Development of a Practical Model of Partnering for Construction Projects

Eddie W. L. Cheng[1] and Heng Li[2]

Abstract: This paper presents a practical model of partnering, which integrates the processes and associated components for partnering espousal. It intends to use the concept of modeling to integrate the aspects of system and process to form a model for practicing partnering. Therefore, a system-process model that is called the procedural mapping model (PMM) is developed, which adopts a more systematic approach to modeling construction partnering, including the identification of the core practices and activities. The PMM forms the basis for designing the key elements of the practical model of partnering that involves three major establishments including interactive process description, success factors' monitoring, and goals' assessment matrices. Individual components of these establishments have also been described.

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Introduction

Partnering helps to advance the collaboration and enhance the competence of construction parties. It is an innovative concept to the construction organizations, which traditionally rely heavily on contracting to bind the parties together. However, such a traditional cooperation of the construction parties for a construction project is subject to merely the fulfillment of the contract's terms and conditions, but little has been done with the contract to strive for the improvement of the project performance. As these parties work with an arms-length relationship, it is easier to cause adversaries (Ellison and Miller 1995; Thompson and Sanders 1998). In pursuit of performance excellence, there is a high demand for partnering. As such, the last decade has seen an explosion of interest focusing on the study as well as application of partnering. For example, Rowings and Federle (1996) developed a guide to electrical contractors when they believed that partnering could bring in opportunities to improve efficiency and competitiveness at the workplace. In the United States, the Construction Industry Institute and the Associated General Contractors (AGC) of America had separately conducted partnering research and produced a set of products (including videos, seminars, and guide books) during the last decade. The Institute mainly focused on three elements: Benefits of partnering, selection of partners, and development of a partnering process model. Their partnering process model is a five-phase all-purpose model (Thompson et al. 1996). The AGC of America on the other hand drew readers' attention to project partnering (e.g., McIntyre 1995; Carr 1999). Although their process models are blueprints for the construction industry, similar to other published partnering process models, they did not attempt to incorporate both project and strategic partnering into a single model. Project and strategic partnering are argued to be composed of different attributes (e.g., Harback et al. 1994; Barlow et al. 1997), and there is currently a major research interest to distinguish them (e.g., Li et al. 2000; Cheng et al. 2000;Cheng and Li 2001,2002).

This paper presents a practical model of partnering describing the processes and associated components that are based on the studies of Cheng and Li (Cheng, unpublished, 2001; Cheng and Li 2001, 2002) who conducted empirical studies to distinguish project and strategic partnering in terms of the process attributes and associated critical factors. It is intended to use the concept of modeling to integrate the aspects of system and process to form a model for partnering. Modeling (or model building) is the formation of a representation of some system of interest. With respect to construction partnering, it entails building up the procedural conducts for the involved parties to behave and act. It is a critical step for understanding and improving a system-process model's performance (Kartam et al. 1997). Therefore, a modeling technique, the workmapping system model of Kartam and Ibbs (1996), is used to develop a system-process model that is called the procedural mapping model (PMM). This PMM summarizes the key elements of a partnering arrangement to establish a system-process model of partnering. In other words, it adopts a more systematic approach to modeling construction partnering, including the identification of the key practices and activities. The CPR (made up from the first letters of the *C*ommunication model, the *P*rocess-interaction model, and the *R*esponsibility matrix) System Models of Kartam and Ibbs (1996) have been adapted to design the core components of the practical model. The paper is organized to first describe the key aspects of partnering, which form the basics for developing the PMM. A modeling technique is then used to identify the key elements of partnering. Finally, a practical model of partnering (PMP) is developed and described.

[1]Postdoctoral Fellow, Dept. of Building and Real Estate, The Hong Kong Polytechnic Univ., Hunghom, Kowloon, Hong Kong. E-mail: bseddie@polyu.edu.hk

[2]Professor, Dept. of Building and Real Estate, The Hong Kong Polytechnic Univ., Hunghom, Kowloon, Hong Kong. E-mail: bshengli@polyu.edu.hk

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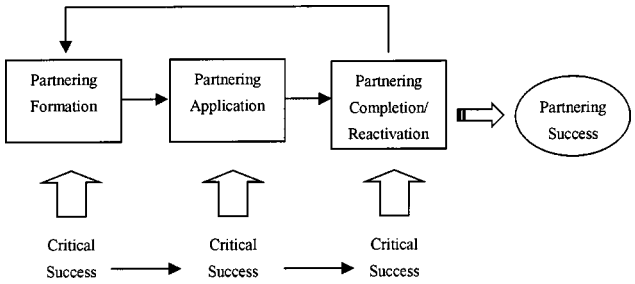

Fig. 1. Conceptual model of partnering: sources from Cheng (unpublished, 2001; Cheng and Li (2001)

Basics of Partnering

Empirical studies of partnering in the West are quite ubiquitous with different foci to realize the process as well as the success factors of partnering (Li et al. 2000). This study was designed based on the empirical studies of Cheng and Li (Cheng, unpublished, 2001; Cheng and Li 2001, 2002). They developed and tested a conceptual model of partnering, which was proposed around the common premise that there was a process of partnering, and various CSFs critical success factors (CSFs) influence the success or failure of partnering. The remaining paragraphs in this section summarize their findings, which form the ingredients for designing the practical model.

Conceptual Model of Partnering

Fig. 1 shows the three-stage partnering model (*formation*, *application*, and *completion/reactivation*) and an individual set of critical factors leading to the success of each partnering stage (Cheng and Li 2001, 2002). There are also critical criteria for measuring the level of success of partnering (Cheng, unpublished, 2001). All of these process stages, critical factors, and critical criteria are taken in consideration when designing the PMM. The three stages are in a sequential process flow 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 cooperation. The former is project partnering, while the latter is strategic partnering. It is proposed that a set of conditions must be achieved in order to reactivate the partnering relationship successfully.

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.

Partnering application refers to the execution of the informal relationship to accomplish the mutually agreed upon goals and objectives in line with the construction project.

Partnering completion/reactivation refers to the intention of the construction parties to rerun an informal relationship with the same group of companies for a new project after the completion of the current project. However, if any of the team members is new, the partnering process is not reactivated but a new process has to be established.

Critical Success Criteria/Measures

In addition, there should be criteria for measuring the level of performance of partnering (Cheng, unpublished, 2001). Yet, objective measures of partnering are difficult to obtain. It is because partnering performance is hard to quantify when the process involved such intangible components as learning, behavioral change, relationship, teamwork, etc. Pinto and Slevin (1988, 1989) suggested that perception from the project parties is an effective determination of project success. This paper extends this conception 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.

Notwithstanding, each partnering project may have its specific conditions for successful performance. That means partnering performance measures of one project may be different from others. In the case of project management, Belassi and Tukel (1996) suggested that due to the unique nature of different projects, key factors of a project might not be crucial in other projects. The use of specific goals and objectives as the measurable criteria is not justified since the measures will vary depending on the goals and objectives favored by different partnering teams. Therefore, it is suggested to use standardized or common measures.

In general, the subjective measures are based on the notion that partnering is used to improve work relationships that helps to achieve predetermined common goals for fulfilling the overall satisfaction of stakeholders. Therefore, improved work relationship, compatible goals, and overall satisfaction of stakeholders are general measures of the success of partnering. It is noteworthy 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 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). Specifically, these criteria are likely to measure the extent of the requirements, needs, preferences, and expectations of some influential people or groups at the individual and organizational levels. Major influences at the individual level come from the top management and representatives in the partnering team. The influence of organizational factors (e.g., the internal organization or the project itself) further embeds into the realization 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 when more constraints are added during the processes (constraints such as contextual requirements or impacts).

Critical Success Factors

CSFs of partnering can be either common or specific. In other words, while there should be an individual set of critical factors affecting each of the partnering stages, some of these CSFs are likely to affect the whole partnering process. On the other hand, Barlow et al. (1997) argued that despite the similarity between the basics of project and strategic partnering, they still maintain different functions and provide various benefits. For example, organizations forming strategic partnering focus partly on broader business goals (long-term objectives), while those with project partnering emphasize specific short-term objectives. As shown in Fig. 1, the loop from completion to formation is 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 for sustaining high quality of products (Kaye and Anderson 1999). Thus, apart from the simi-

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lar 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 purposes are expected, it is able to determine that there are different sets of CSFs affecting the partnering process.

In general, there are four common and four functional factors (Cheng, unpublished, 2001; Cheng and Li 2001, 2002). Common factors are known to be critical to all stages of partnering, while functional factors are crucial to a specific stage where they exert their influence extensively. Consequently, common factors are: (1) Top management support, (2) open communication, (3) mutual trust, and (4) effective coordination. Functional factors are: (1) Long-term commitment, (2) continuous improvement, (3) learning climate, and (4) partnering experience. Their possible relationships and effects will be described in later section.

Procedural Mapping Model

For developing the PMP, it is essential to identify the key processes of partnering and related components. Basically, there are two types of models—system and process (Kartam and Ibbs 1996). Kartam et al. (1997) referred to a system model as a model that focuses on a process surrounding but not the specific 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. The concepts of system model and process model are useful to determine the sequence of the processes of partnering and identify the impacts of any constraints toward the processes, respectively.

A partnering model is said to be clearer and more effective when its design has made use of modeling techniques. The workmapping model of Kartam and Ibbs (1996) is an appropriate modeling tool as it combines the system and process flow concepts in modeling. This model is a systematic approach to modeling 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). This system-process model is the foundation for conceiving the core activities as sets of operation within process stages of the PMP. The concept of the workmapping model 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 modeling the project's planning phase, namely the CPR System Models. This 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 modeling an input-transformation-output process, it is likely to be useful to a change process such as the conceptual model in this study.

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 nonvalue adding activities in the process. The final component is the responsibility matrix, which indicates how management assigns responsibilities.

Although 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, 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. Success factors' monitoring (SFM)—Four common and four functional factors are proposed to be crucial to partnering. The communication model of the CPR System raises the needs for finding ways to increase and sustain a high positive level of these factors. However, this paper will not go into detail for introducing any improvement methods or mechanisms for these factors. Readers may refer to published works on these success factors. Instead, this paper focuses on the establishment of effective monitoring of the positive level of these success factors, which by all means indicates the level gap for improvement.
4. Goals' assessment matrices (GAM)—Using the concept of responsibility matrix to create some 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 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 Fig. 2. It portrays six integrative processes (subprocesses) within the partnering process. Representative Selection Process, Team Building Process, and Partnering Agreement Process, are in the process stage of partnering formation. Goals Attainment Process (GAP) and Joint Problem Solving Process are in the stage of partnering application. Reactivation Decision Process is in the stage of partnering completion and reactivation.

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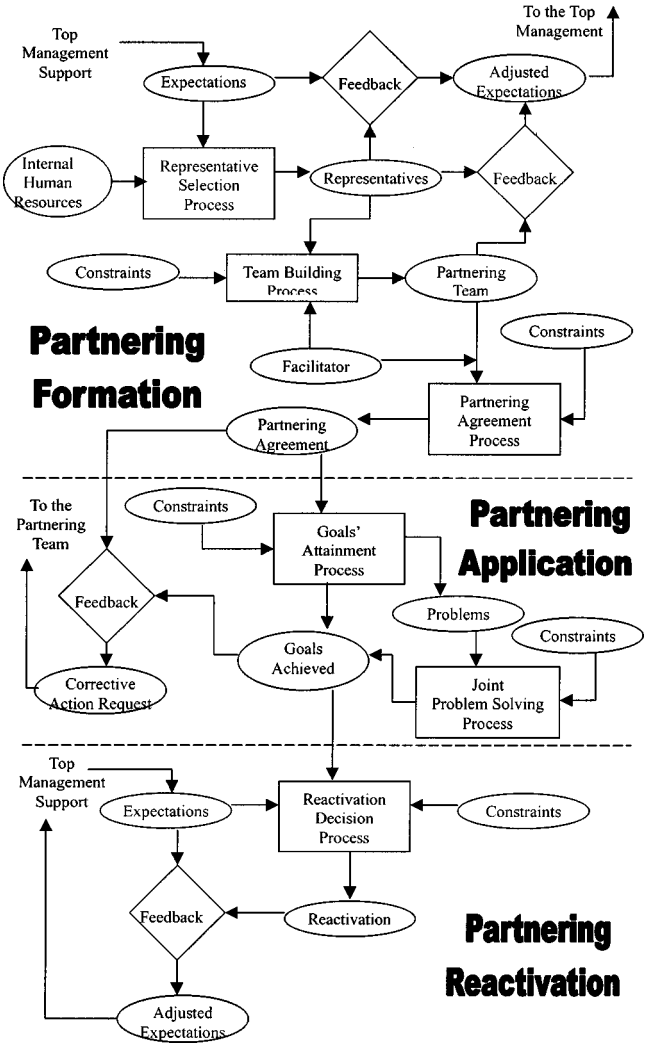

Fig. 2. Procedural mapping model for partnering

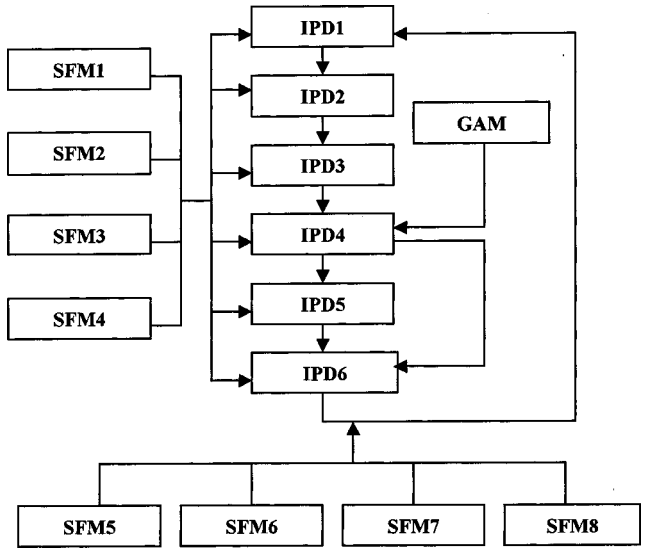

Fig. 3. Practical model of partnering: (1) IPD stands for Interactive Process Description; GAM stands for Goals' Assessment Matrices; SFM stands for Success Factors' Monitoring. (2) IPD1 = Representative Selection Process; IPD2 = Team Building Process; IPD3 = Partnering Agreement Process; IPD4 = Goals' Attainment Process; IPD5 = Joint Problem Solving Process; IPD6 = Reactivation Decision Process; SFM1 = SFM for Effective Coordination; SFM2 = SFM for Top Management Support; SFM3 = SFM for Mutual Trust; SFM4 = SFM for Open Communication; SFM5 = SFM for Partnering Experience; SFM6 = SFM for Continuous Improvement; SFM7 = SFM for Learning Climate; SFM8 = SFM for Long-term Commitment.

Practical Model of Partnering

The PMM is used for representing the system perspective, and forms the basis for developing the IPD, SFM, and GAM. The last three elements in turn form the PMP (as shown in Fig. 3). The PMP represents the key elements for the success of partnering. The core components of the PMP in terms of the IPD, SFM, and GAM are summarized in the following paragraphs.

Interactive Process Description

The IPD (as shown in Table 1) outlines all of 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 nonvalue adding activities can be eliminated easily. The IPD can also serve to determine the duration for each step and avoid task overlap. An efficient timetable specifying the effective steps matches the increasingly tight and taut construction projects.

Success Factors' Monitoring

The Communication Process Model of Kartam and Ibbs (1996) is 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 interorganizational communication requirements should be considered for the design of a supportive communication mechanism. The idea of establishing mechanisms for project and interorganizational 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 is also a method which embodies some managerial or technical skills.

In addition to a communication mechanism, the design of mechanisms extends to other common and functional success factors. For a successful partnering, a series of mechanisms should be built up and sustain a high positive level of the proposed four common and three functional success factors. However, this paper will not go into detail for introducing any improvement methods or mechanisms for these factors. Instead, this paper focuses on the establishment of effective monitoring of the positive level of these success factors, which by all means indicates the level gap for improvement.

In order to monitor the performance level of the success factors, the audit model of Clarke and Manton (1997) can be applied, which uses a matrix to obtain score or rating in order to carry out an audit for the success factors. Prior to the beginning of this audit, key criteria for assessment have to be established. Table 2 shows the audit matrix. A five-point scale is used for the eight

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Table 1. Interactive Process Description of Partnering

Six processes	Description
Representative selection	
Top management agrees to form partnering	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.
Select representatives	Top management is required to first select representatives to participate into the partnering activities.
Choose from internal human resources	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 favor innovative ideas, and possess strong interpersonal and communication skills.
Representatives should be empowered	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.
Team building	
Representatives are selected, and an independent facilitator is hired	After representatives of the key project parties have been selected, an outside/ external facilitator should be hired to facilitate partnering formation, and acts s 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.
Initial workshop as a chance for knowing well about the representatives and for introducing the necessary partnering concepts to them	The facilitator organizes 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 report. 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.
Other workshops when necessary	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.
Formation of a multidisciplinary	A multidisciplinary team is formed when all representatives really understand what is partnering, and are willing to discuss in detail about the partnering agreement.
Partnering agreement	
The facilitator plays a supporting role	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 organizing and managing workshops, solving problems, and conflicts, etc.
The partnering team members should be aware of their own organizations' needs	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 organization. They should ensure that the goals of their own organizations (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 for bridging the gaps	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.

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Table 1. (*Continued.*)

Six processes	Description
The formation of a partnering agreement	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.
Goals' attainment	
The partnering team takes the leading role	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 for monitoring and evaluating the partnering goals	Workshops are organized to monitor and evaluate the achievement levels of the partnering goals. Usually, monthly workshops are sufficient. In some cases of emergency, such as poor partnering performance or serious problems, additional workshops are organized. Some devices, such as performance matrices and graphs, are needed to assess the partnering performance (will be described in detail later).
Assure the attainment of partnering goals	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.
Joint problem solving	
Problem Identification and Interpretation	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 for open discussion	Workshops are organized to solve problems by encouraging open discussions for brainstorming of possible solutions. Some resolving techniques should be adopted to solve the problems.
Choose from possible solutions	In some cases, it is easy to determine which solution is the most appropriate. Whilst, for some complicated issues, some devices, such as evaluation matrices and weighting methods, are used to rate and prioritize the possible solutions. The team should be careful in selecting the criteria (the rating items) for prioritization.
A high performance team to solve problems	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.
Reactivation decision	
Top management takes the decision role	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.
Expectations and considerations	Whether or not to reactivate a partnering relationship, the top management has to make such a decision based on some reasons. Other than the consideration of the internal goals, some common reasons are the favorable past experience, policy of continuous improvement, high level of long-term commitment and a build-in learning climate.
Decided to reactivate partnering	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. Some may choose to use members of the old team; however, due to turnover or redeployment of staff or new expectations from individual organizations, team members often change.

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Table 2. Audit matrix

Four common success factors		
Score	Open communication	Effective coordination
5	*Excellent communication*—No complaint of communication problems; communication channels have been used extensively.	*Very well coordinated*—No complaints of problems in coordination.
4	*Good communication*—A few trivial complaints and have been solved quickly; most of the communication channels have been used very well.	*Well coordinated*—A few complaints of problems in coordination; 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 coordinated*—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 coordinated*—Many complaints; many coordination 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.	*Poorly coordinated*—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 is dealt with seriously.	*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 is dealt with seriously.	*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 recognized 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 recognized in house; just one or two representatives who seldom attend the meetings or workshops.
Four functional success factors		
Score	Long-term commitment	Continuous improvement (CI)
5	*Total commitment*—Fully realize the importance of long-term relationship; Very well prepared to form long-term relationship with other members.	*Fully committed to CI*—Fully aware of the need for continuous improvement; fully understand partnering promoting continuous improvement.
4	*Good commitment*—Knowing the importance of long-term relationship and well prepared.	*Usually committed to CI*—Accept continuous improvement; 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*—Realize that continuous improvement is not a must; committed to it may not be harmful to the organization
2	*Limited commitment*—Realize that long-term relation is not what they want.	*Limited committed to CI*—Believe that improvements might not necessary be continuous ort here 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 organization.
	Partnering experience	Learning climate

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Table 2. (*Continued.*)

Score	Four common success factors: Open communication	Four common success factors: Effective coordination
5	*Always used*—Management always encourage learning the experience from partnering; employees are fully aware of the partneringprogress and are convinced to use what they learnt from the workshops back to thei rworkplace.	*Very keen to learn*—The habit of learning can be found everywhere inside the organization; 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 theirworkplace.	*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 tolearn.	*Sometimes keen to learn*—Learning is good for employees but not widely promoted; discussions are limited during groups' meetings.
2	*Seldom used*—Management seldom encourages their staff to learn from experience; no learning perspective is found within theorganization.	*Seldom keen to learn*—Learning is not encouraged in company; no spare time and place for discussions; organization 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*—Organization sticks to the status quo; never accept new things or new ideas; learning is seen as a devil rather than a hero.

success factors although a three-point scale (Fleming and Kippelman 1996) and a six-point scale (Clarke and Manton 1997) might also be useful.

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 coordination, mutual trust, and top management support). It is also helpful to check within each organization about the level of the four functional success factors (i.e. long-term commitment, continuous improvement, learning climate, and partnering experience). An audit model that consists of four core components are described below:

- The first step is to design a scorecard (usually in table form) for team members or individual organizations to assess the performance level of the success factors. This scorecard must be based on the audit matrix that has been constructed. Team members or individual organizations must identify the key criteria and determine the expected performance, which can help to not only assess the maturity level of the factors' performance but also indicate what has to improve.
- The completed scorecards are then plotted to form graphs or charts, such as radar chart audit (Clarke and Manton 1997). 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 scorecards of all organizations 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 scorecards of each organization 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 to reveal the performance gaps. 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 organizations are responsible to determine such desired scores. Furthermore, some target scores may be plotted on the same chart to illustrate the degree of improvements. Yet, such targets must be realistic and incremental, and an organization is affordable to aim for this.
- Disclosing the performance gap helps to identify the areas for improvement, including the creation of good action plans and methods. The fourth step therefore involves drawing up a priority action plan that specifies the predetermined targets, which are considered based on the performance gap. Then, the audit matrix reveals the good practices to copy.

Goals' Assessment Matrices

GAMs 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 prioritization 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. 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. GAM has four basic components, which are described with examples as follows.

1. A partnering score sheet is designed to collect the opinions about the level of attainment of the partnering goals from team members at each workshop. It involves self-reported evaluation in which the score sheet lists the goals to be

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achieved, and allows members to assess their level of maturity in progress based on a preapproved scale. In general, a five-point scale, from 1 (=very poor) to 5 (=very good), is used. The addition of a "Remark" column allows members to state their reasons for their answers.

2. The data from team members are recorded in an overall assessment table for each assessment with a spreadsheet format. The column headings list those team members who express their opinions, while 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 to trace the need for improvement. Target scores are then set to achieve. For an illustration of such a comparison, see Clarke and Manton (1997).
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. This table's column headings list all workshops with their numbers and dates, while the rows are the mean scores of all those partnering goals. Since the table also indicates how many and how often workshops were organized, it provides more information for analysis. The progress assessment table plots a bar chart in order to track performance of individual goals.

Conclusions

This paper has described the development of a practical model through modeling technique. The PMM, which originated from Kartam and Ibbs (1996), has been created. This PMM helps to transform the conceptual model into a practical model by specifying key practices and activities. The PMP was composed of three major establishments including IPD, SFM, and GAM. Individual components of these establishments were also described. One of the main features of this practical model is the setting up of procedures for espousing project or strategic partnering. It is therefore 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. As it portrays the processing units that form the value adding activities, it may interact with an infrastructure of partnering (Cheng et al. 2001) to develop a total partnering system that consists of both a real and virtualized network. This practical partnering model is claimed to be an alternative view of partnering. It is worth noting that there are other excellent practical guides available in the market, such as those of the Construction Industry Institute and the AGC of America.

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