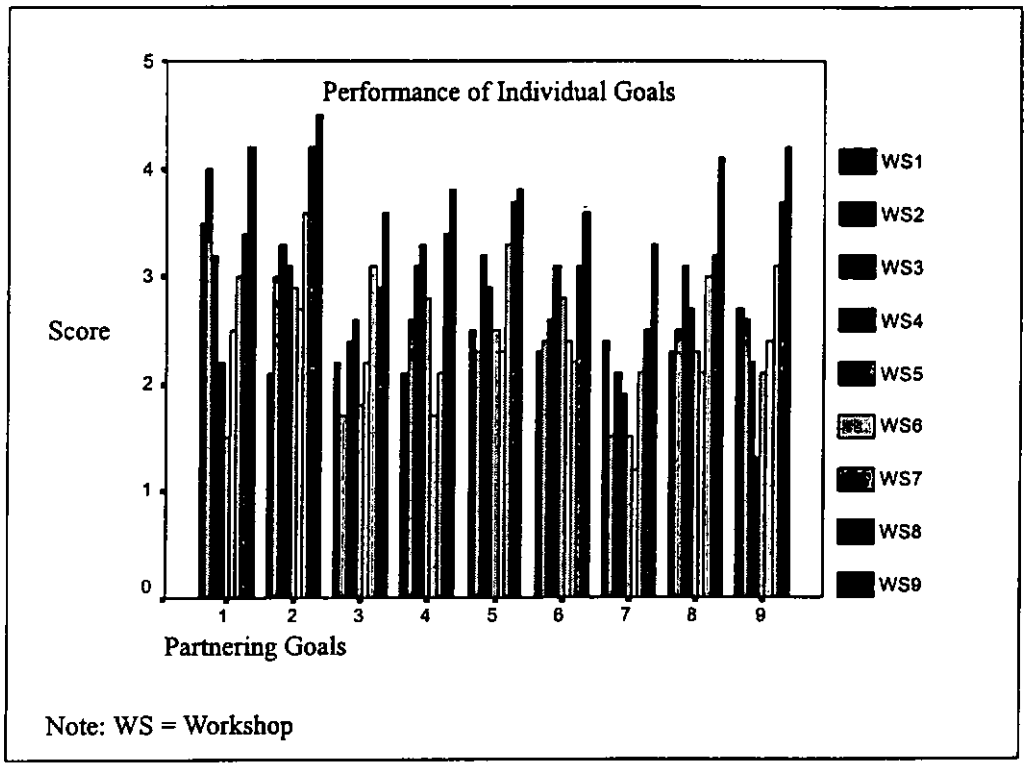


Figure 5.22: Partnering Performance Charts

5.7 SUMMARY

This chapter presented step by step development of a practical model of partnering. Prior to this, three general models of partnering process and three partnering criteria outline models are developed, which stemmed from the refined conceptual model in Chapter 4. Then, a modelling technique, which was originated from Kartam and Ibbs (1996), was used to develop the Procedural Mapping Model (PMM). This PMM helps to transform the conceptual model into a practical model by specifying key practices and activities. The Practical Model of Partnering (PMP) was composed of three major establishments including Interactive Process Description (IPD), Supporting Mechanisms (SMs) and Goals' Assessment Matrices (GAM). Individual components of these establishments were also described.

The PMP is not a conceptual expression but the procedural conducts that the

parties have to behave and act. One of the main features of this practical model is the setting up of procedures for espousing partnering. It portrays the processing units that form the value adding activities. It is also a general guide that features a certain degree of flexibility. In some cases, modified versions may be tailored to fit for the specific nature of construction projects.

CHAPTER 6: CASE STUDY METHODS

6.1 INTRODUCTION

The Practical Model of Partnering (PMP), which was based on the views of partnering and construction experts around the world, was established in Chapter 5. This model is claimed to be general and has principles to be useful in different construction contexts. Thus, this chapter aims at testing the effectiveness of the PMP. However, conducting tests using data from around the world are not possible in accordance with the scope of this thesis. Instead, this study takes the first step to examine the model based on Hong Kong's data for exploring the possibility to undertake further testing in other regions. Two case study methods are used to collect useful data for analysis. The results should be considered exploratory. The two methods are described below:

1. A case is presented to show how a group of companies applied the PMP for establishing a partnering relationship. This case directly tests the effectiveness of the PMP in a real life implementation process. It forms exemplar of the philosophy proffered in this study.

2. A comparative case method is used to evaluate the effectiveness of the PMP. This method benefits mostly when comparisons are made between a successful and an unsuccessful stories so that similarities and differences are identified for inferring cumulative insights (Pearce, 1993; Nelson, 1996; Simpson and Wall, 1999).

For data collection, analysis and report to be potent, some guidelines have been followed:

- During the early design phase of the case study, the four basic aspects of quality of research (i.e. construct validity, internal validity, external validity and reliability) had been addressed.

- During data collection, a free style of questioning without rigid questionnaire on hand was used, which benefited the integration of the real life events with the framework of the case study. In this sense, the investigator did not control the data collection environment, which might exist in other research strategies (Yin, 1994). However, some basic questions were asked in order to allow for probing for more information. Section A1.5 of Appendix 1 lists the basic questions to evaluate the partnering projects.
- Using two sources of data/evidence (interviews and documents) helped to reduce the threats to construct validity by providing multiple measures of the same phenomenon, leading to the development of converging lines of inquiry (Yin, 1994). This is called the "data triangulation" (Denzin, 1978; Patton, 1987). As the interviews were conducted in an open-ended nature, the informant was free to provide relevant facts of the partnering case as well as opinions or insights about the events in the case. Documents (in the form of agendas, reports, etc.), on the other hand, were used to corroborate and augment evidence from interviews.
- The reports of the two case methods were brief but structured in a portrayal reporting style, which attempted to add some of the qualities of narrative in descriptive writing due to the lack of a natural and detailed story line (Stenhouse, 1980). Although Bassey (1999) suggested that the two reporting styles (narrative and descriptive) can be used independently in long presented cases, Zeller (1995) admitted that both styles may combine to support each other, especially in short cases. This thesis presents short cases so that portrayal reporting is appropriate. Stenhouse (1988) created the term "vignette reporting" for short portrayal reporting pieces.
- For comparative case study, a set of criteria for the comparison was established, which formed the basis for a replication of data collection and analysis from other cases when necessary. It was particularly useful in multiple-case study in increasing in reliability due to improved objectivity.

6.2 A SUCCESSFUL IMPLEMENTATION OF THE PMP

In this section, a real case was presented to show how a group of companies used the PMP materials to establish a long-term partnering. In order to secure the confidentiality of the information providers and prevent the intention of making any guesses, the project's, the parties' and actors' names were not shown, and narrative was modified. In fact, the essence of the case was preserved to ensure the provision of real information sufficient to justify the effectiveness of the PMP.

This case involved the creation of a long-term partnering. A thorough testing of the effectiveness of a long-term partnering in construction involves a longitudinal study that may require several years' efforts. Also, the model contains so many components and materials that a full evaluation of it may need the input efforts as much as those efforts for the development and examination of the conceptual model of partnering. Therefore, these reasons imply that a full testing and presentation of the case is out of the scope of study, which could not be done in this thesis. Instead, the case was a general one. The testing of the implementation of partnering was under the following procedures:

1. The PMP materials were given and introduced to the facilitator who used them to run a partnering relationship for the involved companies.
2. The investigator acted as an external consultant for the facilitator if any problems were created.
3. A senior executive of the client's company and the facilitator were interviewed to trace the implementation of partnering. Two sources of information provider would be helpful to ascertain the reality of information. Clarifications were needed if discrepancies existed.
4. The case's parties were asked to provide their opinions to reveal their perceptions of the effectiveness of the model. The case is presented hereinafter.

Recently, CHT Company Ltd (CHT) would like to establish a restaurant chain in Hong Kong. The company signed contracts with a property agent and an interior and contractor firm (hereinafter the interior firm). The property agent helped to find suitable locations for new restaurants, while the interior firm specialised in interior design and construction. The interior firm had a network of suppliers (construction materials) and subcontractors. Since the interior firm realised that CHT was a major client with an ongoing design and construction demand and a growing provision of jobs, it arranged one supplier and two subcontractors to serve for the client regularly. CHT had also regular suppliers of furniture and food.

As a restaurant chain, CHT had to maintain a united image of their restaurants, including the logo, interior design, furniture, and certainly the cuisine. Due to different sizes of the restaurants and different locations, CHT had to co-ordinate with other parties to ensure that the united image could be kept. However, for the past few months, problems like irregular design, work delay and shortage of suitable furniture easily put the company into trouble. With this in mind, CHT realised the needs for a closer relationship for maintaining its united image. Moreover, the company also realised that such a close relationship would speed up the expansion of the number of restaurants to compete with other chains. The company looked for efficient and effective co-ordination and co-operation of work. These include:

- CHT would have a better plan for expanding the chain. This could be achieved by possessing a full picture of the progress of the duties of all involved parties, including the search of shop outlets, design, construction, and supply of materials, furniture and food.
- The property agent could facilitate the process in searching appropriate shop outlets. By establishing appropriate communication channels, expectations and decisions from CHT could be quickly known. This would help to find good locations.
- The interior firm could be faster in response to the needs for interior design and construction. As the property agent had the expert knowledge

about the new restaurant's location, a direct discussion between the agent and the interior firm would speed up the design process and release the administrative burden of CHT from acting as a co-ordinator between the two parties.

- Suppliers for construction materials, furniture, and food could supply and deliver on time. Directly involved in the project, suppliers would be more efficient in response to the needs of the project, resulting in a better supply schedule.

A senior executive of CHT heard about partnering and knew that forming partnering was one of the modern business strategies to face the turbulent environment. This executive made a proposal to the managing director to propose the adoption of partnering since they intended to form a long-term relationship with the property agent, a major food supplier, the interior firm and the furniture supplier. A meeting from the five companies concluded that they had agreed to create a partnering relationship for a certain period. With a favourable review of the relationship, they would go on for the next agreed period and so on. The senior executive approached the investigator to ask for his opinions with respect to the formation of a partnering relationship. The investigator had done a preliminary study of the background of the companies and their expectations, and realised that:

- a core competence focus and business pressure moved to the needs for strategic partnering,
- the parties should employ an independent facilitator to initiate partnering since they had no partnering experience, and
- without partnering experience, a successful establishment of a strategic partnering was queried. However, the PMP materials provided a good foundation for the involved companies. The facilitator would also help in delivering partnering knowledge to them to make strategic partnering possible.

The investigator introduced a facilitator to them, who was a management consultant. This facilitator was provided with the PMP materials and was told to not only provide the knowledge to the involved parties but also take care of the interests of all parties.

The facilitator first diagnosed the full background of these companies. He knew that they had almost one year of joint efforts and had established three restaurants consecutively. While they had co-operated with each other, such relationships were instituted at the project level. In fact, they had no experience to exchange knowledge and information in a network structure. CHT had been the centre for all other parties. He knew that their previous relationships were established based on pure contractual requirements. Luckily, these parties did not have serious conflicts or problems. This reduced the barriers for the formation of partnering.

The facilitator, based on the PMP materials, found that these companies had:

- Intention to form partnering;
- Willingness to provide their own resources for the partnering process; and
- Considerable trust among parties since they would rely on each other for the completion of each project;

However, they also had:

- Limited knowledge on partnering;
- No well-established communication channels; and
- No common forms of co-ordination.

As a result, the facilitator set about placating the needs of the parties, in terms of:

- Quality (maintaining a united image in design, construction, furniture and food).

- Responsiveness (quick response in the needs for expanding the chain, searching outlets and other supply).
- Minimal administrative burden (relocation of the administrative duties, e.g. procurement, management of works).
- Satisfied customers (e.g. the plan of CHT, an early notice to suppliers).

As shown in the PMP materials, a partnering arrangement involved the formation of a high performance team that was the spirit of partnering and brought in the life elements for long-term survival of the relationships. Therefore, the facilitator helped the parties enact the partnering team. The PMP suggested that this involved two processes:

1. Selection of the team representatives. This team should consist of senior members from individual companies. Although the involved companies were all very small (with a staff size not more than 100), each of them was told to select two representatives to the inter-organisational team. These representatives were the spokesperson for individual organisations, and they should understand very well about the philosophy and objectives of the company especially in the area of development and had high morale for creating partnering relationships.
2. Formation of the partnering team. The facilitator then organised the first workshop for parties' representatives. Before this workshop, he distributed some PMP materials to the involved companies, which introduced the concept of partnering including what could be achieved from and contributed for such a relationship. He explained in the note that the objective of close relationship was not to simply reduce delay in work but to put all involved parties on a distinct and more effective footing.

In the first workshop, the facilitator found that some of these senior members did not show their interests in partnering. Due to insufficient understanding, they were afraid that partnering might change their normal work practices. They were also afraid of discussing in detail about the work practices and processes of their own companies. It seemed to him that they were afraid of

the exposure of important information without the consents made by their top management. In addition, these senior executives were obviously in lack of communication skills, and had serious co-ordination problems with other team members. They did not prepare well for the workshop and just simply looked for "receiving" rather than "giving". As an independent facilitator, he presented some concepts of communication and co-ordination skills (according to the PMP materials) for these team members. He made a conclusion in the first workshop that a second workshop was needed before the agreement could be finalised.

Before the second workshop, he discussed with the top management of individual organisations, concerning how to adapt to the change process and commit to a continuous improvement process (referring to the PMP materials). Obviously, information exchange within the partnering group was a critical factor conducive to the success of such an informal relationship. Without their commitment to the flow of information, further co-operation among members could not be attained. The facilitator talking with the top management was crucial, especially when the latter had committed to partnering but did not know how to contribute to partnering. Moreover, he had given further materials on helping the companies identify their requirements for this partnering relationship. He told the companies to identify what their current practices were and what they supposed to improve (or were requested to improve). He also reminded the companies to prepare a list of proposed requirements before attending the second workshop. Examples of partnering goals were given, such as:

> "Our intention is to identify a partner who can assist us in the application of advanced technology, will add a lot of value in terms of continuous improvements in cost control and quality, and can be a significant partner to us in the new areas we are seeking to exploit".

He tried to help these companies to identify the gap between what their status quo were and what they needed in the future, and to decide if this gap could be filled by partnering. These companies now could make sure what areas they

wanted to address in the next workshop. These include the areas with which they did not previously identify but in which they did not have the necessary in-house experience and knowledge. They could of course try to develop these areas by themselves, but the feeling was that their partners who had the relevant experience and skills could provide a better solution.

In the second workshop, the team members talked more openly. With the consents from their top management, they were able to exchange their expectations and desires except for the restricted confidential information. More expectations between parties stimulated the needs for closer relationships. At last, a partnering agreement was drafted. The mission of the partnering was that

> "Partnering parties are able to work in a network structure so that they can achieve the plan of CHT through a long-term strategic relationship among partners".

In addition to the mission heading, there were seven common goals to be achieved by the partnering organisations. Some of these goals were that they agreed to maintain a communication network, reply enquiry from other parties within two hours, refer to the codes of the reference list (e.g. codes for construction materials and furniture) for enquiry and discussion, and provision of updated stock and price lists. They expected that partnering could help the parties establish closer relationship resulting in not only meeting contractual requirements but also advancement in organisational performance. The facilitator also delivered the problem-solving skills to the team members since these skills were useful for them to resolve any conflicts that might arise in the future between involved parties.

The drafted agreement was approved and was signed by all parties in the second workshop. Up to this moment, the facilitator's duty would almost finish. He had already initiated the formation of a partnering. Since future workshops might start to exchange more confidential information, he might not be appropriate to be involved in them. He left the rest to the team for

sustaining the established relationships. He, however, acted as an external consultant to assist in any dispute or conflict that would be encountered by the parties and provide his professional knowledge when necessary.

Afterwards, the partnering team organised workshops periodically for planning the openness of new restaurants. Because of partnering, CHT had created a new direction. They started to acquire those restaurants with financial problems. Since the food supplier easily approached other restaurants, they could gain such information. Acquiring old restaurants not only saved the time for finding appropriate outlets, but also reduced the time and costs for applying licences.

After the grand opening of the fourth and fifth restaurants, they made a review of the effectiveness of partnering. Following is a list of the major achievements:

- Schedule had been shortened for the period from finding a location until the running of the restaurant.
- Costs were reduced considerably because the licence fees were waived and the kitchens of the two restaurants were refurbished but not newly constructed.
- United image could be maintained. The colour used for interior design (including the signboards) and the furniture used were consistent.
- There was no shortage of construction materials. Construction could be finished on schedule.
- Food suppliers had an early notification for food supply to the new restaurants. Previously due to unexpected date of opening, food suppliers were difficult to placate the needs.
- CHT could be better in planning the addition of new restaurants with the information provided from other parties disclosing the business strategy of its competitors (i.e. other restaurant chains).

With these positive outcomes, CHT wished to review the existing partnering agreement and would like to add more long-term goals into it. They aimed at targeting on continuous improvement in business performance including food, interior design, furniture, etc. They kept track of the achievement of the goals by rating the attainment level in each workshop and plotted graphs to identify the problems to be solved and to trace the performance gap for improvement respectively. Trust and commitment had been improved continuously.

These long-lived workshops helped to shape the direction for the future, to add functional expertise to the team, to introduce cross-company best practices, and to manage contract negotiation, while the high performance team acted as a consulting group and the catalyst for change.

Finally, the facilitator and the partnering team members of the parties were asked whether the PMP materials were useful to them. All of them admitted that the PMP contained the core components for a successful partnering and was a complete reference for them to use during the partnering process. Their perceptions of the PMP are shown in Table 6.1.

Table 6.1: Perceived Effectiveness of the PMP

Project Criteria for Comparison	Two shops with partnering	Three shops without partnering
Overall co-operation	High	Average
Work flow	High	Average
Quality of design	Very high	High
Quality of construction	Very high	High
Schedule	In time	Usually behind
Cost savings	Very High	Low
Work Safety	High	High
Rework	Few	Some
Labour productivity	High	Average
Problem solving ability	Very high	Average
Staff commitment	High	Average
Marketing strategy	Very high	Average
Resource allocation	High	Average
Communication	Very high	Average
Co-ordination	Very high	Average
Trust	Very high	Average

6.3 CASES FOR COMPARISON

6.3.1 Background of the Two Cases

There is a lack of in-depth study of construction partnering in Hong Kong. For example, a reported case of a construction project of Hospital Authority embarking on the North District Hospital only stated in one of its sections that partnering is one of the critical factors, which affects mainly the quality of both design and construction (Deakin, 1999). In fact, it is accepted that partnering extends down through the whole construction supply chain and a case study of its implementation inevitably promotes the uptake of good partnering practices or even the best practices from successful examples (CIB, 1997).

The two cases in this section were supplied by an executive of a well-known consultant company, a key player in the local construction industry, which had good and bad examples for partnering implementation. These were real cases although the projects had disguised, the parties' and actors' names were all fictitious, and narrative was modified in order to secure the confidentiality of the information provider and prevent the intention of making any guesses. However, the essence of the two cases was preserved to ensure the provision of real information to fit the framework of the comparative analysis.

6.3.2 The Successful Case

Lee Consultant Ltd had been taking part in the construction projects in Hong Kong for almost twenty years. Its main business was to provide structural and architectural designs to construction projects including building design and civil engineering work. Recently, it joined forces with other construction parties after an open tender process for a civil engineering project in Hong Kong. The project was planned and composed under five stages, where the first stage was worth approximately HK$30 million.

Although the contract was traditionally procured, the client agreed that establishing partnering among parties was possible. They believed that partnering could promote teamwork to achieve the project goals and provide them with a productive performance in maximising every party's contribution. Also, they were positive that partnering might be more productive for a long-life project like the one they were working on.

As partnering was a new concept to all of them, an external facilitator was hired to speed up the process for the formation of partnering. The facilitator was authorised to organise a number of workshops for resolving conflicts among parties and to push for their agreement to sign a partnering charter. A charter was expected to enable the parties to concentrate on the major issues about the project management and engineering work without the distraction of the traditional, confrontational procuring method. A charter was an agreement signed by all parties committing to achieve a set of partnering goals. Some of these goals were similar to those project goals and objectives, emphasising that they had to be particularly dealt with.

Before the creation of the charter, the first job of the facilitator was to establish a partnering team. Each involved party assigned at least two senior executives to the initial partnering workshop. These executives were very familiar with the company of which they represented and were empowered to make partnering decisions on behalf of the company. All parties were distributed with some partnering materials from the facilitator in the first workshop to discuss the relevant concepts.

After resolving some discrepancies, the team members signed a charter in the second workshop. Eleven mutually agreed goals were instituted and listed below:

- To meet or even shorten the project completion dates.
- To accomplish the financial budgets of all parties.
- To construct a quality product which satisfies the client's requirements.

- To recognise the expectations of other parties in a co-operative work environment.
- To achieve the best safety standard in Hong Kong.
- To recognise the importance of problem resolution for minimising disputes and conflicts as early as possible, leading to no litigation.
- To establish and sustain open communications.
- To attain a successful project that enhances the reputations of all parties.
- To take ethical consideration of the social and environmental responsibility.
- To have early agreement on design.
- To recognise and manage inherent project risks.

When all parties reached an agreement, the first stage of the project was then designed and constructed under a partnering charter signed by such key parties as the client, the project manager, the design consultant (Lee Consultant Ltd), and the general contractor. The partnering team was formed in May 1997 and dismissed in April 1999, covering the whole period of the first stage.

During the period when the charter is being effective, the parties had paid much attention to monitoring the attainment of the partnering goals. They introduced a monthly questionnaire (as shown in Figure 6.1) to keep track of the level of attainment.

This questionnaire was designed to obtain information from the partnering team members about the extent to which the goals were achieved. A separate performance chart was also plotted (using computing spreadsheet) to trace any trough for improvement.

As shown in Figure 6.2, the performance chart, despite a successful ending, still had some periods of poor performance. It was mainly due to some disputes created between parties. The parties recognised the problems and agreed to solve them as soon as possible. They discussed about the problems and intended to tackle them positively to resume the partnering performance to

a high level. Other materials might also bring into the partnering workshops, such as onsite construction progress charts and reports, accident and labour statistics, etc. as deemed to be necessary.

Partnering Assessment Sheet (Monthly)

Project: Contract 1/JCK/97A(BH) Partner: Client Period: Aug 1998

To be completed using the scale below:
1 = Very poor; 2 = Poor; 3 = Average; 4 = Good; 5 = Very good

Ref #	Partnering Goals	Score 1-5	Reasons (for high or low scores)
1	To meet or even shorter the project completion dates	2	Storage problem on site has not been solved.
2	To accomplish the financial budgets of all parties	3	
3	To construct a quality product which satisfies the client's requirements	4	Quality of supplied material assured by MPCL.
4	To recognise the expectations of other parties in a co-operative work environment	2	Recently KCCL not really helpful.
5	To achieve the best safety standard in Hong Kong	3	
6	To recognise the importance of problem resolution for minimising disputes and conflicts as early as possible, leading to no litigation	3	
7	To establish and sustain open communications	2	Responses from KCCL were slow recently compared to previous months.
8	To attain a successful project that can enhance the reputations of all parties	3	
9	To take ethical consideration of the social and environmental responsibility	3	
10	To have early agreement on design	3	
11	To recognise and manage inherent project risks	3	

Signature: _____
Full Name: Ivan Wong
Date: 7 Aug 1998

Figure 6.1: Partnering Assessment Sheet

Under normal circumstances, it is often the general contractor who shows less or little interest into partnering as compared to the other parties such as clients, designers or the project managers because contractors always think that partnering is a management tool to bind them tightly for the project. However, one interesting point of this particular project was that the general contractor not only showed a great enthusiasm towards partnering, but also willing to drive the idea of partnering to the remaining parties. This alone might contribute much of the successful ingredient of this project.

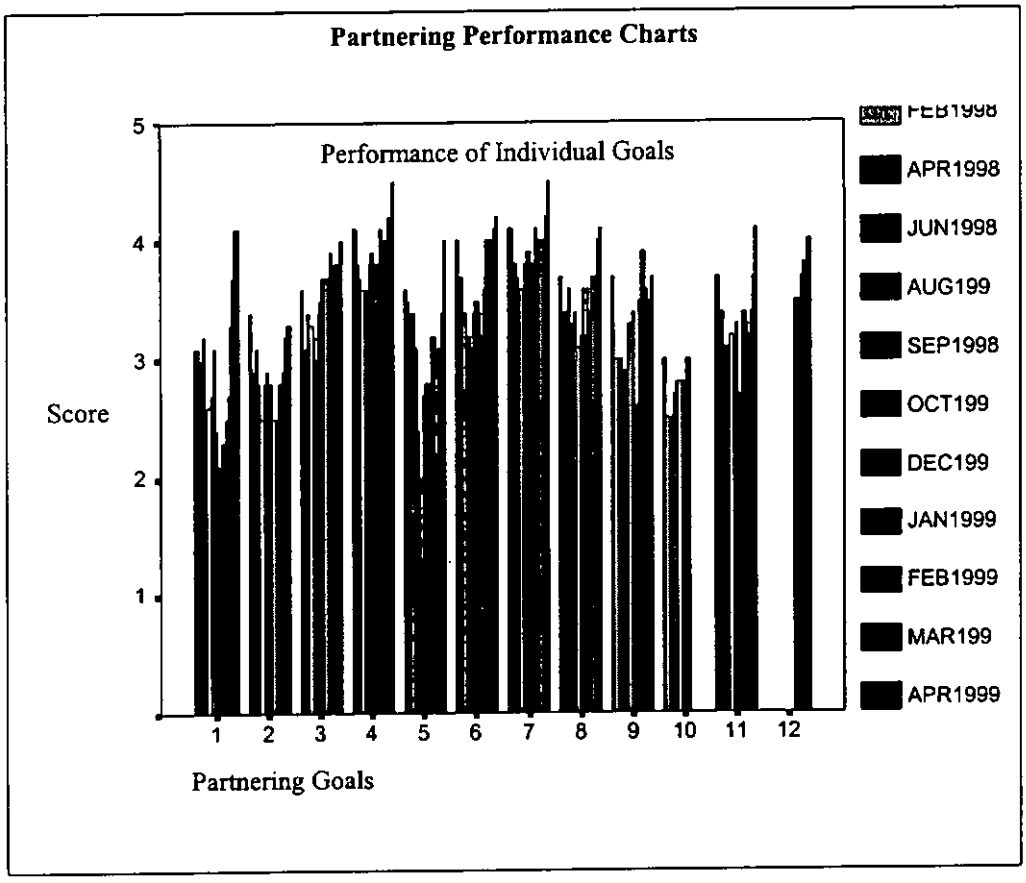


Figure 6.2: Partnering Performance Chart

Note: The original bars are different in colour.

6.3.3 The Unsuccessful Case

Lee Consultant Ltd won another construction project, which was also given a chance to combine partnering into the project management. With the evidence of the high partnering performance in the previous project, all involved partners were willing to attempt partnering in this project. Most of the project participants were the same as the previous one except the general contractor. With the background and knowledge from the successful experience, they believed that the role of a facilitator could be omitted in this round. Therefore, the partnering materials provided in the previous project were used again. The general contractor was new to partnering and was then received a set of partnering materials. They agreed that workshops for partnering formation could be exempted and the old partnering charter could be reused with modification of some partnering goals to fit for this project. With this new arrangement, they believed that it could save the time for the commencement of the project.

However, the process was not how they anticipated. The top management of the general contractor was well known to practice individualism. They fear that the introduction of partnering might cause a cultural shock to their company. Therefore, they did not pay attention to the provided partnering materials. Due to the applause of other parties, especially the engineering group who strongly believed in the magic of partnering, a partnering charter was early signed. The establishment of the goals was hasty without serious deliberation. These led to the beginning of the nightmare.

Since there was no workshop organised for socialising and orientating the general contractor and breaking its mindset to accept partnering, the cohesiveness of all partners could not be built up. Trust and commitment were established badly. As mentioned previously, the general contractor was gloomy that it was obligated to form the partnering relationship in this project. Also, it started to wary the motives of the other parties. Due to suspicion and distrust, the top management sent lower grade staff to the partnering workshops. These participants had no authority to make decision on behalf of

their companies. They even treated themselves as the observers rather than members of the team. No decisions could be made in the workshops, which became ineffective and inefficient. Everybody felt discontented and unenthusiastic, which led to the cease of running partnering workshops when the project was completed half way. Workshops lost their value to raise vis-à-vis discussions and to increase mutual understanding.

Moreover, sometimes when parties inquired the top management of the general contractor, replies were late and meaningless. As a result, they were faced with conflicts and disputes, as much as other non-partnering projects. In fact, there was no actual monitoring of the achievement of the partnering goals. Unfortunately, they had to dissolve the charter and dismiss the team.

Northouse (1994) argued that some project participants are not committed to partnering due to two reasons. First, the project participants are unable to attend the partnering workshops and have limited knowledge of partnering principles. Second, they were asked to accept new processes, procedures and goals that were developed during the partnering workshops in which they were not a part of. So, it is important to inform these individuals quickly and secure their commitment to partnering early in the project (Geary, 1991; c.f. Northouse, 1994). Referring back to the case, the parties, in spite of a failure experience, were preparing to employ a facilitator to restart the partnering process. The case provider told us that the process had not yet initiated and he might not be involved in it, further information about this new process could not be delivered.

6.4 ANALYTIC FRAMEWORK AND COMPARISONS

An analytic framework was adopted in order to observe and highlight similarities and differences of the two cases. This framework interpreted a common premise that comparison should be focused on common characteristics or dimensions (Newcombe, 2000). This study has identified six processes and eight supporting mechanisms, which formed the dimensions of

the framework. To operationalise the framework, some requirements (i.e. characteristics and aspects) of the dimensions were outlined for comparison. Such requirements were originated from the previous chapter. Noteworthy, some particular information could not be disclosed and furnished, and hence a full and detailed analysis could not be undertaken. Therefore, the comparative analysis focused on the matching of the information from the two cases to the characteristics and aspects of the practical model. As mentioned previously, individual projects might need to modify the model to fit for their specific use. As a result, this study conducted a general comparison of the two cases to validate the PMP.

In order to compare the partnering cases, a comparison table was developed. Such a table lists the framework's dimensions and requirements to assess whether they were established within the partnering arrangement. Positive and negative signs were used to indicate the assessment. A positive sign was used if the case satisfied a requirement, while a negative sign indicated that it was not satisfied. Both positive and negative signs were marked if a requirement was partly satisfied. As the major difference of the two cases was the replacement of the contractor, this study chose to separate the contractor from other partners for analysis.

Three comparison tables are constructed for assessing the cases due to the three-stage partnering process – formation, application and completion and reactivation. Summaries to the comparisons are presented in three separate sections under the three headings of the partnering process stages. Within each subsection, further elaboration is provided with reference to individual dimensions and requirements. After having compared the two cases, some insights from the successful case as well as the comparisons are given.

6.4.1 Comparison in Partnering Formation

Table 6.2 summarises the comparison of the two cases in the partnering formation stage. As the table shows, the critical components of the successful

case were all positive while those of the unsuccessful case were not. They are elaborated as follows:

Similarities – There are a few similarities between the two cases. The general contractors of both cases assigned key executives to represent the companies and received some partnering materials. Although the representatives from the general contractor of the unsuccessful case were senior executives, the company still had a negative impression of partnering. They had been given some partnering materials, but, without an initial partnering workshop for orientation and socialisation, mutual understanding may hardly be developed.

Differences – The table indicates that the majority of evaluations for the general contractor of the unsuccessful case were negative. Although the partnering team was there and agreement was still signed, the general contractor was the main problem that prevents further co-operation. As the top management of the contractor had a negative impression on partnering, reluctance to partnering was clearly observed. Without a change adaptation process, wrong expectation could not be corrected. Owing to the lack of the facilitator and initial workshop for orientation and socialisation, the general contractor hardly trusted their partners. Furthermore, the general contractor gave up discussions with other partners and as a result could not understand the real intention of them. Although the requirements of both cases are similar, they could not be any advantages to the partners. Because they thought that most of the previous partners were retained, they pushed even faster during the process of partnering. These partners did not realise the potential problems, and so they were still optimistic to partnering as shown by their positive level of such attitudinal factors as trust and management support. However, other critical contextual factors, such as communication, co-ordination and teambuilding process, were all negative and dominated in the unsuccessful case. It is noteworthy that although a partnering agreement was formed due to their contracts, without true commitment from all parties, no co-operation could be sustained in the long run.

Table 6.2: Comparison of the Two Cases in Partnering Formation

Dimensions and Requirements	Successful Case		Unsuccessful Case	
	Contractor	Other Partners	Contractor	Other Partners
Selection of Representative:				
Representatives were carefully selected.	+	+	-	+
Senior executives were assigned.	+	+	+ & -	+
Appropriate authority was delegated.	+	+	-	+
Expectations from partnering were clear.	+	+	-	+
Team Building Process:				
A facilitator was employed.	+	+	-	-
An initial workshop was organised to provide an orientation for participants.	+	+	+ & -	+ & -
The participants were gathered to establish a partnering team.	+	+	+	+
Partnering Agreement Process:				
The partnering team formed to first establish a partnering agreement.	+	+	-	-
Workshop(s) are organised to minimise divergence.	+	+	-	-
Top Management Support:				
It is highly committed (very much concerned about partnering and highly expected from it).	+	+	-	+
It supplied sufficient resources.	+	+	-	+
It kept tack of the progress.	+	+	-	+
Mutual Trust:				
Members believed that partners are highly involved in partnering.	+	+	-	+
Members believed that partners provide adequate resources.	+	+	-	+
Members believed that partners look for shared success and shared risks as well.	+	+	-	+
Open Communication:				
Members talked openly to generate constructive ideas.	+	+	-	-
Members actively discussed to reduce misunderstanding and divergence.	+	+	-	-
Members used different communication channels for discussions and exchange of information.	+	+	-	-
Effective Co-ordination:				
Team members know the expectations from others.	+	+	-	+ & -
Clear points during discussions.	+	+	-	-

Notes: + = positive; - = negative; N.A. = not applicable.

6.4.2 Comparison in Partnering Application

Similarities – Similarities between the two cases could not be found when partnering was applied to the construction project (as shown in Table 6.3). It is because the outcomes of the two cases were different (one is successful while the other is unsuccessful) resulting from greatly different level of the success factors. These factors drove the two cases to follow different routes.

Differences – It is clear that the two cases faced oppositely in almost all requirements (as shown in Table 6.3). Therefore, it is obvious to conclude that these requirements dominate the success of partnering. Using the unsuccessful case as an example, since the general contractor was discontented with partnering, poor relationships with other partners were seen. After the poor feedback of the first few workshops, the contractor only sent lower grade employees to the partnering team. The spirit of team building was therefore totally destroyed since all members involved in a partnering team should be delegated with sufficient power to vote and speak on behalf of the company. Thus, partnering agreement formed under these circumstances would not work. Although other partners attempted to create useful communication channels and effective co-ordination especially for the contractor, they were not successful due to a very low level of trust between contractor and other partners. As a result, no parties followed the partnering agreement. After the top management of individual parties knew the situations, no useful resources were contributed. Partners had no confidence to partnering and would not rely on each other to solve any problems. At last, the partnering agreement was terminated and the arrangement was given up. Without regard to the new comer of the partnering team (in this case the general contractor), all partners became losers.

Table 6.3: Comparison of the Two Cases in Partnering Application

	Successful Case		Unsuccessful Case	
	Contractor	Other Partners	Contractor	Other Partners
Goals' Attainment Process:				
Team members agreed to monitor and assess the achievement of partnering goals.	+	+	-	-
Some methods were used to monitor and evaluate the progress of the achievement of partnering goals.	+	+	-	-
Joint Problem Solving Process:				
Members solved problems together.	+	+	-	-
Members used systematic methods to solve problems.	+	+	-	-
Members realised that problems had to be solved as early as possible to reduce their detrimental effects.	+	+	-	-
Members organised special workshops or meetings to solve serious problems or to deal with urgent matters.	-	-	-	-
Top Management Support:				
It is highly committed (very much concerned about partnering and highly expected from it).	+	+	-	-
It kept tack of the progress of the achievement of the partnering goals.	+	+	-	-
It provided adequate resources to the partnering team.	+	+	-	-
Mutual Trust:				
Members believed that partners are highly involved in partnering.	+	+	-	-
Members believed that partners provide adequate resources.	+	+	-	-
Members believed that partners look for shared success and shared risks as well.	+	+	-	-
Open Communication:				
Members talked openly to generate constructive ideas.	+	+	-	-
Members actively discussed to reduce misunderstanding and divergence.	+	+	-	-
Members used different communication channels for discussions and exchange of information.	+	+	-	-
Effective Co-ordination:				
Team members know the expectations from others.	+	+	-	-
Clear points during discussions.	+	+	-	-

Notes: + = positive; - = negative; N.A. = not applicable.

6.4.3 Comparison in Partnering Completion and Reactivation

Similarities – Both cases indicate that other partners were all committed to long-term partnering, looked for continuous improvement and developed a learning climate (as shown in Table 6.4). Despite a failure experience in the unsuccessful case, those partners learned from it and were preparing to employ a facilitator to restart the process. They knew that a facilitator had to be hired if there was any new member(s).

Differences – The only difference between the two cases is that the partners of the unsuccessful case had learned from the unsuccessful partnering and knew that they must use a third party to develop trust and commitment for all parties. So, if any new members enter into a partnering relationship, a new process should be organised. In fact, reactivation is only adequate for a group of experienced partners that had co-operation previously.

6.4.4 Insights from the Findings

The comparative analysis supports that the Practical Model of Partnering (PMP) possesses the essential components for ensuring the success of partnering. The comparisons together with the successful case provide some insights, which are described below:

- The test indicates generally that the components of PMP are essential to the success of partnering.
- These components have their own functions appropriate for individual process stages of partnering. For example, mutual trust is important for all stages, while continuous improvement can increase the possibility of long-term partnering.
- Some of these components are highly correlated. Without one component, some others may not work well. For example, lack of communication will lead to poor co-ordination. Therefore, all these components are

prerequisite in serving their focused areas. Organisations should not choose some of them while leaving others untouched. This will totally violate the purpose of developing the model.

- Organisations should be careful in learning the model. Misunderstanding and misinterpretation always lead to poor results. For example, in the unsuccessful case where the parties believed that they were undergoing the process of reactivation, and hence no facilitator was required. Apparently, they were undergoing a new process, and therefore a third party facilitator should be employed to build up trust and commitment.
- As mentioned previously, the PMP is a general model. Modification of the model may be required to fit for different projects. Modification refers to a slight variation or adjustment to the basics of some components. Again, organisations should be careful to adjust the components so that they work effectively for the partnering arrangement.
- With all the above in mind, implementing the PMP involves a learning process, and all involved parties must prepare to adopt new practices and metrics. Organisational learning should then be the core strategy of the parties. The importance of organisational learning has been incorporated into the PMP. Continuous Improvement Supporting Mechanism (CISM), Partnering Experience Supporting Mechanism (PESM) and Learning Climate Supporting Mechanism (LCSM) have addressed the issues of organisational learning (as described in Appendix 4). These mechanisms are intended to deliver the necessary learning theories in order to help the organisations build a learning culture.

6.5 SUMMARY

This chapter used two case study methods (a case study and a comparative case study) to ascertain the effectiveness of the practical model of partnering. The comparative analysis supported that the PMP possesses the essential components for the success of partnering. Some insights were also provided.

Table 6.4: Comparison for Partnering Completion and Reactivation

	Successful Case		Unsuccessful Case	
	Contractor	Other Partners	Contractor	Other Partners
Reactivation Decision Process:				
All or most previous partners were retained in the partnering reactivation process.	N.A.	+	N.A.	N.A.
New partner(s) were added to the reactivation process.	N.A.	+	N.A.	N.A.
Decision for partnering was raised by all involved parties.	N.A.	-	N.A.	N.A.
Top Management Support:				
It is highly committed (very much concerned about partnering and highly expected from it).	N.A.	+	N.A.	N.A.
It expected to provide adequate resources to partnering.	N.A.	+	N.A.	N.A.
Mutual Trust:				
Partners believed that partners are highly involved in partnering.	N.A.	+	N.A.	N.A.
Partners believed that partners provide adequate resources.	N.A.	+	N.A.	N.A.
Partners believed that partners look for shared success and shared risks as well.	N.A.	+	N.A.	N.A.
Open Communication:				
Partners talked openly to discuss the formation of partnering.	N.A.	-	N.A.	N.A.
Partners actively discussed to reduce misunderstanding and divergence.	N.A.	-	N.A.	N.A.
Effective Co-ordination:				
Team members knew the expectations from others.	N.A.	+ & -	N.A.	N.A.
Clear points during discussions.	N.A.	-	N.A.	N.A.
Long-term Commitment:				
Top management realised the importance of long-term relationship.	N.A.	+	N.A.	+
Top management prepared to form long-term relationship with other members.	N.A.	+	N.A.	+
Continuous Improvement:				
Top management was aware of the need for continuous improvement.	N.A.	+	N.A.	+
Top management understood that partnering promoting continuous improvement.	N.A.	+	N.A.	+
Learning Climate:				
Learning was encouraged inside the organisation.	N.A.	+	N.A.	+
Top managers encouraged employees' discussions and were actively involved.	N.A.	+	N.A.	+
Top management looked for innovations, ideas and improvement.	N.A.	+	N.A.	+
Partnering Experience:				
Management encouraged learning the experience from partnering.	N.A.	+ & -	+ & -	+
Employees were aware of the partnering progress and used what they learnt from partnering back to their workplace.	N.A.	+ & -	+ & -	+

Notes: + = positive; - = negative; N.A. = not applicable.

CHAPTER 7: CONTRIBUTIONS AND CONCLUSIONS

7.1 INTRODUCTION

This study originated with the four research objectives: (1) developing a conceptual model of partnering; (2) testing the model by means of surveying methods; (3) transforming the conceptual model to a practical model of partnering using a modelling technique; and (4) evaluating the practical model by employing case studies. Systematised research activities were expected not only to measure but also to help to improve the research directions and perspectives.

Major contributions of the study are clarification of definitions for strategic and project partnering, the identification of CSFs and partnering performance criteria, and the practical model of partnering and its associated key components, which have been described in detail in Chapter 3, 4 and 5 and Appendix 4. This chapter aims at summarising the achievements and contributions of the study by juxtaposing different facts, pertinent findings and projections in the foregoing chapters with the view of pinpointing future research directions and new perspectives on partnering.

7.2 THEORETICAL CONTRIBUTIONS

This study provides a raft of achievements and contributions, both theoretical and practical. They are briefly illustrated in Figure 7.1. Theoretical contributions are summarised in this section, while other contributions are highlighted in the following sections.

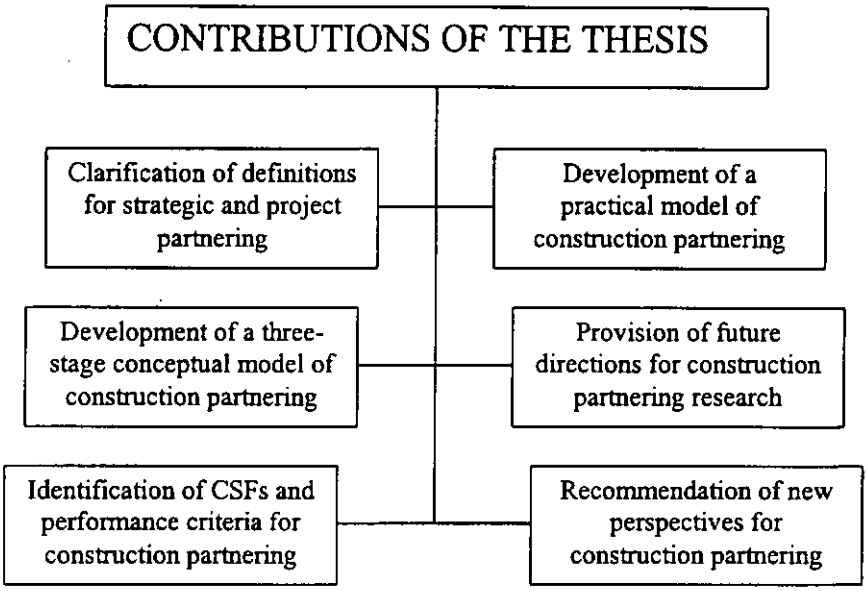


Figure 7.1: Major Contributions of the Thesis

7.2.1 Methods Fulfilling the Research Objectives

The study applied Yin's (1994) selection table to determine what research strategies should be used for the research objectives (in Chapter 3). The selection is based on three basic conditions: (1) the type of research question posed, such as how, why, who, what, etc.; (2) the extent of control an investigator has over actual behavioural events; and (3) the degree of focus on either contemporary or historical phenomena. Pursuant to the table, survey method was an advantageous strategy for determining a conceptual model of partnering (as "what" and "how much" questions were dominated), while case study was appropriate for testing the practical model of partnering (since "how" and "why" questions had been addressed).

After the conceptual model of partnering had been developed, three surveys were conducted to examine and refine the model (in Chapter 4). The first survey was used to test the following three hypotheses:

- Hypothesis 1a: There are critical factors common to both project and strategic partnering.
- Hypothesis 1b: Long-term factors affect more on strategic partnering than project partnering.
- Hypothesis 2a: There are similar as well as different process characteristics between project and strategic partnering.

A simple rating method was used to calculate the mean scores for determining the importance level of the tested elements. A systematic analysis strategy was adopted. This included the use of t-test to compare the tested elements.

The second survey examined the following two hypotheses:

- Hypothesis 3a: There are different sets of critical success factors affecting the partnering process stages to reflect the distinctive functions of each process stage.
- Hypothesis 3b: Factors of each proposed set of critical success factors exert considerable degree of influence on the respective partnering process stage.

As the first survey had only 27 usable responses, this second survey designed a simpler questionnaire so as to increase the number of response. Expectedly, there were 79 usable responses. Mean scores were also calculated to determine the importance level of the posited factors.

The final survey used an AHP questionnaire to examine the following three hypotheses:

- Hypothesis 2b: A partnering process consists of stages exerting considerable degree of influence on the success of partnering.
- Hypothesis 4a: The proposed performance criteria are important measure measuring the success of partnering.

- Hypothesis 4b: The partnering process stages exert considerable degree of influence on the achievement of each of the performance criteria for measuring the success of partnering.

Due to the difficulties in gathering a large number of participants, it was planned to collect data from some experts who had the experience in applying the partnering concept in construction projects. AHP was then chosen to perform the prioritisation of the elements to reveal the real partnering context. It is a subjective method that is not necessary to involve a large sample. For example, Lam and Zhao (1998) invited eight experts to perform the pair-wise comparisons for a quality-of-teaching survey. Experts provide penetrating insights that are highly valuable to an empirical study. AHP is useful to research activities focusing on a specific area where a large sample is not mandatory. In case of the increasing difficulties in achieving a large sample or high response rate, the application of AHP is expected to grow in the future. Noteworthy, one of the great values of AHP is that it can help to test the consistency of responses in order to screen out inconsistent replies.

In order to ascertain the effectiveness of the practical model of partnering (PMP), two separate case study methods were used (in Chapter 6). Cases are based in Hong Kong. Although the scope of this thesis was not planned to ascertain the utility of PMP in the contexts of other countries, the study took the first step to test its effectiveness. Specifically, a case was presented to show the implementation of the PMP by a group of construction parties. The case indicated that the PMP was applied successfully and the construction parties showed a positive view on the PMP and were willing to apply all its components for the establishment of a long-term partnering. On the other hand, comparative case study was adopted to evaluate the PMP. Two extremely different cases (one successful and the other unsuccessful) were compared and contrasted for the purpose of identifying any similarities and differences for inferring cumulative insights. As Simpson and Wall (1999) argued that research emphasis on isolated case studies might result in understandings that were less profound than they might otherwise have been. The comparisons that were done have implications for arousing learning of the

successful practices and the attention paid to the barriers. In consequence, such historical or evolutionary accounts provided persuasive insights for a positive view of the practical model for partnering.

7.2.2 Summary of Findings and Achievements

The following list of the pertinent findings and achievements of this study (mainly in Chapter 4), including the accounts for all supported hypotheses, represents the researcher's view of the overall impacts:

1. The study found that four critical factors are common to both types of partnering (i.e. project and strategic), whereas four long-term factors affect more on strategic partnering than on project partnering.

2. It is clear that implementing partnering involves a process. This process discloses all key elements that have to be incorporated, such as stages of the process (i.e. sub-processes). In project partnering, the three process stages are formation, application and completion. Each stage is an independent sub-process and forms the basis for next stage, and exerts different degree of influence on the success of partnering. For a long-term co-operative (i.e. strategic) partnering, the completion stage of a project is the foundation for reactivating another partnering process. Then, the three stages are formation, application and reactivation.

3. There are similar as well as different process characteristics between project and strategic partnering. Both types of partnering have a common process and are affected by a common set of success factors except for the final stage at which four long-term factors affect the intention of involved parties to form further co-operation. These are also known as functional factors (i.e. partnering experience, continuous improvement, learning climate and long-term commitment) of strategic partnering. Therefore, it is possible to combine the two types of partnering into one single process,

which consists of three stages – formation, application, and completion and reactivation.

4. There are different sets of critical success factors affecting the three stages of the partnering process to reflect the distinctive functions of the three stages. The functional factors of partnering formation are team building, facilitator and partnering agreement, while those of partnering application are joint problem solving, partnering goals' achievement and adequate resources. The functional factors for the final stage (i.e. the completion and reactivation stage) are partnering experience, continuous improvement, learning climate and long-term commitment. The study also identified four factors common to all stages and they are open communication, mutual trust, effective co-ordination and top management support.

5. The performance criteria are important measures measuring the success of partnering possess. Overall satisfaction of stakeholders is the most important, followed by improved work relationship and compatible goals.

6. The three stages of the partnering process exert considerable degree of influence on the achievement of each of the performance criteria for measuring the success of partnering. However, the results indicate that they are all crucial and comparable.

7.3 PRACTICAL CONTRIBUTIONS

The use of modelling technique to transform a conceptual model to a practical model in partnering was presented in Chapter 5. The modelling technique used was originated from Kartam and Ibbs (1996), which is simple to use and most appropriate for mapping and portraying the system perspective. A model is a convenient formalism to specify the relationships of all elements within a system.

The practical model of partnering (PMP) developed in this study (in Chapter 5) is a useful tool for representing the system perspective and forms the basis for developing the key components including Interactive Process Description (IPD), Supporting Mechanisms (SMs) and Goals' Assessment Matrices (GAM).

The IPD consists of six major processes – Representative Selection Process, Team Building Process, Partnering Agreement Process, Goals' Attainment Process, Joint Problem Solving Process and Reactivation Decision Process. The first five processes are useful for both project and strategic partnering, while the last one is particularly created for long-term co-operative partnering.

SMs are of two types – basic and functional. Four basic SMs (for establishing open communication, effective co-ordination, mutual trust and top management support) are essential for all partnering stages, while four functional SMs (for developing long-term commitment, continuous improvement, partnering experience and learning climate) are particularly suitable for long-term co-operative partnering. The researcher has recommended four basic SMs, which are Communication Supporting Mechanism, Co-ordination Supporting Mechanism, Trust Development Supporting Mechanism and Change Adaptation Supporting Mechanism. He has also recommended four functional SMs, which are Long-term Commitment Supporting Mechanism, Continuous Improvement Supporting Mechanism, Partnering Experience Supporting Mechanism and Learning Climate Supporting Mechanism. Details of these SMs are described in Appendix 4.

GAM has several features that are used to audit the level of attainment of the partnering goals. GAM consists of tools to identify the performance gap and is solely made for the GAP (Goals' Attainment Process). It helps not only to obtain the current performance of the parties but also monitors the performance from time to time when comparing all previous matrices. It works with a partnering score sheet to collect team members' opinions, an

assessment table to trace the scores for partnering goals, an overall spreadsheet to keep track of the progress, and graphs for analysis.

7.4 RESEARCH IMPLICATIONS

Research methods, both quantitative and qualitative, were found in this study, which needed integration and adaptation into a viable system. The focus on surveying critical success factors on the partnering process led to the use of quantitative research method. Since very few partnering experts could be identified for the surveys, a large sample would not be provided. So, without the feasibility of a statistical testing on causal relationships, a detailed relationship map (or model) of the factors with the partnering criteria and process stages cannot be established. In particular, this is required to obtain an adequate size of sample and to determine how to attract potential respondents to participate in the study.

In addition, future research can be built on a more detailed model that specifies not only the relationships between independent and dependent variables but also the relationships between independent variables. For example, it is worth pursuing whether open communication is closely related to effective co-ordination. In this study, their relationship is assumed but has not been tested. On the other hand, other variables may be added into the model. For example, partnering is a concept that is originally developed in the West. Cross-cultural issues are therefore worth of pursuit. For investigating these relationships, a more sophisticated statistical method (e.g. multiple regression) has to be employed.

This study had used two case study methods – a real case in partnering establishment and a comparative case study – to ascertain the effectiveness of the practical model. These case study methods are justified to use in social research textbooks. As Yin (1994) suggested, the use of multiple-case for evaluation of model helps to address the problems of validity and reliability. Moreover, use of more cases can help to further reduce threats to validity and

reliability in order to increase the degree of confidence of the results. In addition, the evaluation criteria created for the practical model were all very general. More precise criteria should be used in order to establish a more rigorous evaluation. These criteria must reflect the characteristics of all the key components of the practical model.

Moreover, it is recommended that a longitudinal study of partnering is more appropriate in both quantitative and qualitative studies. For example, the quantitative measures of the level of commitment or trust before the formation of partnering and after the completion of partnering disclose the relationships of these attributes with partnering success. In case study, observation is another good method other than employing interview and documentation to collect useful data. Investigators can grasp the useful data objectively by observing the running of a partnering arrangement from its initial stage until its completion or conducting an on-going observation of a reactivated partnering. Converging views or emerging trends can be obtained after a careful reviewing of the data piece by piece.

This study has developed and tested a conceptual model of partnering, has transformed it to a practical model (PMP), and has performed a preliminary test of the PMP. It is suggested to conduct a more precise evaluation of the effectiveness of the PMP implementing in the real world. Such an evaluation may require on-going observation for a longitudinal study with several years' efforts to test every component and mechanism in great detail. Moreover, this thesis has only tested the utility of the PMP in the context of Hong Kong. Its effectiveness in other countries has to be ascertained when it has to be claimed as a broadly received model. During the testing process, the PMP can also be refined to become the best practice for the construction industry.

7.5 FUTURE PERSPECTIVE

This study has a detailed examination of partnering. A general view of partnering has been established, including the formation of a conceptual

framework and a practical model of partnering. However, expanding the applicability of such a practical model is subject to the development of a partnering infrastructure. The following sections describe an infrastructure that helps to strengthen a partnering arrangement. This is intended to be a plan for partnering.

7.5.1 An Infrastructure of the Construction Networking System

An infrastructure for a construction network is shown in Figure 7.2. It is an integrated system adapted from the one proposed by Camarinha-Matos *et al.* (1998) who suggested that organisations involved in virtual enterprises, on one hand, need to share and exchange information with others, and on the other hand, keep their own independence. As such, the infrastructure is expected to consist of two major components – the local enterprise system and the network terminal.

The local enterprise system represents the normal operation of individual organisations. It is an independent component that would not require direct correspondence with members of the network. This system preserves all kinds of business and management activities. In information terms, it maintains internal management information system, planning and control system, and decision-making processes. Moreover, it supports the reiteration of the enterprise information to the network terminal. The parallel mapping has to ensure that transmission of information is proceeded without distortion or loss (Eastman and Jeng, 1999).

The network terminal, on the other hand, is the connection platform for partnering parties. As shown in Figure 7.2, it has several core functions – information receiving and sending, storing and retrieving, coding and decoding, presenting and deleting. These core functions can be "upgraded" by means of computers. For example, if several projects are operating simultaneously, computers not only support the running of them with a large storing capacity, but also restrict the dripping out of sensitive information to

parties of other projects using security pass-code. Also, it speeds up the process for retrieving a piece of information from a large batch of electronic folders that, if in hard copy format, may occupy a large filing room.

Furthermore, the network terminal works differently in the real and the virtual environment. It sets up workshops to push the real environmental collaboration while computerisation would be the "panacea" to expand the interaction of parties in a virtual environment. They are presented in the following sections.

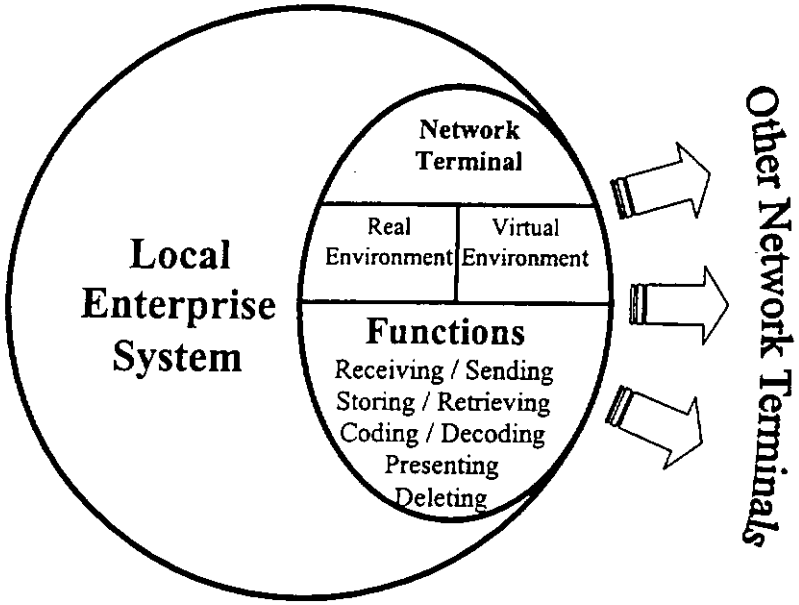


Figure 7.2: The Infrastructure of Partnering

7.5.2 Workshops for Project Collaboration in a Real Environment

Workshops are organised to establish a "real" medium for exchanging information in a construction network. Other than data, facts and knowledge, information here includes skills, comments and ideas. In such a real environment, the spontaneous "debates" can be raised. As the distance

between members is much shorter, feedback will be more efficient. At a higher level of partnering (e.g. strategic partnering), face-to-face discussion is one of the main criteria for facilitating the development of common goals and objectives. Thus, workshop is a place for the involved parties to collect more comments and ideas directly or make an agreement on something that might be discussed but not yet finalised in the electronic network.

Other than being familiar with the operation of a computerised network, the partnering team members should be able to elicit new information based on discussions and comments on initial results. The workshops are organised for different purposes in different project phases:

- In the Planning Phase, workshops help the client collect more information from the project manager to finalise the scope definition of the construction project.
- In the Design Phase, workshops allow the client, design consultants, project manager and quantity surveyor to meet together to develop a feasible construction plan, outlining the product design and specifications and related financial arrangement.
- In the Procurement Phase, workshops are crucial for the assessment team (i.e. the client, project manager, design consultants and quantity surveyor) to evaluate the tenders from potential contractors to select the most appropriate general contractor.
- In the Construction Phase, workshops provide opportunities for different construction specialists (e.g. design consultants, general contractor, subcontractors, suppliers, etc.) to co-ordinate to ensure that all construction activities and tasks work properly.
- In the Commissioning Phase, workshops monitor the final building tests to ensure that any defect is rectified by the contractor, and thereby enhancing the final hand-over of the product.

7.5.3 Computerisation of Partnering in a Virtual Environment

One of the major problems for the network to exchange and share information is the "distance" between network partners. Line (1997) identified three key conditions of the "distance factor" - speed (or time) for the transmission of information, complexity of information and the quality of the communication channels, and suggested that the digital world is a dependable solution: information can be transmitted in digital formats by computers. This greatly increases the speed and reduces the time for delivery.

On the other hand, the complexity of information affects the feasibility of using digital transmission. The transmission of "high density" graphs or drawings requires a lot of time and a large memory in the computer to store the information. But the speed and memory capacity of computers have been increased dramatically over the past years, which may solve the problem of transmitting complex and massive volume of information. Nowadays, telecommunication becomes an essential part of business operation. Services such as video conferencing are increasingly used by virtual enterprises, and electronic mails have become a common and convenient way of communication.

This final part will not go into details of how the "distant" information can be effectively transmitted. This involves the discussion of the development of a computerised information management system, which is beyond the scope of this section.

7.6 SUMMARY

This chapter represented a synopsis of the contributions provided by this study. The chapter was organised to firstly describe the theoretical contributions, including methods fulfilling the research objectives and a summary of the findings and achievements from the surveys. Secondly, a brief description of the practical model of partnering was presented. Then, some

research implications were provided for future research agenda. Finally, the chapter described an infrastructure of partnering, which formed a future perspective for those who wanted to incorporate partnering into their construction projects.

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APPENDIX 1: SURVEY QUESTIONNAIRES

A1.1 SAMPLE OF COVER MESSAGE FOR THE FIRST SURVEY

Dear Participants

My name is Eddie Cheng. I am now conducting a research for my PhD programme. Attached questionnaire is part of my research programme examining factors affecting construction partnering. Both academics and practitioners who have the knowledge of partnering are cordially invited to participate in this research by simply completing the questionnaire and returning through email to: bseddie@polyu.edu.hk.

Thanks in advance for your kind participation.

Yours truly

Eddie Cheng

A1.2 QUESTIONNAIRE FOR THE FIRST SURVEY

Construction Partnering Survey Questionnaire

To be completed by *Professionals* of the construction field

This research aims at identifying the factors affecting *project partnering* and *strategic partnering*. Therefore, two sets of answers according to your knowledge and experience are required. The following lists the definitions of the two terms for your information. Those who complete the questionnaire would like to receive a report of this research as a souvenir, please tick the right box [ ]. Now, you can start to fill in the questionnaire. Thank you very much.

Project partnering refers to a method of transforming contractual relationships into a cohesive, project team with a single set of goals and established procedures for resolving disputes in a timely and effective manner (Cowan et al., 1992). It mostly applies to a single project (one-off project).

Strategic partnering refers to a much closer relationship established between organisations for a long-term sharing of resources in terms of knowledge, information, skills, technology, etc, looking for benefits other than those for a single project. It applies to a long-term relationship (e.g. ten years) for several projects or a large project that exists for some years.

Section A

The following please find a three-column answer platform. The central column is a set of items to be rated by you. The left-hand column is the extent of your agreement to the items that refers to *project partnering*. The right-hand column is the extent of your agreement to the items that refers to *strategic partnering*. Please carefully think of each item before answering.

Please rate the factors that affect *project partnering* and *strategic partnering*, according to the following scale:

1 = not important
2 = little important
3 = some important
4 = more important
5 = the most important

1. Please rate the following factors which affect the formation of partnering (A partnering agreement may be established).

Project Partnering	*Factors*	*Strategic Partnering*
	Adequate resources	
	Top management support	
	Partnering agreement	
	Team building	
	Open communication	
	Effective co-ordination	
	Creativity	
	Joint problem solving	
	Long-term commitment	
	Continuous improvement	
	Mutual trust	
	Learning climate	
	Partnering experience	
	Facilitator	

2. Please rate the following factors that affect the functioning of partnering during a construction project.

Project Partnering	*Factors*	*Strategic Partnering*
	Adequate resources	
	Top management support	
	Partnering agreement	
	Team building	
	Open communication	
	Effective co-ordination	
	Creativity	
	Joint problem solving	
	Long-term commitment	

	Continuous improvement	
	Mutual trust	
	Learning climate	
	Partnering experience	
	Facilitator	

3. Please rate the following factors that affect the formation of a future relationship between involved parties after the completion of a project.

Project Partnering	*Factors*	*Strategic Partnering*
	Adequate resources	
	Top management support	
	Partnering agreement	
	Team building	
	Open communication	
	Effective co-ordination	
	Creativity	
	Joint problem solving	
	Long-term commitment	
	Continuous improvement	
	Mutual trust	
	Learning climate	
	Partnering experience	
	Facilitator	

Section B

Please use the following scale for your answers:

1 = mostly disagree
2 = some disagree
3 = neither disagree nor agree
4 = some agree
5 = mostly agree

Please write down the number that you think most represents your level of agreement.

Project Partnering	*Items*	*Strategic Partnering*
	Partners praised each other when they complete their part of work successfully.	
	Partners must fulfil their task commitments conforming to their partners' expectations.	
	Partners' organisational goals are in line with the partnering goals.	
	Partners' organisational goals have no conflict with the partnering goals.	

Section C

(1) Your current job title of the organisation in which you are working.

_____

(1a) How long have you been working at your current position? [ ] year(s).
(1b) How long have you been working in your profession? [ ] year(s).

(2) Which term best describe the business of your organisation?

Manufacturing Construction Service Government

Other(s), please specify _____

(3) How many people are employed within your organisation?

< 100 100 - 499 500 - 999 > 999

(4) What is your profession?

Engineering Architecture Surveying Accounting

Computing Science Medical Science Management

Other(s), please specify _____

(5) What is your highest attainment in your education?

High school graduate Diploma Bachelor degree

Masters degree Doctorate degree

Other(s), please specify _____

(6) Your gender: male female

(7) Please identify your age according to the following age groups.

below 25 25 to 34 35 to 44 45 or above

Have you checked that you have completed all the items above? Please be reminded that all the information you provided will be kept in the strictest confidence. Thank you very much for your participation.

oooOOOENDOOOooo

A1.3 QUESTIONNAIRE FOR THE SECOND SURVEY

I would like to thank you for those who have completed my last questionnaire. After careful consideration of your opinions and the analysis of the preliminary findings, I have revised the questionnaire. This time, I have attached this revised questionnaire in this message to attract more responses. Please complete the questions below. Those who have responded to my last questionnaire are welcome to complete again. Without your support, my thesis cannot be completed. If you want for a report of my study, please mark here [ ]. Kindly fill in the questions now and reply as soon as possible. Thank you very much.

Please rate according to the following scale:

1 = the least important
2 = less important
3 = some important
4 = more important
5 = the most important

1. Please rate the following factors that affect the formation of partnering (When necessary, a partnering agreement will be established at this stage).

Top management support
Facilitator
Team building
Partnering agreement
Workshops
Mutual Trust
Open communication
Effective co-ordination
Creativity
Joint problem solving

2. Please rate the following factors that affect the application of partnering during a construction project.

Partnering goals monitoring
Top management support
Open communication
Effective co-ordination
Creativity
Joint problem solving
Mutual trust
Workshops
Adequate resources

3. Please rate the following factors that affect the establishment of long-term co-operative partnering with the same group of parties.

Adequate resources
Top management support
Partnering experience
Mutual trust
Workshops
Open communication
Long-term commitment
Continuous improvement
Joint problem solving
Effective co-ordination
Learning climate

4. Have you been involved in partnering?

[ ] Yes – Academic research
[ ] Yes – Practical application
[ ] No – Have only learned partnering concept

If you have any further comments, please feel free to write in the reply message to me. Your completed answers and comments are both invaluable to my research. Thank you again for your participation.

Best wishes.

Eddie Cheng

A1.4 QUESTIONNAIRE FOR THE THIRD SURVEY

Partnering in Construction Questionnaire

This questionnaire aims at obtaining information from construction professionals about their experience in applying partnering concept in construction project. Partnering in construction is defined as an informal but co-operative relationship formed by the construction parties for a construction project for the purpose of achieving a set of partnering goals. This questionnaire is divided into two sections. It may require less than 30 minutes for completion. Those who want for a report of the whole project by post, please state your name and address in the returned questionnaire. All data provided will be kept in the strictest confidence and will only be used to produce aggregated statistics. These data will not be made available to any third party and will be destroyed after the completion of the thesis. Before providing your opinions, please read the instruction of each section carefully. Kindly complete the questionnaire and return by email to bseddie@polyu.edu.hk within 14 days. Thank you very much for your participation.

Eddie W.L. Cheng (PhD Candidate)
Research Associate

Dr Heng Li (Principal Supervisor)
Associate Professor

Department of Building and Real Estate
The Hong Kong Polytechnic University
Hunghom, Kowloon
Hong Kong

(All correspondence please forward to Eddie Cheng. Thank you.)

Section A: Rating

This section is designed according to the first and second surveys of this study. It is intended to prioritise the critical factors, the partnering process and the success criteria. For this study, a partnering process is perceived to consist of three key stages - *partnering formation*, *partnering application*, and *partnering completion and reactivation*. There are also three success criteria – *improved work relationship*, *overall satisfaction of stakeholders* and *compatible goals*. This section uses the pair-wise comparison concept to prioritise some elements within each judgement matrix. The questionnaire is simple, short and easy to complete. Please read the following concepts that may be useful for providing your answers.

Pair-wise comparison	Pair-wise comparison is to compare two items at one time for the purpose of generating more information for analysis. However, it is very sensitive in detecting the consistency of your answers. So, please fill in your answers in a logical sequence. For example, suppose there are three items to compare (i.e. A, B and C). If A is 3 times more important than B while B is 2 times more important than C, then A will be 6 times more important than C. If someone puts that C is 2 times more important than A, this becomes a violation of logical sequence and an inconsistency value will be computed using the consistency ratio method. If someone puts that A is 2 times more important than C, this sounds logical but a low consistency will be computed since A should be 6 times more important than C. Therefore, please think carefully before you fill in the questionnaire.
Partnering Formation	It refers to the "beginning" of a partnering process. If the construction parties express their interests to adopt partnering, they will assign representatives to form a team to establish the partnering goals and objectives. Usually, a partnering agreement/charter will be established and signed by all parties, which assures their commitment explicitly.
Partnering Application	It refers to the "implementation" of partnering during the construction project. At this stage, partnering is used to facilitate the construction project. More specifically, all parties will conduct to work according to their agreed partnering goals and objectives. If any problems arise, the parties will solve them together.
Partnering Completion and Reactivation	It refers to the "intention" of the construction parties to incorporate partnering into a new construction project after the completion of the current project. Modification of goals and objectives may be necessary for reactivating another construction project. However, the original team members must be kept as much as possible in the reactivated partnering process. If there is any new member, the partnering process is said to be new (but not reactivate) since there was no previous partnering relationships established among them.
Improved Work Relationship	The core concept of partnering is to improve work relationship. So Improved work relationship is a measure of partnering.
Overall Satisfaction of Stakeholders	Partnering performance must be perceived and accepted by all stakeholders. Stakeholders' overall satisfaction is another criterion to measure the success of partnering.
Compatible Goals	Compatible goals mean the matching of partnering goals with each involved party's internal goals. A mismatch will result in failure of partnering due to conflict of interests.

Please answer according to the following rating scale:

1 = the two items are equally important
2 = the left (row) item is a bit more important than the column item.
3 = the left item is more important to a moderate extent when compared to the column item.
4 = an intermediate value between 3 and 5.
5 = the left item is more important to a large extent when compared to the column item.
6 = an intermediate value between 5 and 7.
7 = the left item is more important to a very large extent when compared to the column item.
8 = an intermediate value between 7 and 9.
9 = the left item is more important to an absolutely large extent when compared to the column item.
1/2 = the left (row) item is a bit less important than the column item.
1/3 = the left item is less important to a moderate extent when compared to the column item.
1/4 = an intermediate value between 1/3 and 1/5.
1/5 = the left item is less important to a large extent when compared to the column item.
1/6 = an intermediate value between 1/5 and 1/7
1/7 = the left item is less important to a very large extent when compared to the column item.
1/8 = an intermediate value between 1/7 and 1/9.
1/9 = the left item is less important to an absolutely large extent when compared to the column item.

Only one answer for each paired comparison. Those boxes with crosses are no need to fill in any answers. Taking the first question as an example:

A1. Please compare the degree of impact of the partnering process stages on the criterion "Improved Work Relationship".

	Partnering Formation	Partnering Application	Partnering Completion and Reactivation
Partnering Formation	XXX	1/2	3
Partnering Application	XXX	XXX	6
Partnering Completion and Reactivation	XXX	XXX	XXX

In this example, partnering formation was a bit less important than partnering application in improving the work relationships of the partnering parties. Also, partnering formation is stronger (to a moderate extent) than partnering completion and reactivation when exerting influence on improved work relationship, while partnering application is stronger (to a large extent) than partnering completion and reactivation. This example had a perfect or absolute consistency. It is also noted that those boxes with crosses were no need to answer.

A1. Please compare the degree of impact of the partnering process stages on the criterion "Improved Work Relationship".

	Partnering Formation	Partnering Application	Partnering Completion and Reactivation
Partnering Formation	XXX		
Partnering Application	XXX	XXX	
Partnering Completion and Reactivation	XXX	XXX	XXX

A2. Please compare the degree of impact of the partnering process stages on the criterion "Overall Satisfaction of Stakeholders".

	Partnering Formation	Partnering Application	Partnering Completion and Reactivation
Partnering Formation	XXX		
Partnering Application	XXX	XXX	
Partnering Completion and Reactivation	XXX	XXX	XXX

A3. Please compare the degree of impact of the partnering process stages on the criterion "Compatible Goals".

	Partnering Formation	Partnering Application	Partnering Completion and Reactivation
Partnering Formation	XXX		
Partnering Application	XXX	XXX	
Partnering Completion and Reactivation	XXX	XXX	XXX

A4. Please compare the degree of measurability of the three criteria on partnering success.

	Improved Work Relationship	Overall Satisfaction of Stakeholders	Compatible Goals
Improved Work Relationship	XXX		
Overall Satisfaction of Stakeholders	XXX	XXX	
Compatible Goals	XXX	XXX	XXX

A5. Please compare the degree of impact of the following factors on Partnering Formation.

	Top Management Support	Mutual Trust	Open Communication	Effective Co-ordination
Top Management Support	XXX			
Mutual Trust	XXX	XXX		
Open Communication	XXX	XXX	XXX	
Effective Co-ordination	XXX	XXX	XXX	XXX

A6. Please compare the degree of impact of the following factors on Partnering Formation.

	Facilitator	Team Building	Partnering Agreement
Facilitator	XXX		
Team Building	XXX	XXX	
Partnering Agreement	XXX	XXX	XXX

A7. Please compare the degree of impact of the following factors on Partnering Application.

	Top Management Support	Mutual Trust	Open Communication	Effective Co-ordination
Top Management Support	XXX			
Mutual Trust	XXX	XXX		
Open Communication	XXX	XXX	XXX	
Effective Co-ordination	XXX	XXX	XXX	XXX

A8. Please compare the degree of impact of the following factors on Partnering Application.

	Partnering Goals Achievement	Joint Problem Solving	Adequate Resources
Partnering Goals Achievement	XXX		
Joint Problem Solving	XXX	XXX	
Adequate Resources	XXX	XXX	XXX

A9. Please compare the degree of impact of the following factors on Partnering Completion and Reactivation.

	Top Management Support	Mutual Trust	Open Communication	Effective Co-ordination
Top Management Support	XXX			
Mutual Trust	XXX	XXX		
Open Communication	XXX	XXX	XXX	
Effective Co-ordination	XXX	XXX	XXX	XXX

A10. Please compare the degree of impact of the following factors on Partnering Completion and Reactivation.

	Long-term Commitment	Continuous Improvement	Learning Climate	Partnering Experience
Long-term Commitment	XXX			
Continuous Improvement	XXX	XXX		
Learning Climate	XXX	XXX	XXX	
Partnering Experience	XXX	XXX	XXX	XXX

Section B: Personal Background

(1) Your current job title of the organisation in which you are working.

Answer: ( )

(1a) How long have you been working at your current position? ( ) year(s).

(1b) How long have you been working in your profession? ( ) year(s).

(2) Which term best describe the business of your organisation?

[ ] Architecture [ ] General Contractor [ ] Sub-contractor
[ ] Government [ ] Structural Engineering [ ] Quantity Surveying
[ ] Civil Engineering [ ] Building Surveying [ ] Developer
[ ] Other(s), please specify ( )

(3) How many people are employed within your organisation?

[ ] < 100 [ ] 100 - 499 [ ] 500 - 999 [ ] > 999

(4) What is your profession?

[ ] Civil Engineering [ ] Architecture [ ] Structural Engineering
[ ] Building Surveying [ ] Management [ ] Quantity Surveying
[ ] Other(s), please specify ( )

(5) What is your highest attainment in your education?

[ ] High school graduate [ ] Diploma [ ] Bachelor degree
[ ] Masters degree [ ] Doctorate degree
[ ] Other(s), please specify ( )

(6) Your gender: [ ] male [ ] female

(7) Please identify your age according to the following age groups.

[ ] below 25 [ ] 25 to 34 [ ] 35 to 44 [ ] 45 or above

Have you checked that you have completed all the items above? All the information you provided will be kept in the strictest confidence. Thank you very much for your participation.

oooOOOENDOOOooo

A1.5 INTERVIEW QUESTIONS

1. Which term best describes the type of your project that involved partnering?

2. What was the actual amount of the project?

3. What was the duration of the project from inception to completion?

4. Which year the project commenced (i.e. inception phase)?

5. At which phase(s) of the project was partnering applied?

6. For how long the partnering had established?

7. What was the procurement method of the project?

8. What was the responsibility of your organisation in the project?

9. What was your role in the project (i.e. your title)?

10. What parties were involved in partnering?

11. Was there any signed agreement/charter/certificate? If yes, how did you and your partners called it?

12. Was there any partnering team formed? If yes, how many representatives your organisation had assigned to the team?

13. If there was no partnering team, how to organise partnering meetings?

14. How many workshops or meetings were organised for partnering?

15. Please state what activities were organised in partnering workshops or meetings?

16. What were the partnering goals? Are they associated with parties' organisational goals, project goals, etc.?

17. Was there any goal monitoring system or goal evaluation system?
(Please describe about the system if you say yes.)

18. If the partnering team faced conflicts and problems, did they solve them jointly? (Please describe if there was any joint problem solving system.)

19. Do you think that it was a successful partnering? Why?

APPENDIX 2: CR VALUES FOR THE MATRICES

The following table lists the CR values of usable responses for Questions (i.e. matrices) A1, A2, A3, A4, A5, A6, A7, A8, A9 and A10 of **Section A: Rating** of the third survey.

TABLE A2.1: CR VALUES FOR THE JUDGEMENT MATRICES

	CR (A1) 3by3	CR (A2) 3by3	CR (A3) 3by3	CR (A4) 3by3	CR (A5) 4by4	CR (A6) 3by3	CR (A7) 4by4	CR (A8) 3by3	CR (A9) 4by4	CR (A10) 4by4
No.1	0	0	0	0	0.058	0.033	0.058	0.006	0	**0.766**
No.2	0	0.046	**0.118**	0	0.022	**0.188**	0.022	0	0.022	0.045
No.3	0	0	0	0	0.008	0.016	0.008	0	0.008	0.008
No.4	**0.188**	0	0	0.047	0.023	0	0.069	0.046	0.022	0
No.5	0	0.016	0.038	0	0	0	0	0.016	0	**0.161**
No.6	0	0	0.001	0.001	0.002	0	0	0	**0.093**	0.063
No.7	0	0	0	0	0.081	0.046	0.081	0	0.081	0.022
No.8	0	0.005	**0.156**	0.025	0	**0.430**	0	0	0.022	0.044
No.9	0.003	0.025	0.016	----	0.044	**0.188**	0.069	0	0.069	0

Notes: (1) The nine respondents are assigned with No.1 to No.9.
(2) Acceptable CR values (Saaty, 1980) [1] : 0.05 or below for a 3-by-3 matrix (3by3); 0.08 or below for a 4-by-4 matrix (4by4); 0.1 or below for larger matrices.
(3) Bolded when a value is larger than the acceptable CR value. Respondent No.7 has three CR values (0.081) being marginal and are accepted for analysis.

[1] Saaty, T.L. (1980), *The Analytic Hierarchy Process*, McGraw-Hill, New York, NY.

APPENDIX 3: INFORMATION FOR IPD

The following figures are some supplementary materials that can help to support the interactive processes of partnering. They are adapted from some publications and other unpublished partnering cases' materials.

- Acting as the trustee and sponsor of partnering.
  - Supplying adequate resources to the partnering team
- Supporting team formation.
  - Selecting team representatives
  - Hiring facilitator
- Directing team representatives.
  - Affirming total commitment and continuous support
  - Delivering expectations
    - Defining the required information
    - Describing how results will be used
  - Providing guidelines to act in the team
    - Boundary conditions
    - Ground rules and assumptions
    - Constraints
- Keeping abreast of the partnering process.
  - Scheduling meetings with their representatives
  - Checking and reviewing periodically
    - Understanding their own status
    - Knowing team development and expectations
  - Supplying additional resources when necessary
- Supporting partnering team's action plans.
  - Implementing recommended solutions
  - Joint problem solving

Figure A3.1: Role of Top Management in Partnering Arrangement

Note: Adapted from Bicknell and Bicknell (1995) [1]

How to plan and manage

- Able to schedule, define, co-ordinate and control within the workshop
- Able to think conceptually or systematically so that various pieces of information can be integrated into a holistic approach or thought
- Able to select the methods to documented knowledge and maximise productivity

How to guide and advise

- Able to communicate the expectations, scope and necessary activities
- Able to build trust in a team environment
- Able to educate team members on the partnering process
- Able to develop and train the partnering team in group dynamics and decision making

How to influence and motivate

- Able to inspire team members with charisma and participative style
- Able to translate the passion and vision for change into action
- Able to provide recognition to push team progress
- Able to entertain members by creative activities and new approaches to keep sessions interesting and motivating

How to negotiate and arbitrate

- Able to monitor team participation and behaviour
- Able to balance team participation and prevent domineering members from biasing the outcome
- Able to identify and settle conflicts and disputes to ensure that problems are being solved and members stay committed to the process

Figure A3.2: Expected Capabilities of a Facilitator

Note: Adapted from Bicknell and Bicknell (1995) [2]

Pre-workshop

- Confirm what, when, where and why to meet
- Confirm who to meet if a technical workshop is organised
- Arrange adequate facility and equipment for workshop
- Distribute agenda some days before workshop in order to let team members prepare materials for discussion

Workshop commences

- Prior to commencement, record team members attendance and, if any, introduce new members or observers
- Start on time
- Stick to agenda throughout the workshop
- Review action items from previous workshop first, and then go to other new issues
- Manage time and set time limit for discussions

During workshop

- Encourage active participation
- Give respect to other team members
- Be patient and a good listener
- Ask direct questions and be succinct
- Ensure a balance power during discussion

Workshop ends

- Report again those tasks that have been accomplished, and then identify tasks to be accomplished before next workshop
- Advice clearly who are responsible for the planned tasks
- Agree mutually on a tentative schedule for the next workshop
- Check finally any further questions or enquiries before the conclusion of workshop
- Deliver a workshop report in one or two days

Figure A3.3: Tips for a Successful Workshop

Note: Adapted from Bicknell and Bicknell (1995) [3]

Partnering Workshop Report

Project: MLB Construction Project

Date of Workshop	*Time*	*Place*	**Workshop No.**
7 Aug 1998	10:30 a.m.	Site Office	10

Present: IW (Client); PI (Project Manager); SL (Design); JM (G. Contractor)
EL (Client); JF (Design); AS (Design); JG (G. Contractor)

Apologies: TK (Client); CC (Project Manager); DC (G. Contractor)

Observers: M. Chen (Client); P. Chan (Client); T. Davis (Design); E. Tang (G. Contractor)

Distribution: All Present + Apologies

Item	Descriptions	Action
1.0	*Notes of the last workshop*	
1.1	Agreed	
2.0	*Matters raised from the last workshop*	
2.1	Report on quality issues of material supplied by MPCL submitted. MPCL agreeing to assure the quality of supplied material.	KCCL
2.2	KCCL (General Contractor) having difficulty in finalising additional storage area, resulting in delaying of the storage of material. KCCL willing to continue to pursue.	KCCL
2.3	Client complaining KCCL having poor responses to their enquiries. KCCL admitting the problem being due to the misunderstanding of a new executive. KCCL introducing the new executive to all members in the workshop and promising to resume a normal response to partners' enquiry.	KCCL
3.0	*Review of assessment sheets*	
3.1	Item 1. From 2.4 to 2.1 • KCCL delaying the flow of material	
3.3	Item 3. From 3.5 to 3.8 • KCCL assuring the quality of supplied material, improving the quality of product directly	
3.7	Item 7. From 3.9 to 3.8 • KCCL promising to resume normal communication.	

Page 1 of 3

Figure A3.4: Partnering Workshop Report

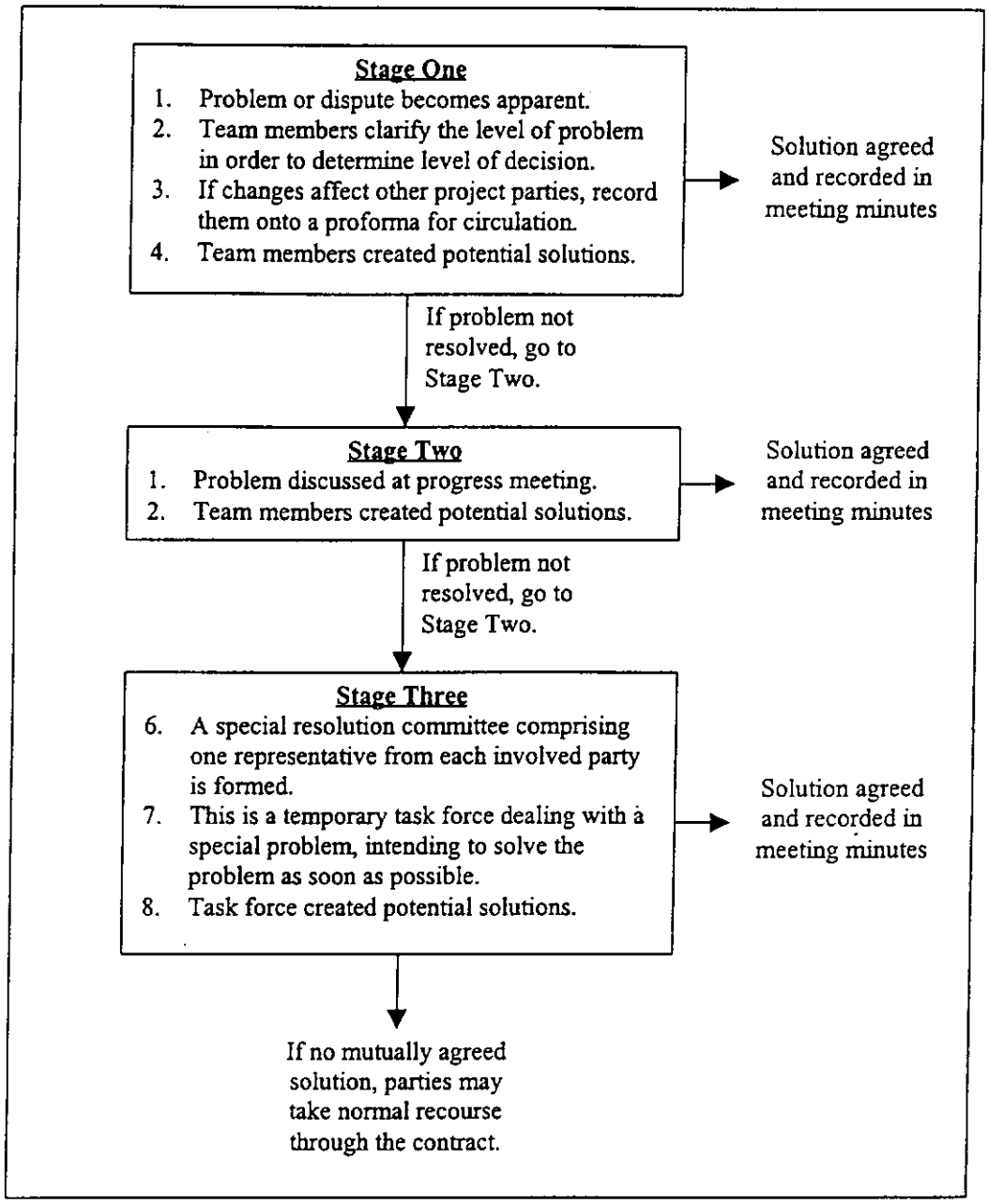

Figure A3.5: Three-Stage Problem and Dispute Resolution Method

Sources: Brindley Place (c.f. CIB, 1997) and CIB (1997) [4]

[1] Bicknell, B.A. and Bicknell, K.D. (1995), *The Road Map to Repeatable Success Using QFD to Implement Change*, CRC Press, Boca Raton, Fla.
[2] ibid
[3] ibid
[4] Construction Industry Board (CIB) (1997), *Partnering in the team*, A report by Working Group 12 of the Construction Industry Board, Thomas Telford, London.

APPENDIX 4: SUPPORTING MECHANISMS

A4.1 EIGHT SUPPORTING MECHANISMS

For the success of partnering, eight Supporting Mechanisms (SMs) are described here. Specifically, there are four basic SMs that are essential for all partnering stages and four functional SMs that are particular designed for long-term co-operative partnering. These mechanisms are not claimed to be exclusive and unique. They are formed by adapting from existing published mechanisms or models, or from the concepts of relevant literature. Yet, it is suggested that they are useful to partnering arrangement and are treated as a reference for those who wish to apply partnering. They are illustrated hereinafter.

Communication Supporting Mechanism (CSM)

Figure A4.1 depicts an example of a communication web of four co-operative companies and highlights the key elements of the Communication Supporting Mechanism (CSM) between them. It represents the intra-organisational as well as inter-organisational communication linkages existing among the partnering parties. More specifically, it implies that top level management is associated with cognitive meaning while partnering level with moral meaning and functional level with pragmatic meaning. The three levels within each company are linked, and in particular the partnering levels of different companies are also linked. These linkages form the communication channels for intra-changing and inter-changing information so that partnering team members can reason about their own and others' behaviour to ensure a coherent manner of the team.

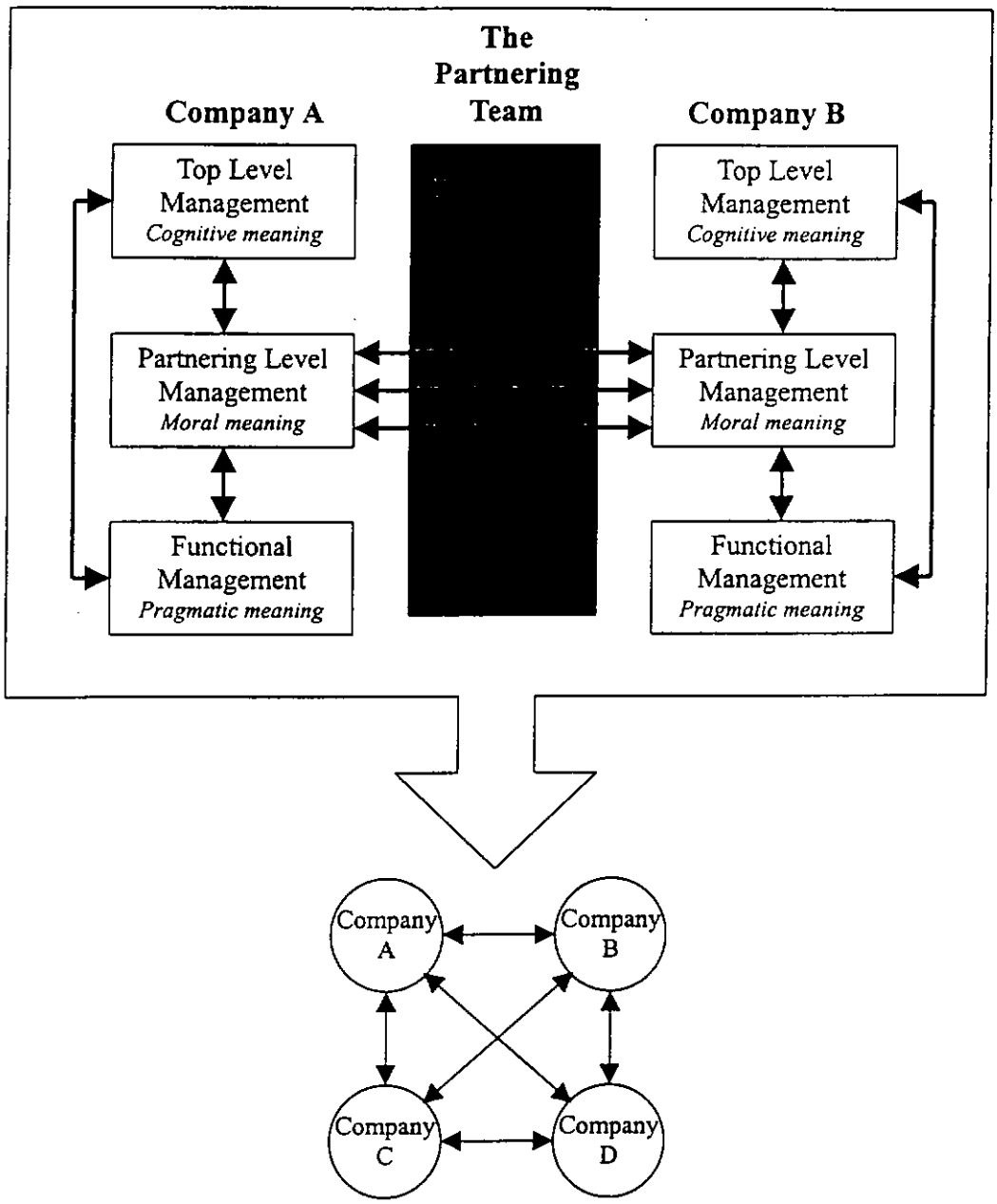

Figure A4.1: Communication Supporting Mechanism

Intra-organisational linkages imply that organisational members deliver multiple meanings among themselves concerning various purposes and functions while each meaning is associated with a specific form of legitimacy. According to Suchman (1995), there are three different forms of legitimacy – cognitive, moral and pragmatic. Cognitive legitimacy refers to the development of a logic or rationale that is meaningful to the stakeholders and comprehensible to all. Moral legitimacy refers to the appropriateness of

actions undertaken by the different parties. Pragmatic legitimacy refers to the satisfaction of the interests of the different constituents. These three forms of legitimacy are based on three levels of meaning, namely the cognitive, moral and pragmatic, which form a graded hierarchy from the apex to the bottom respectively (Kumar and Andersen, 2000).

Kumar and Andersen (2000) further proposed that there are three intra-organisational levels of management in an international strategic alliance, which focus on their associated level of meaning. Although they argued that there should be interactions between the same level of management of different alliance partners, such argument was not appropriate here due to the view that partnering in construction is different from the strategic alliance proposed by them. As shown in Figure A4.1, there are no interactions of the top and functional levels of management between organisations since a partnering team is formed for inter-organisational communication. Only the partnering representatives (i.e. partnering level management) are responsible for the overall running of the partnering team. They should be sensitive in communicating with other team members. Moreover, they should pay attention to the behaviour of other team members (i.e. conception of meaning), whether or not these members behave in a co-operative way and/or are putting in the necessary effort, and should provide appropriate action and feedback. Thus they are concerned with coding and decoding (i.e. producing and interpreting) moral meanings from other members, which form the inter-organisational communication.

On the other hand, the other two levels within the organisational hierarchy exert influence on the partnering representatives when the latter delivers their organisational meanings in the partnering team. Kumar and Andersen (2000) assumed that there is a process of reciprocal influence where the three levels may not be equally influential and the patterns of influence will vary across organisations. These postulates are important to outline the format for intra-organisational communication.

Co-ordination Supporting Mechanism (COSM)

The term "communication" has been associated with "co-ordination" in some publications (e.g. Nassimbeni, 1998; Cheng et al., 2000). As implied earlier, the CSM supports co-ordination among partnering team members; that is to ensure the coherence of the team. As previously stated, co-ordination is defined as to arrange or organise different "parts" to achieve a desired or effective combination. The "parts" here mean the construction parties who are grouped together for two main combination purposes:

- Bringing in specific skills and competence from all parties to the team, which involves the integration of independent entities.
- Rendering a raft of interdependent activities and behaviour from all parties coherent with the expectations of the partnering team.

A co-ordination mechanism is therefore developed to bind or organise the parties effectively into a coherent group that strives to meet the mutually agreed goals and objectives (Raghu et al., 1998). Nassimbeni (1998) and Raghu et al. (1998) developed two different co-ordination mechanisms. The former translated the four main kinds of interdependence (i.e. workflow, processes, scale and social relationships) from Mintzberg (1979) into the key elements of a co-ordination mechanism for a network of companies, whilst the latter specifies the essential features of four structures of a co-ordination mechanism in business processes. Their designs are adapted here to form the Co-ordination Supporting Mechanism (COSM). Figure A4.2 illustrates the salient features of the COSM. The COSM highlights the importance of skills and process standardisation, adjustment function and a workflow structure. These three major elements are described hereinafter.

A workflow structure is needed to specify and to organise the tasks and activities for the partnering project. The current workflow structure very much corresponds to four of the five major attributes of the workflow structure of Raghu et al. (1998). These are *activities and activity relations*, *sequential*

interdependence, concurrent interdependence and *mixed interdependence.* First, members of a partnering team determine partnering activities based on their expectations. Thus, team members should have a clear picture of all partnering activities and their interdependency. Second, some activities may be sequential interdependence. That is a sequential order exists in a group of activities where one activity is directly dependent on another. Third, some activities may be done simultaneously. Such a synchronisation of activities reflects concurrent interdependence (Malone, 1987; Drucker, 1988). Finally, some activities involve all parties at the same time to perform, e.g. joint problem solving. Identifying the nature of interdependence of activities helps team members to correctly interpret the meanings among members, leading to the integration of all independent parties. However, this workflow structure does not disclose how to render a raft of interdependent activities and behaviour from all parties coherent with the expectations of the partnering team to effective co-ordination. In fact, rendering the activities and behaviour depends on whether there exists standardisation.

Nassimbeni (1998) classified three kinds of network – supply relationships, agreements/joint-ventures and regional industrial systems. Supply network involves operational interaction and assumes a tree-net configuration, which promotes a direct supervision typed co-ordination mechanism. Agreement network focuses on "functional" synergy between the parties and forms the main integration vehicle to the expertise flow and skills exchange within the network. Regional industrial network is devoted to strategic synergy emphasising on joint efforts and common practices. A construction project (i.e. multi-disciplinary parties performing to achieve diversified goals and objectives of the project) is a typical supply network while a partnering structure is more prone to the last two network types. Nassimbeni (1998) refers both of these last two networks as process interdependencies, which gain process synergy by determining the necessary interactions between parties who are concerned about specific and various flows (e.g. information, skills or competence) but joined by similar processes (i.e. common goals). He then suggested that skills and process standardisation are crucial for process interdependencies. In addition, he recognised that interdependencies in social

relationships exist in all kinds of network. Thus, the function of adjustment should be incorporated in the co-ordination mechanism to regulate the standards when necessary. Such an adjustment function works mainly through informal ways to ensure effective adaptation and synchronisation of the partnering activities.

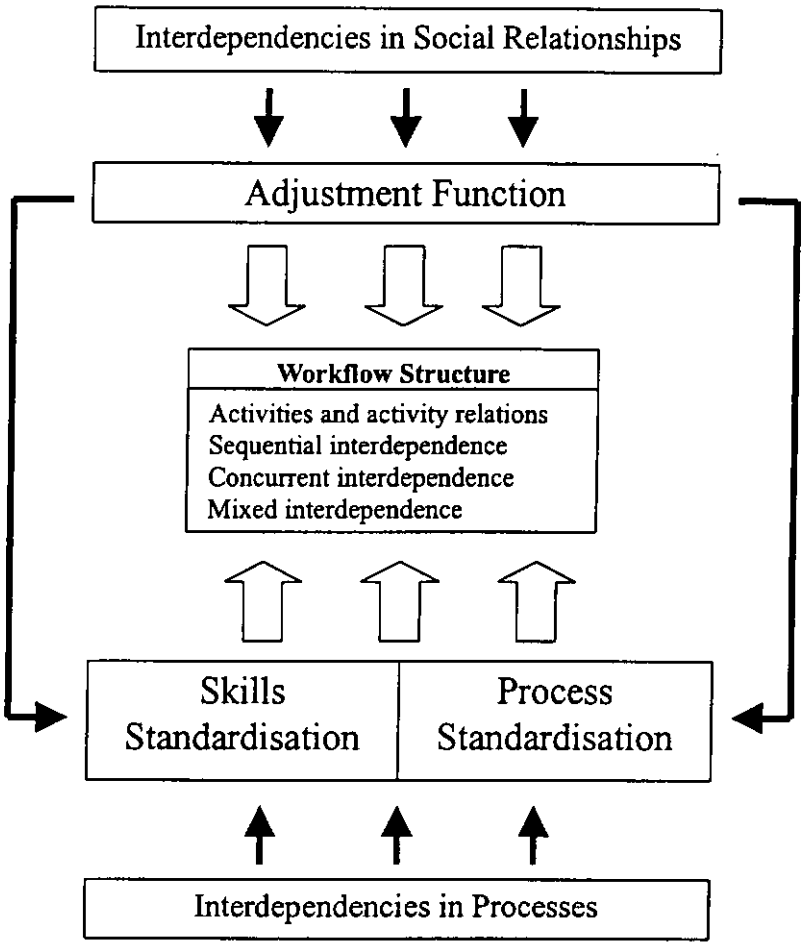

Figure A4.2: Co-ordination Supporting Mechanism

Standardisation refers to a pre-definition and codification of the activities and tasks. Process standardisation highlights joint decisions and planning of the network affairs and a high uniformity (e.g. norms, common behaviour and compatible goals) is expected. Skill standardisation involves the sharing/exchange of original and specific resources or competence. Each

member brings in the skills that are complementary to those of the others. Hence, co-ordination deals with the standardisation of the skill providers.

Trust Development Supporting Mechanism (TDSM)

Trust is formed between two intended parties based upon one's positive expectations of the intentions or behaviour of another (Rosseau et al., 1998). Yet, the technique of establishing and maintaining trust is not commonly known. Since the action (i.e. reaction) of one party would be a result of the expectation or impression of what the other party acts, trust can be seen as an action-reaction pair, but involves in a feeling, thinking or analysis process rather than a reflex action. Munns (1995) made use of the Spiral of Trust model developed by Zand (1972) to explain that the development of a relationship within a project is on the basis of action and reaction pairs. The model determines the entry level of mutual trust since low level of trust at the start of a project leads to the decline and breakdown of relationships. He summarised that trust is always low at an early stage of a project due to lack of previous knowledge of the other parties or the consistent behaviour of the professional group that they belong to. Conflict is a typical nuisance in building mutual trust. Jumping over the hurdle underlying potential for conflict requires adequate conflict resolution techniques, leading to mutually established trust between involved parties.

Figure A4.3 is a Trust Development Supporting Mechanism. It adapts the Spiral of Trust model but attempts to improve trust between parties by providing stimulation to improve their behaviour and perception. It builds on the concept that problem solving is the basis for trust building. Besides this, trust can be enhanced by improving one's behaviour toward others and one's perception on others. Improved behaviour can be achieved by establishing open communication, effective co-ordination, common goals and fairness, and building up one's integrity, sincerity and trustworthiness while improved perception can be accomplished by building confidence about others and learning how to think optimistically. When people have a new expectation and

impression on others, a higher level of trust can be reinforced.

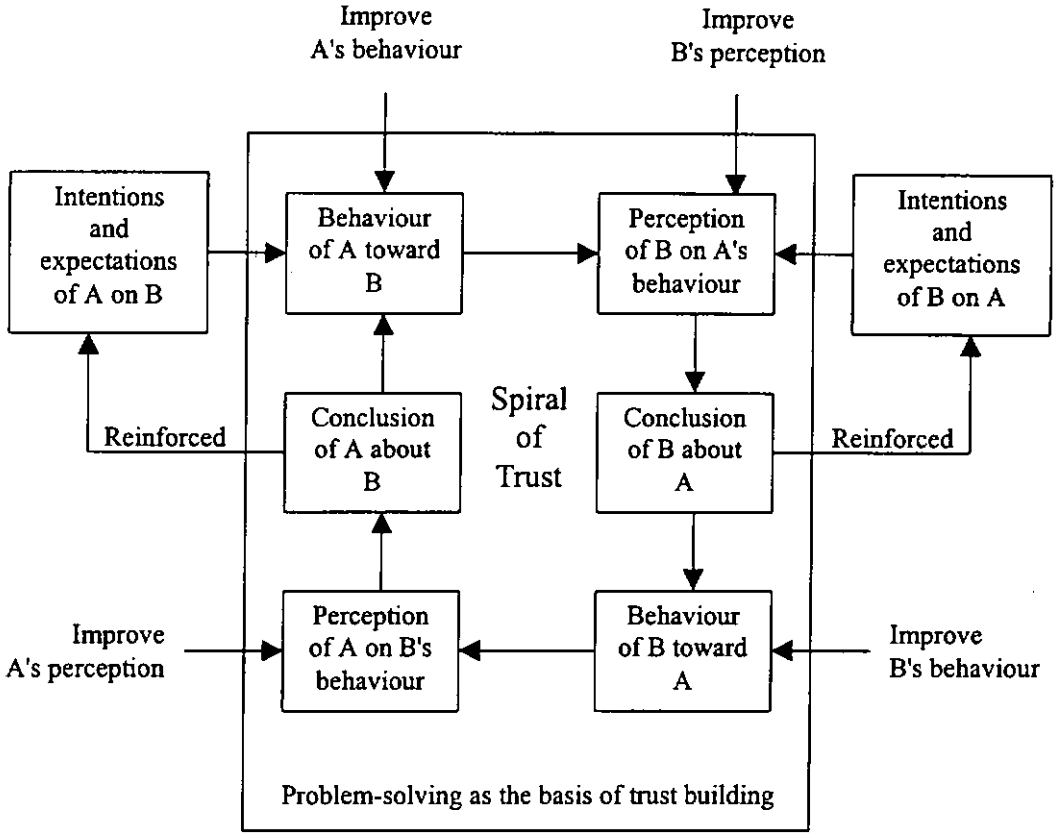

Figure A4.3: Trust Development Supporting Mechanism

Change Adaptation Supporting Mechanism (CASM)

A partnering relationship brings in the opportunities for improvements. A project partnering has short-term quantified benefits, such as reduced costs and litigation, without changing the internal practices of the involved parties. Whilst, a strategic partnering implements a long-term co-operative relationship, which implies a change of the status quo of the core elements of an organisation. These include mission, vision, business strategy, goals, culture, technology, training and policies (Mukherji and Mukherji, 1998). Top management may not like such deep level changes. How to galvanise top management adapting to change is key to long-term co-operative partnering.

After the top management has paid attention to it, it will develop conditions to promote and induce changes (Lewis, 1994). In addition to top management, other employees may be reluctant to change, especially when they are the "change recipients". As such, a Change Adaptation Supporting Mechanism (CASM) is established (as shown in Figure A4.4).

This CASM is not a typical change process like the one suggested by Mink et al. (1993) although partnering is seen as a change process (Wilson et al., 1995). It adopts the force-field diagram of Dervitsiotis (1998) and highlights the necessary conditions for people to feel the need for change. Dervitsiotis (1998) argued that organisation is in a state of dynamic equilibrium no matter how strong its status quo is. For shifting the current temporary balance toward the new state of equilibrium, two forces favouring change must be considered. These forces are mutually reinforcing (Beckhard, 1986; c.f. Dervitsiotis, 1998) and their influences are multiplying rather than additive (Dervitsiotis, 1998). They are:

- Awareness of threats and weaknesses of the status quo in terms of current performance levels such as profit, quality, responsiveness, productivity, competitiveness, etc. Communicating to all about the anxiety of the status quo and convincing them to recognise the poor state are necessary.
- Attracting everyone to a bright new future that is often associated with some desires in terms of goals and performance attributes. Promoting the new future to all and training them to be more alert to such a bright future are essential.

However, a change strategy cannot be put forth without eliminating any potential resistance. Dervitsiotis (1998) realised two kinds of resistance - passive and active. Passive resistance is like the inertia in a physical object when it is forced to move. It explains that people are always comfortable with the way things are. Even when the status quo is not satisfied, the psychological cost of transition to a new state might be perceived as greater than the anticipated benefits. Nevertheless, people are upset of an uncertain future. So,

a change agent has to be recruited from outside to unfreeze the status quo. Sometimes when the resistance cannot be overcome, the change agent must reinforce the "upset" by means of repeating communicating, convincing, promoting and training. Once the resistance could be eliminated, "change recipients" are ready to change.

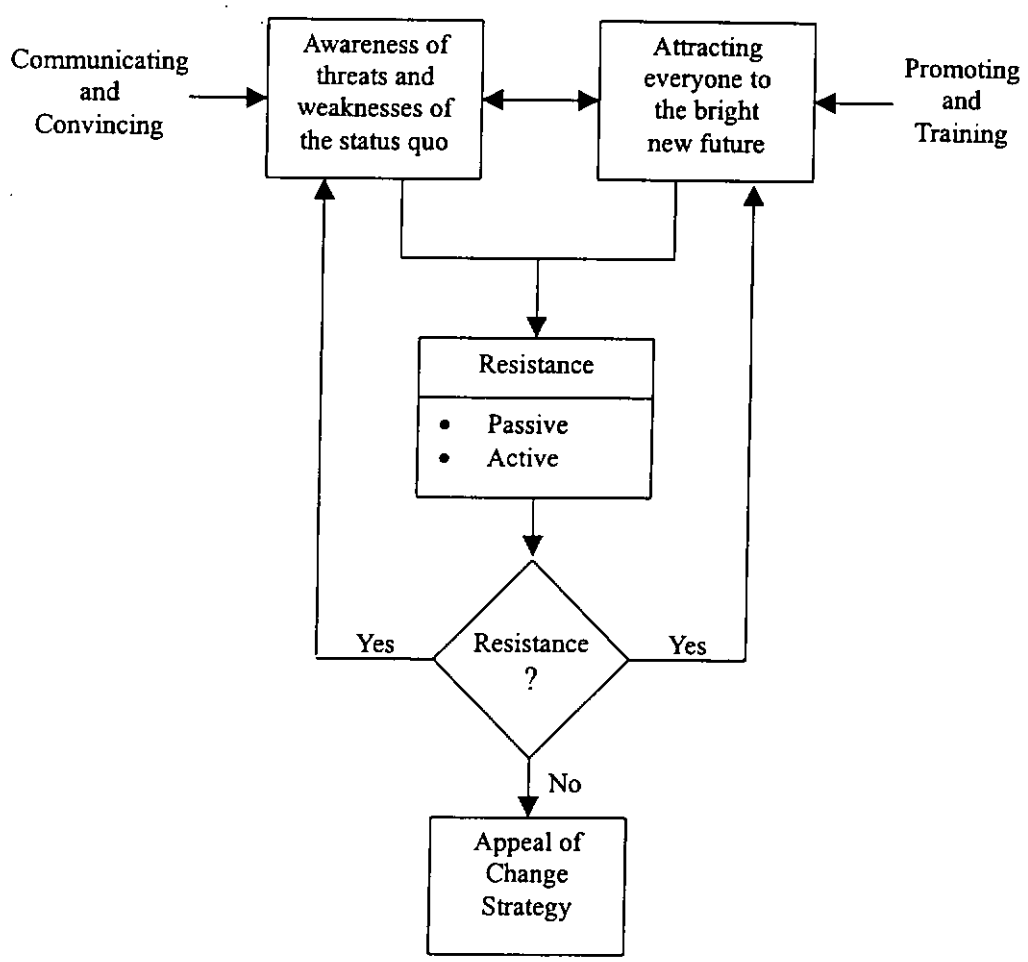

Figure A4.4: Change Adaptation Supporting Mechanism

Note: Adapted from Dervitsiotis (1998)

Another opposing force is active resistance. It is the resistance from those who are threatened by a redistribution of political power, resulting from the adjustment to a new order. Dervitsiotis (1998) argued that active resistance is

usually dangerous as it unreasonably undermines all possible plans. Other than to avert it by means of brute force (e.g. firing or layoffs those who reinforce the active resistance), effective communications are important to drive out the political fear.

Long-term Commitment Supporting Mechanism (LTCSM)

Unless construction parties establish a mechanism for joint commitment, long-term strategic partnering implementation is doomed (Sharma, 1998). Figure A4.5 illustrates the Long-term Commitment Supporting Mechanism. This mechanism embraces the concepts from Goffin and Szwejczewski (1996) and Brewer (1996). First, there are four core aspects for building commitment as suggested by Goffin and Szwejczewski (1996). Although their model is used in the context of quality management, the essence of it is also applicable to the creation of long-term commitment to partnering. These four core aspects are:

(1) *Investment in time and effort.* Top management can provide the greatest support to partnering, but it is the largest barrier too. Thus, time and patience must be taken to overcome the inertia from adopting partnering. In order to persuade the top management and other interest groups to accept partnering, efforts have to be put forth to fight against all odds.
(2) *Clear goals and organisational structure.* Goals must be clearly communicated and assigned to an organisation whose structure must also support rather than hinder their achievement.
(3) *Passion and enthusiasm for partnering.* Without passion and enthusiasm, management will not be interested in partnering, resulting in a low level of commitment.
(4) *Strong focus on staff.* As Goffin and Szwejczewski (1996) stressed, the key to business success is human resource. So, business winners who have invested in staff will earn a dividend. The more one invests, the better will be the earning. In addition to recruiting the right people for jobs or training them to reach the required performance level, orientating and convincing them to accept the organisational goals and decisions, including

partnering, cannot be overlooked.

On the other hand, for maintaining a high level of commitment to partnering, four internal policies have to be implemented (Brewer, 1996):

(1) *Decentralised authority*. Delegating more power to employees increases their responsibility and involvement in partnering decision and subsequently enhancing their level of commitment to partnering.
(2) *Participative management*. Brewer (1996) argued that participation is essential in the creation of a co-operative work atmosphere, which is exactly the core concept of partnering.
(3) *Adequate resources*. Empirical evidence reveals that committed partners are willing to contribute their valuable resources in a co-operative reciprocity and are reliable to take roles in it (Anderson and Weitz, 1992).
(4) *Social rewards*. Partnering team members with a good social relationship will become more committed to partnering because they have good faith about other members in terms of respect, friendliness and trust.

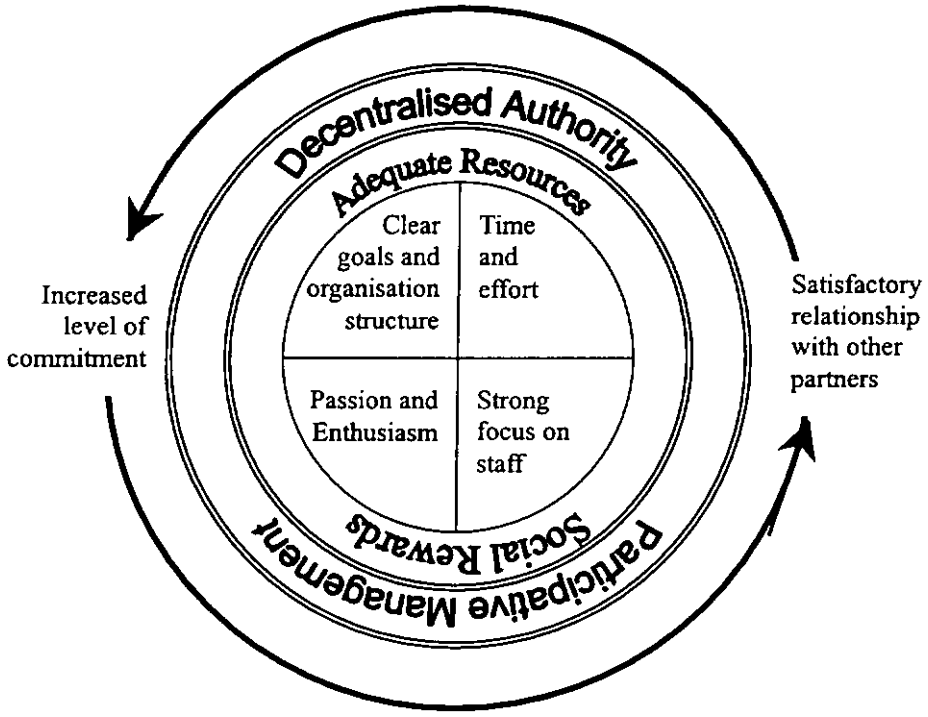

Figure A4.5: Long-term Commitment Supporting Mechanism

Finally, when a partner perceives that partnering contributes positive outcomes and is satisfied with them, more commitment to partnering is conceivable. Such an increased level of commitment further enhances the satisfaction. This is like rolling of a snowball, making long-term commitment as a strong variable of strategic partnering.

Continuous Improvement Supporting Mechanism (CISM)

Learning, experience and continuous improvement are associated terms but with distinctive topical issues (e.g. Senge, 1990; Atkinson, 1994; Mumford, 1994; Riley, 1994; Burgoyne, 1995; Honecker et al., 1999; Laurillard, 1999). Developing individual mechanisms for these related terms will enhance their functions in partnering. This part of the study will focus on a mechanism for continuous improvement while the next two will be dealt with learning climate and partnering experience.

Continuous improvement has been studied ubiquitously in the published literature. With the consideration of some viewpoints (i.e. Chapman and Hyland, 1997; Atkinson, 1994; Honecker et al., 1999; CIB, 1997; Love and Li, 1998), the Continuous Improvement Supporting Mechanism (CISM) is created (as shown in Figure A4.6).

The CISM has put two fundamental structures into practice. On one hand, it embodies the Deming's model (i.e. a Plan-Do-Check-Act cycle) to propel continuous improvement (Schultzel and Unruh, 1996). On the other hand, it highlights four major frameworks of reference for continuous improvement:

(A) *A clear strategic framework* - Top management should treat continuous improvement as an organisation's strategic affair and identify what to be achieved. These are plans or goals that should be in line with the organisation's plans and goals, and, when necessary, should be written as part of the organisational missions. CIB (1997) determined some critical

aspects for continuous improvement as follows:

- Focusing on customers' need, value-adding activities and waste elimination.
- Admitting that competition is not the only way to achieve best value for money.
- Aiming for benchmarking the best practices.
- Identifying specific quantified targets, monitoring progress and measuring performance.

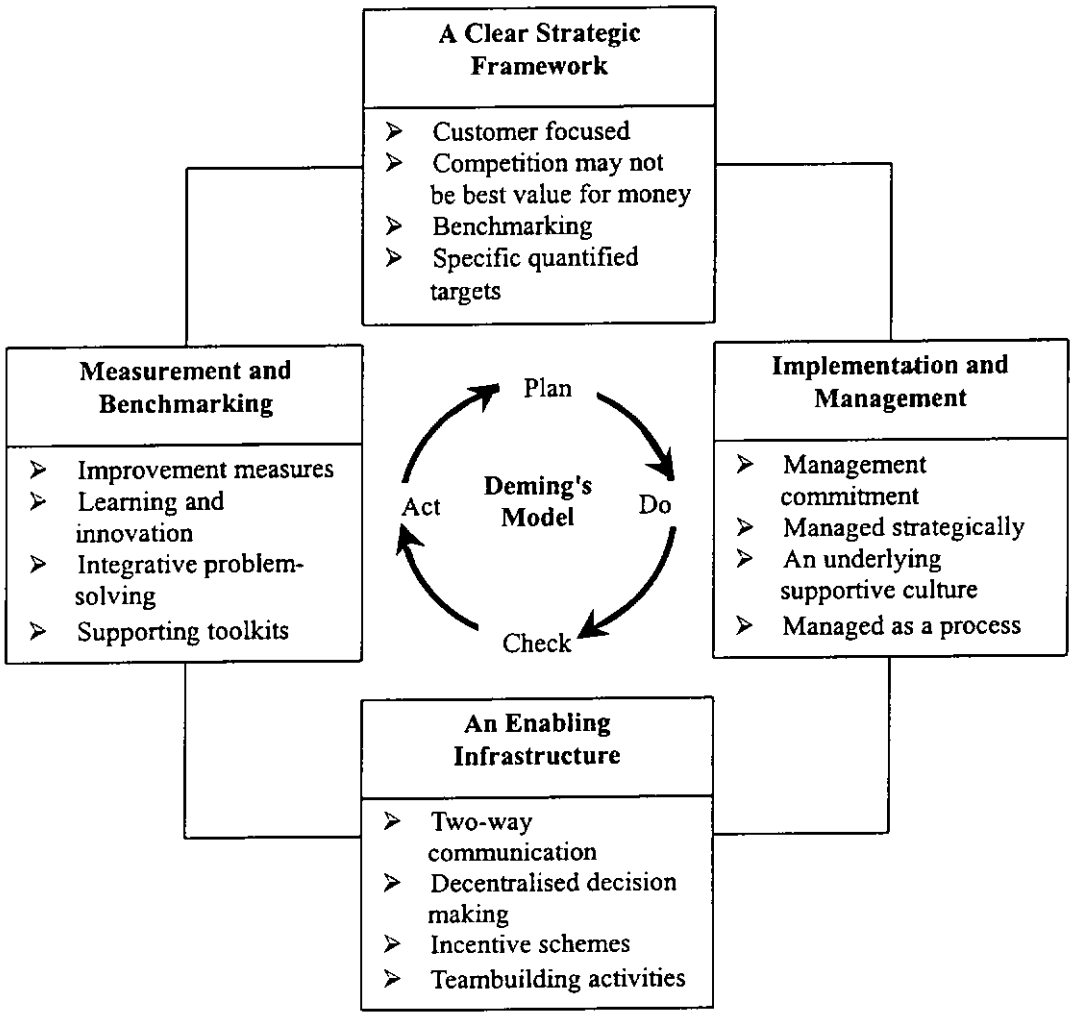

Figure A4.6: Continuous Improvement Supporting Mechanism

(B) *Implementation and management* - Implementation of a plan sounds obvious, but is always poorly managed. Implementing a plan and

regularly reviewing and checking against what have been done cannot be accomplished without the following concerns:

- Management commitment is pre-requisite to continuous improvement. Conveying total commitment to satisfying all stakeholders governs any action and decision (Atkinson, 1994).
- It needs to be managed strategically so that it becomes one of the core elements to be taken care of.
- It should be embedded with an underlying supportive culture so that its importance and value are well organised by everyone in the organisation.
- It needs to be managed as a process that can accommodate the Plan-Do-Check-Act cycle.

(C) *An enabling infrastructure* - This is suggested by Chapman and Hyland (1997) that has to incorporate two-way communication and decentralised decision making. In addition, incentive schemes and team building activities are also two major enablers. The National Society for Quality through Teamwork (NSQT) (Atkinson, 1994) provides the key to continuous improvement success and identified four kinds of teams for improvement activities:

- Workplace improvement teams (such as quality circles), who are dealing with problems in their responsible area.
- Cross-functional teams or corrective action teams, who are responsible for examining a problem that affect several units or departments, but be created temporarily for handling one specific problem. Once the problem solved, the team is disbanded.
- Business and process improvement teams, who are created to address the issues of a business area, looking for improvements and savings. In other words, these teams are in search of improvement proactively rather than simply reacting to a single problem. Like corrective action teams, on completion of a given challenge, the team is disbanded.
- The three types of team working and integrating together into what

they called the "Total Teamwork Way" which allows individuals to seek out opportunities for improvement in their own domain continuously and propose ideas for improvement.

(D) *Measurement and benchmarking* - Improvement corresponds to the actions oriented towards a set of goals (Honecker et al., 1999) that have to be measured. An integration problem-solving component has to be added to achieve the goals that have been pinpointed. It would appear that the availability of a supporting toolkit (a set of common problem solving tools and training programs) is of great benefit in assisting employees to implement continuous improvement (Chapman and Hyland, 1997). Moreover, in order to enhance the capability of the teams, a learning and innovation perspective has to be introduced to propel the benchmarking activities. Honecker et al. (1999), as quoted from John Deere Works Mannheim (JDWM), emphasised some common improvement goals, which are:

- Reducing in costs and time
- Improvement in several product quality
- Organisational flexibility
- The quality of working life (including humanisation of work)

Some others can be the enabling of maximum employee contribution, promotion of safety, increase in customer satisfaction, optimisation of partnering performance, excellent planning and delivery of work (McAdam and Leonard, 1999).

Partnering Experience Supporting Mechanism (PESM)

In this part of study, a mechanism is developed for those team members who want to learn from their accumulative partnering experience and for organisations to transfer such personal experience to become their own experience. So, how individual learns, how to manage personal learning from

experience and how to transfer such personal experience to become the organisational experience are crucial to such a mechanism.

Kolb's Experiential Learning Cycle explains how individual learns. It shows learning as a four-stage cyclical process in which Concrete Experience leads to Reflection and Observation that is followed by the formulation of Abstract Concepts and Generalisations, the implications of which are tested in new situations through Active Experiments. Sims (1993) stated several aspects of Kolb's concepts. First, learning is more than a simple reflex action (i.e. stimulus-response) and implies thinking and analysis, which can occur during reflection and generalisation, as well as in the testing of hypotheses. Second, the learning cycle is continuous. Previous learning influences current learning which in turn influences future learning in an intellectual development or growth process. The third point is that due to the cyclical nature of the learning process, it is possible to begin new learning at any stage of the process. He used an example to explain this point: a person enters at the abstract conceptualisation stage if this person reads about a new theory before going out to experiment with this new knowledge (i.e. progress to the testing hypothesis stage). These three aspects give rise to a final point of view: learning is a highly individualised process, and thus people have different styles of learning.

Nevertheless, Kolb's model cannot address the last two issues, i.e. how to manage personal learning from experience and how to transform such individual experience to become the organisational experience. These issues involve the establishment of an experience learning mechanism that can be managed. Such a mechanism or model has been raised by some researchers (e.g. Kim, 1993; Appelbaum and Reichart, 1998; Honecker et al., 1999). Their models have separately applied four main theories, i.e. Kolb's Experiential Learning Cycle, Single-Loop Learning, Double-Loop Learning and Mental Models. The mechanism established in this study (as shown in Figure A4.7) corresponds to those features of these theories that have great value.

Figure A4.7 is the Partnering Experience Supporting Mechanism (PESM)

which is designed to address the above learning and experience issues. This mechanism illustrates the individual experience process and presents how individual experience can become organisational experience. The individual and organisational experience accumulation processes are described below:

1. Individual Experience Accumulation Process – Partnering events provide opportunities for gaining experience. Experience can be either successful or failure events in terms of work practices, individual conduct or collective encounter. What experience should be learned and how does it become one's own intellectual assets? Kolb's experiential learning cycle gives the answer. Figure A4.7 also applies the learning cycle to function the Individual Experience Accumulation Process. The cycle helps to select what experience is needed by awareness of the knowledge gap or new insights leading to increased common sense and "upgraded" intelligence. An experience is said to be mastered through intellectual experimentation on the surrounding (Burgoyne, 1995). Such a process always involves the individual single-loop and double-loop learning. Individual single-loop learning initiates simple learning corresponding to a given set of assumptions of the individual in terms of individual mental models. As opposed to single-loop learning, the double-loop learning implies that the individual's experiences are sometimes not simply reflected in the already existing frame of the mental models. They may undergo a change of individual mental models, resulting in a fundamental change of individual learning and action (Honecker et al., 1999). Therefore, single-loop ties to the increase in common sense while double-loop ties to the growth in intelligence. However, people have difficulties in realising these learning and experience processes. In fact, some tips are useful for them to experience the individual experience process:

   - Good or bad events as well as successful or failure stories are all potential experience sources for learners.
   - Do not rely on others to determine what you need to master. It depends totally on your own "master mind" (i.e. the individual mental models).

- Try to compare the new encounter with your own understanding to make sure an experience has to be mastered due to a knowledge gap or new insights.
- Do not rely merely on single-loop learning to learn based on your pre-defined assumptions. Partnering involves complex activities or multi-level decisions. Double-loop learning from partnering experience cannot be ignored. Changing of the individual mental models is usually undertaken in order to capture the chance for intelligence growth. Growth in intelligence may not be entirely related to improved knowledge and skills but leads to a change of behaviour. For example, a person who has grown in intelligence may be more mature or serious to handle problems.

2. Organisational Experience Accumulation Process – Organisation has its own pre-defined mental models such as policy or operations (Burgoyne, 1995). Individual action becomes the source for organisational experience which may "learn" through single-loop learning process. For example, a partnering representative who has learned from the team that e-mail correspondence is good for communication. The organisation learns from it (i.e. shared individual learning) and agrees to assign each employee a personal e-mail address. Certainly, this single-loop learning implies that the organisation has a strong sense of computerisation (i.e. there is a pre-defined set of assumptions). If not, the organisation has to undergo a change of its mental models before an action has to be initialised. Moreover, the fundamental change in the individual mental models results in changing the corresponding mental models, which then influence organisational action. This is one kind of double-loop learning. For example, when a partnering representative has observed and believed that trust cannot be established in the partnering team although he originally looked for the establishment of mutual trust within the team, this experience may influence the organisation with the same perception even though it trusted its partners initially.

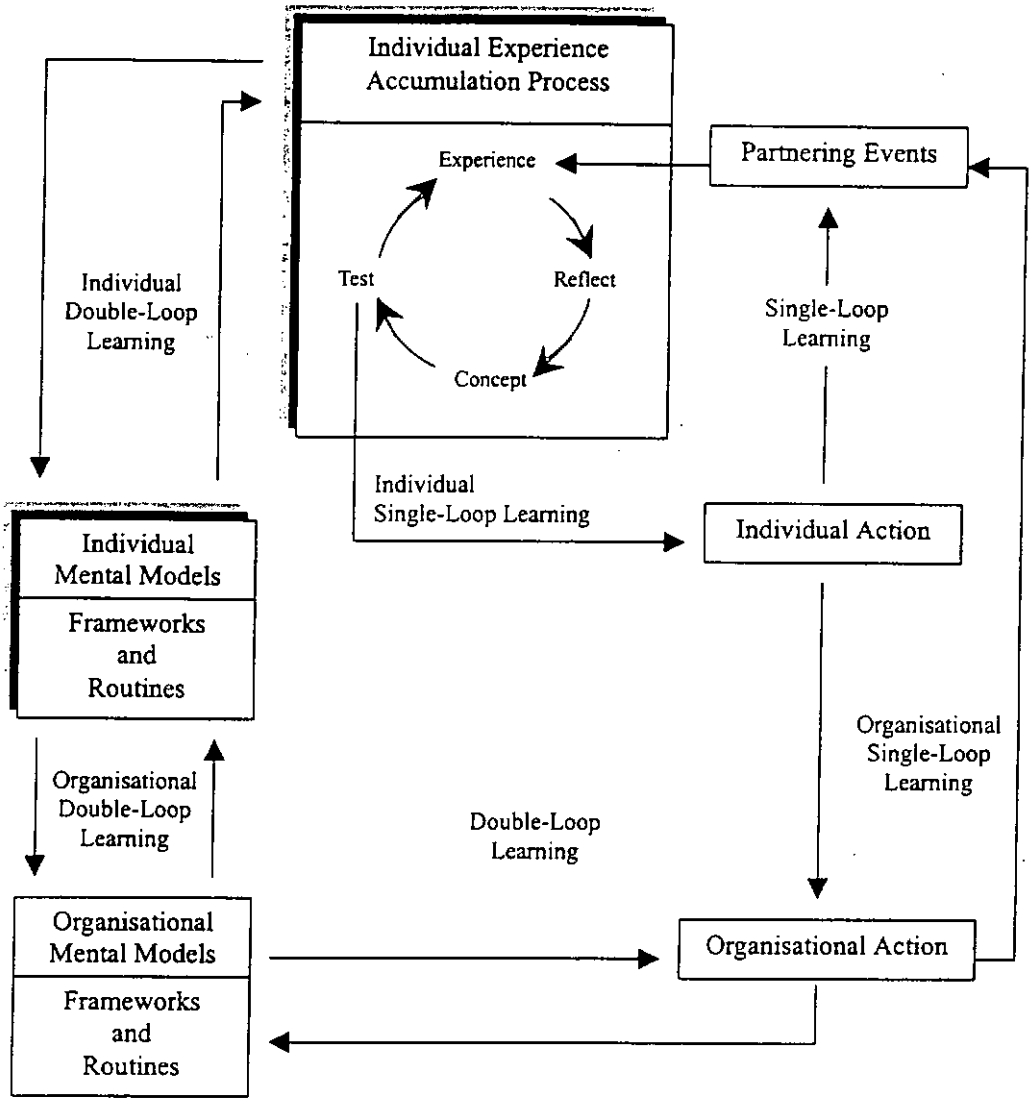

Figure A4.7: Partnering Experience Supporting Mechanism

Note: Adapted from Appelbaum and Reichart (1997, 1998) and Honecker et al. (1999)

Learning Climate Supporting Mechanism (LCSM)

The PESM has showed how to manage the learning process for partnering experience accumulation, but it never indicates how to stimulate or induce such a learning process. To establish a climate for learning from partnering, some characteristics have to be accommodated:

- It has to be built systematically since it provides an environment or community for learners to share and compare different responses, insights and experiences (Sims, 1992).
- It helps to establish shared responsibility for maintaining the process of "getting" and "giving".
- It must be able to stimulate learning in a proactive (but not passive) manner and meet everyone's learning needs.

The best way to incorporate these characteristics to build a learning climate is the application of computer. Saad and Hancher (1998) have suggested the use of multimedia systems to learn from a construction project. They established a Project Navigator Model for Processing Lessons Learned, which is tailor-made for the civil engineering and construction projects. Yet, this program may be too complicated for construction partnering. Therefore, a mechanism is created which shows a more practical approach to learning climate (as shown in Figure A4.8).

Figure A4.8 is the Learning Climate Supporting Mechanism (LCSM). This mechanism is designed for organisations, which has the following features:

- Continually post useful information, including knowledge and skills, to their employees by using their e-mail addresses, internal mails or notice board.
- Periodically raise topics for discussion, motivating employees' responses with incentives.
- Encouraging employees to initiate any topics for discussion, where organisations need to monitor the discussion activities so that discussions that violate laws or organisational regulations have to be avoided.
- Other than discussion, the learning platform should allow employees to make enquiry and search for answers.

Places for employees to discuss or exchange information can be called chat rooms. These chat rooms can be a real room such as conference room, office,

dining hall and pantry, or through other means such as telephones, written memos and computers. Among all, computer is more appropriate to establish such a forum for learning and teaching as it allows a large number of people to discuss simultaneously, and participating the forum is arbitrary without disturbing those who are inside the chat room. Hence, in addition to e-mail correspondence, chat room interfaces and programs like electronic bulletin board are installed for interactive learning.

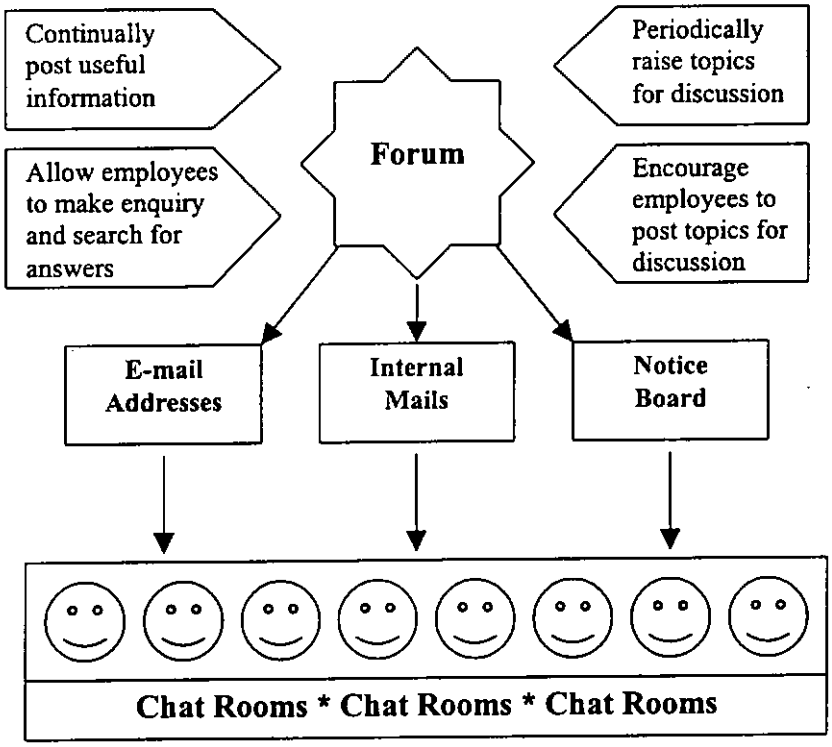

Figure A4.8: Learning Climate Supporting Mechanism

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APPENDIX 5: PUBLICATIONS OF EDDIE CHENG

Accepted/Published Refereed Journal Papers:

1. **Cheng, E.W.L.**, Li, H., Love, P.E.D. and Irani, Z. (2001) 'Network communication: a mechanism for building inter-organisational construction alliances', *Corporate Communication: An International Journal*, (accepted for publication).

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1. **Cheng, E.W.L.** and Ho, D.C.K. (1997) 'Transfer of training: a review of recent studies', in *BRC Working Papers, Series No.: WP 97020*, June, Hong Kong Baptist University.