Exploring Critical Success Factors for Partnering in Construction Projects

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Abstract: The construction industry is a very competitive high-risk business. Many problems, such as little cooperation, lack of trust, and ineffective communication resulting in adversarial relationships between contracting parties, are facing the construction industry. Partnering is perhaps one of the most innovative developments in delivering a project efficiently and reducing construction disputes. It provides a sound basis for a ''win-win'' climate and synergistic teamwork. Project partnering in the Hong Kong construction industry has gained in popularity since 1994. A number of potential factors contributing to partnering success have emerged and deserve further study. This paper presents a review of the development of the partnering concept in general and identifies critical success factors for partnering projects from the Hong Kong perspective in particular. Through a postal questionnaire survey geared toward project participants with hands-on partnering experience, the opinions of various parties—clients, consultants, and contractors were sought and evaluated in relation to partnering success factors. The relationship between the perception of partnering success and a set of success factors hypothesized in the study was derived using factor analysis and multiple regression. The results indicated that certain requirements must be met for partnering to succeed. In particular, the establishment and communication of a conflict resolution strategy, a willingness to share resources among project participants, a clear definition of responsibilities, a commitment to a win-win attitude, and regular monitoring of partnering process were believed to be the significant underlying factors for partnering success. Such an identification of success factors could well formulate effective strategies for minimizing construction conflicts and improving project performance.

DOI: 10.1061/(ASCE)0733-9364(2004)130:2(188)

CE Database subject headings: Teamwork; Construction industry; Hong Kong; Factor analysis; Multiple regressions; Partnerships.

Introduction

The construction industry is beset with several problems, such as lack of cooperation, limited trust, and ineffective communications leading to an adversarial relationship among all project stakeholders. This kind of relationship is reflected in project delays, difficulty in resolving claims, cost overruns, litigation, and a win-lose climate (Moore et al. 1992). This relationship has instigated the need for a new procurement approach all the more urgent. This need is compounded by the experiences of many within the industry, which in the past, have resulted in arbitration proceedings or litigation processes while attempting to overcome difficulties.

Many new management techniques have gained popularity to help solve these problems (Schriener 1991; Eckert 1994; Sanders 1994). Partnering is one such technique that tries to create an effective project management process between two or more organizations. It aims to generate an organizational environment of trust, open communication, and employee involvement (Sanders and Moore 1992). This is achieved through the rapid nurture of a project culture to fulfil the function of a successful corporate culture in longer lasting organizations.

Over the years, partnering has evolved as an innovative approach to procurement of construction services in the industry. It lowers the risk of cost overruns and delays as a result of better time and cost control over the project (Black et al. 2000). Also, it increases the opportunity for innovation, especially in the development of value engineering changes and constructability improvement (Abudayyeh 1994) because of open communications and existence of trust among project parties. It provides the basis for project participants to reorientate themselves toward a ''win-win'' approach to problem solving and fosters synergistic teamwork among them.

Project partnering has been gradually applied in the Hong Kong construction industry because of a growing quest for substantial improvements in project performance (CIRC 2001). Although partnering is an effective approach to teamworking, its success factors are worthy of in-depth investigation. This paper, based on earlier research work by Chan et al. (2002a,b), expands on the current literature by evaluating empirically the perceptions of project participants on which ingredients make partnering a

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Note. Discussion open until September 1, 2004. Separate discussions must be submitted for individual papers. To extend the closing date by one month, a written request must be filed with the ASCE Managing Editor. The manuscript for this paper was submitted for review and possible publication on July 2, 2002; approved on January 16, 2003. This paper is part of the ***Journal of Construction Engineering and Management***, Vol. 130, No. 2, April 1, 2004. ©ASCE, ISSN 0733-9364/2004/2-188–198/$18.00.

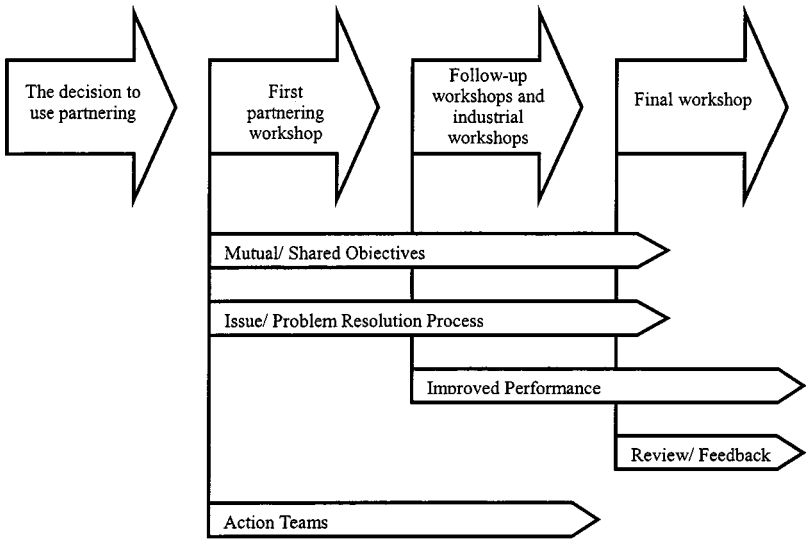

Fig. 1. Project partnering process [source: Latham (1994)]

success. The development of partnering philosophy, a review of its success factors, research methodology, analysis of survey results, and the application of research to construction are explained. The essence of partnering demands immediate attention, and parties concerned should be rewarded from its application. The practice is at a germinating stage of development in Hong Kong, and more partnering arrangements should be initiated and supported within the industry.

What Is Project Partnering?

Many research papers have discussed the definition and meaning of partnering. The fundamental principles of partnering: Commitment, trust, respect, communication, and equality are designed to include proper consideration of the interests of all parties at every level (CII 1991; Cowan et al. 1992; Uher 1999). It is the building of ''trust'' among the interested parties of a contract. This helps avoid problems with the project that in recent times, more often than not, lead to litigation (Moore et al. 1992). Numerous definitions of partnering have been derived from past studies. Among them, the definition developed by the Construction Industry Institute (CII) in the United States is the most widely cited. The CII defined partnering as

> *A long-term commitment between two or more organizations for the purposes of achieving specific business objectives by maximizing the effectiveness of each participant resources. This requires changing traditional relationships to a shared culture without regard to organizational boundaries. The relationship is based on trust, dedication to common goals, and an understanding of each other's individual expectations and values.* (CII 1991)

Another classical definition was put forward by Bennett and Jayes (1998) that partnering is defined as ''*a set of strategic actions that deliver vast improvements in construction performance. It is driven by a clear understanding of mutual objectives and co-operative decision-making by a number of firms who are all focused on using feedback to continuously improve their joint performance*.''

It is also important to measure project performance in the areas agreed to during the initial partnering workshop, at the agreed time intervals, and to feed back the results to the project team for evaluation (CIB 1997). This is not necessarily easy but is essential. Fig. 1 portrays the process from the decision to use partnering through final review and feedback.

Evolution of Construction Partnering in Hong Kong

Recently, there has been significant growth in the interest of partnering in construction. Some of the interests follow the success of partnering in nonconstruction fields ranging from pharmaceuticals to professional services firms. Hong Kong has followed this trend, and partnering arrangements can be found among some of the major local government authorities and departments. Project works have been delivered based on the traditional procurement system where clients appoint consultants to act on their behalf in order to produce designs and supervise site works. The adversarial relationship between clients and construction contractors inherited in this procurement system is one of the major barriers to the success of the construction industry, which prompts the need for partnering.

Over past decades, the buoyant property market in Hong Kong has suppressed concerns over the quality of buildings, because buildings are considered to be more of a commodity than a home for people (Tam et al. 1995). The increasingly competitive and quality discerning international markets indicate a mandatory need for all industries in Hong Kong to upgrade the quality of their products (Tam and Chan 1996). In the past few years, both construction professionals and the general public have continuously criticized the quality of buildings and construction safety. The prevailing traditional procurement system that fosters confrontational contractual arrangements and win-lose situations is no longer a valid approach for improving the quality and safety issues of today.

Previous studies (Cowan et al. 1992; Moore et al. 1992; Crowley and Karim 1995) suggested that project partnering could well be applied to construction projects with an encouraging record of success and can provide improved time and cost benefits to both clients and contractors. Partnering has been applied as a new management strategy to procuring construction projects. It is created by the parties who will be involved in the project including

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Table 1. Results of Partnering Performance of Construction Projects in Hong Kong [Source: Chan and Chan (2002)]

Performance indicator	Percentage of partnering success
Time performance	73.3% of the partnering projects were on-schedule or ahead of schedule
Cost performance	82.9% of the partnering projects were on-budget or under budget
Disputes occurrence	86.7% of the partnering projects had less or an equal number of disputes than an average project
Claims occurrence	86.8% of the partnering projects had less or an equal number of claims than an average project
Satisfaction with quality	90.9% of the partnering participants were moderately to highly satisfied with the quality
Satisfaction with working relationship	78.2% of the partnering participants strongly agreed that they were happy with the working relationship

the client, consultants, main contractor, subcontractors, and suppliers (CII 1996; CIB 1997). It benefits all parties involved, but mutual commitment is required at all levels.

The earliest formal partnering arrangements recorded within the Hong Kong construction industry were exclusively applied to hospital projects in 1994 (Skues 1996). The two pioneering proponents were the Hong Kong Hospital Authority and Hsin Chong Construction Co. Ltd., a leading Hong Kong based contractor. The two design-and-build hospitals managed by the Hospital Authority have embarked on partnering. The first of these projects, North District Hospital located in the Sheung Shui District, introduced partnering through the initiative of the employer (Skues 1996). The initial partnering workshop was conducted after tender out but before the contract award. The second project, Tseung Kwan O Hospital, included a partnering provision in the contract, and the partnering workshop was launched by the contractor, Hip Hing–Laing Joint Venture. Leighton Contractors (Asia) Ltd., a prominent Australian-based contractor, has successfully adopted partnering for the contracts of the Haven of Hope Hospital in 1995 and the United Christian Hospital in 1997. (Skues 1996).

In recent years, the application of partnering principles has not been limited to hospital projects. The mass transportation units, Kowloon-Canton Railway Corporation (KCRC) and Mass Transit Railway Corporation, Ltd. (MT RCL), have introduced partnering for their development projects such as the West Rail and the Tseung Kwan O Railway Extension (Bayliss 2002). Moreover, the focus on reducing construction disputes via partnering has been placed in the public sector. Apart from infrastructure developments, the Hong Kong Housing Authority and the Hong Kong Housing Society are also actively nurturing a partnering culture in public and semipublic sector residential developments. The past 8 years have seen an explosion of interest in the application of partnering to the local construction industry, as shown by more than 50 projects recorded since 1994 (Chan and Chan 2002), following remarkable successes in other industries and in other countries. Indeed, partnering arrangements are highly recommended for adoption in the industry by local government (CIRC 2001), but not every construction project adopting partnering is equally successful, as revealed in Table 1, and, thus, the critical factors for partnering success are worthy of further investigation.

Essential Ingredients for Partnering Success

Several empirical studies and the opinions of industry practitioners from archival data identifying significant factors affecting the success of partnering projects were reviewed, and these factors are summarized in Fig. 2.

Adequate Resources

Because resources are scarce and competitive, it is not common for an organization to share its own resources with others. These main resources include knowledge, technology, information, specific skills, and capital. Several previous studies point out the importance of shared resources (CII 1991; Brooke and Litwin 1997; CIB 1997). It is also significant to ascertain the maximum use of shared resources. The complementary resources from different parties not only can be used to strengthen the competitiveness and construction capability of a partnering relationship (Cheng et al. 2000) but can be major criteria for assessing partnering success.

Support from Top Management

Commitment and support from top management are always prerequisites for a successful partnering project (Harback et al. 1994; Slater 1998). As senior management formulates the strategy and direction of business activities, their full support and commitment are critical in initiating and leading the partnering spirit (Cheng et al. 2000).

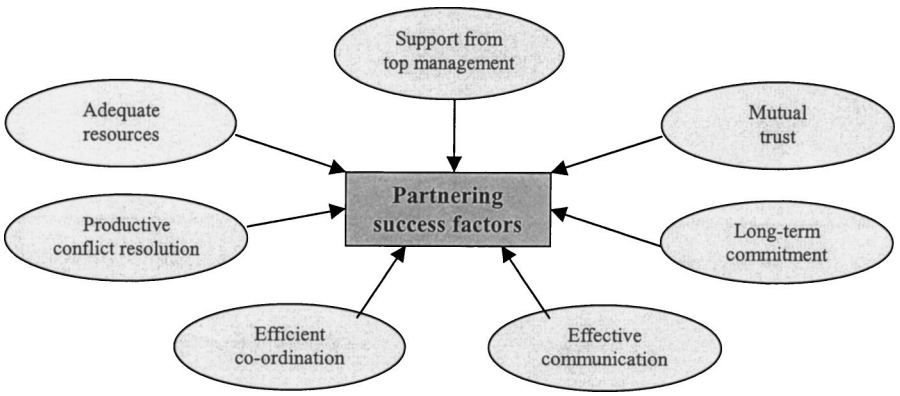

Fig. 2. Summary of significant factors affecting partnering success

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Mutual Trust

For partnering to work, parties involved must have mutual trust toward other partners (Hellard 1996). They should have the belief that others are reliable in fulfilling their obligations in an exchange relationship. It is essential to ''open'' the boundaries of the relationship because it can relieve stress and enhance adaptability, information exchange, joint problem solving, and promise better outcomes (Mohr and Spekman 1994; Cheng et al. 2000; Bayramoglu 2001).

Long-Term Commitment

Long-term commitment can be regarded as the willingness of the involved parties to integrate continuously to unanticipated problems (Bresnen and Marshall 2000; Cheng et al. 2000). 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 behavior (Mohr and Spekman 1994; Romancik 1995).

Effective Communication

Partnering requires timely communication of information and the maintenance of open, direct lines of communication among all project team members (Larson 1995; Hellard 1996). Problems on site need to be solved immediately at the lowest possible level (Dunston and Reed 2000). If communication is used only for routine matters while important issues are conveyed from each site office to the respective head offices and then back to the site office before any interactions, partnering will fail (Moore et al. 1992). It is clear that effective communication skills can help in facilitating the exchange of ideas, visions, and the overcoming of difficulties (Cheng et al. 2000).

Efficient Coordination

Coordination reflects the expectations of each party from the other parties in fulfilling a set of tasks (Mohr and Spekman 1994). Good coordination resulting in the achievement of stability in an uncertain environment can be attained by an increase in contact points between parties and sharing of project information (Bayramoglu 2001).

Productive Conflict Resolution

Because of the discrepancy in goals and expectations, conflicting issues are commonly observed among parties. Conflict resolution techniques such as coercion and confrontation are counterproductive and fail to reach a win-win situation (Slater 1998; Lazar 2000). In fact, conflicting parties look for a mutually satisfactory solution, and this can be achieved by joint problem solving in order to seek alternatives for problematic issues. Such a high level of participation among parties may help them to secure a commitment to a mutually agreed solution (Cheng et al. 2000).

Research Methodology

Research Framework

The specific methodology of this research study undertaken in Hong Kong follows the concept of Walker's (1997) model, which is based on a literature review, a survey questionnaire, face-to-face interviews, and detailed case studies (see Fig. 3).

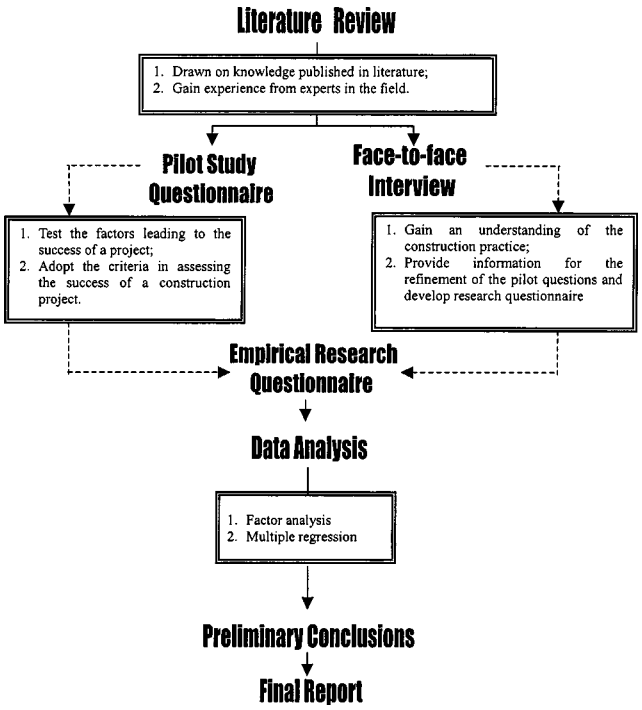

Fig. 3. Overall research framework for this research study [source: adapted from Walker (1997)]

Survey Questionnaire

The research study began with a review of relevant materials from textbooks, professional journals, conference papers, refereed publications, research reports, and Internet information to capture background knowledge about partnering. The objective of the literature review was to develop a framework for the research study and to prepare for the structured interviews and questionnaire survey. All reported significant factors for partnering success were considered to develop a list of items for empirical testing. The identified factors were scrutinized and verified through a series of face-to-face interviews with a number of selected industrial practitioners possessing eminent experience in project partnering, including senior management representatives and the site management staffs of clients, consultants, and contractor and subcontractor organizations in Hong Kong. A total of 22 key target project participants were invited for interviews to solicit their perceptions on the benefits and problems of partnering, together with the critical factors and performance measurement criteria for partnering success. The interviews were conducted in the interviewees' head offices, and lasted for 1 to 1.5 h, depending on the time allocated by the interviewees and the level of detail of their answers.

A pilot study questionnaire was drafted to test the factors and criteria adopted when assessing the success of a construction project. Meanwhile, face-to-face interviews in the form of detailed case studies were launched to acquire an understanding of construction practices in Hong Kong, as well as to provide information for the refinement of the pilot questionnaire and the development of the main research questionnaire. The draft of the main empirical research questionnaire was reviewed by the participants during the face-to-face interviews. Because no adverse

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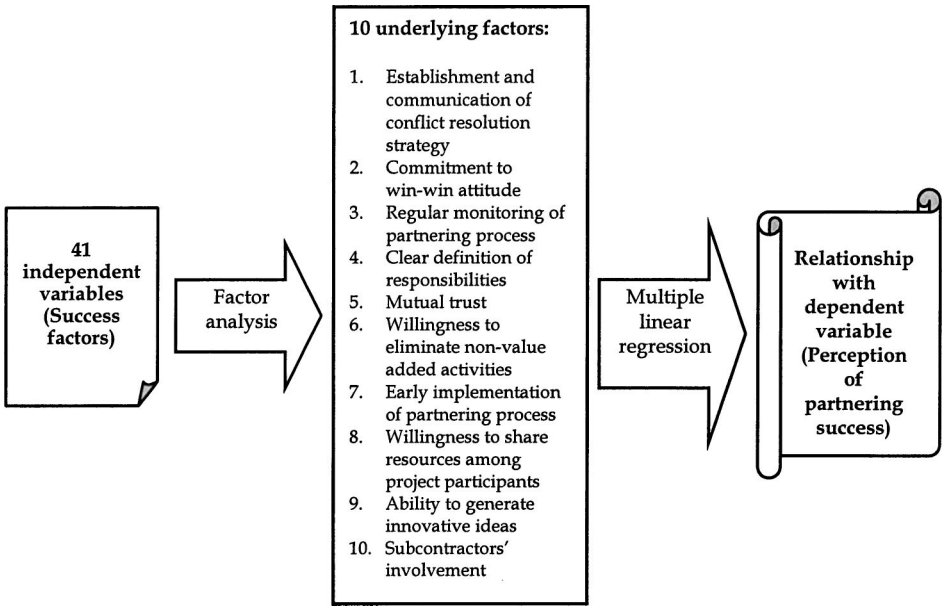

Fig. 4. Flow of analysis procedures

comments were received from the interviewees, the pilot study questionnaire was taken as the final empirical questionnaire for the investigation. Finally, 41 critical success factors were determined, and these constituted the empirical survey questionnaire. An extract of the final questionnaire in respect to the critical success factors for partnering is provided in the Appendix.

A list of completed or on-going construction projects adopting the partnering approach was developed based on information obtained from the Hong Kong Government's tender records, trade magazines, newspaper, personal networking, and other relevant sources (Chan and Chan 2002). Participants in partnering projects were the primary target study population for the questionnaire survey. Key staff of client organizations, consulting practices, and construction firms involved in partnering projects were identified and approached via self-administered questionnaires. The respondents were requested to rate all partnering success factors and personal perceptions of partnering success according to a five-point Likert scale (1 = strongly disagree and 5 = strongly agree), based on their actual hands-on experience on partnering practice. Survey forms from those respondents who had indicated no partnering experience were discarded from the analysis. A total of 78 valid responses were received for analysis, and the overall response rate was about 30%. The 78 returned questionnaires consisted of 18 respondents from client organizations, 37 from main contractors, and 3 from subcontractors. Seventeen respondents were consultants from various disciplines that included architects, engineers, project managers, and quantity surveyors. The remaining three respondents could not be identified in terms of the types of organizations in which they were working. As to the partnering experience, all respondents possessed related experience but at disparate levels. That is, there were 39 respondents having only one partnering project experience, 16 with two, and 23 with three or more partnering project experiences.

Analysis of Survey Results

Two statistical tools, factor analysis and multiple regression, were used to analyze data from the survey questionnaire. Factor analysis was used to identify the underlying dimensions; whereas, multiple regression was used to seek the strongest predictors of success factors (Chan 1996). The analysis was conducted using the *SPSS* for Windows software package that provides a comprehensive range of statistical programs suitable for manipulating the work of analysis. Prior to factor analysis and multiple regression analysis, all variables of partnering success factors and personal perceptions of success were tested for potential outliers and normality. It was manifested from the test results that they all satisfied the basic assumptions of a linear regression model and were confirmed acceptable and reliable. Similar research methodology has been applied by Chan et al. (2001) for identifying critical success factors for design-and-build construction projects in Hong Kong.

Factor analysis is a statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables (Norusis 1993). It was conducted to reduce the 41 items (partnering success factors) into a small number of ''underlying'' factors. The extraction and rotation of the factors were launched to generate a small number of factors and obtain a clearer picture of what these factors represent. The basic steps in conducting factor analysis are listed below.

1. Identify the critical success factors for partnering from reported literature.
2. Compute the correlation matrix for all the success factors.
3. Extract and rotate each success factor.
4. Interpret and label principal (grouped) success factors as underlying factors.

A regression model is a mathematical model that can relate a number of independent variables to a dependent variable. Hence, this technique is chosen as the principal tool in this study to identify the important predictors of partnering success. Multiple regression was performed to explore the relative significance of the factors extracted from factor analysis on the personal perceptions of partnering success. Fig. 4 shows the flow of analysis procedures.

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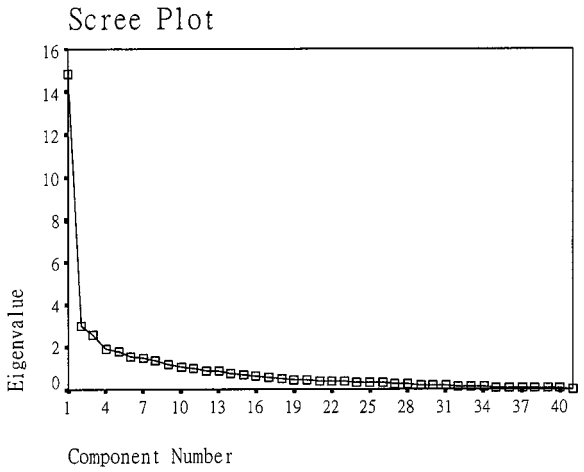

Fig. 5. Scree plot of 41 partnering success factors

Factor Analysis of Partnering Success Factors

Principal components analysis was used to identify underlying factors. To determine how many factors would be required to represent that set of data, the total percentage of variance explained by each factor was examined. Principal factor extraction with a Varimax rotation was carried out through the *SPSS FACTOR* program on 41 items of partnering success factors from a sample of 78 responses. Table 2 contains the details and initial statistics for each of the 41 factors. The total variance explained by each factor was listed in the column under factor loading. The percentage of the variance and the cumulative percentage of the variance are also indicated in Table 2.

Ten factors were extracted that accounted for 74% of the variance in responses. The first two factors accounted for 13 and 12%. Almost all factor loadings were greater than 0.5, and 11 of them were greater than 0.7. In general, the loadings and the interpretation of the factors extracted were reasonably consistent. Fig. 5 is a plot of total variance associated with each factor. The plot shows a distinct break between the steep slope of the large factors and the gradual trailing off of the rest. This gradual trailing off is called the ''scree'' because it resembles the rubble that forms at the foot of a mountain (Norusis 1993). The figure confirms that a 10-factor model should be sufficient for the research model.

Meanings of Underlying Success Factors

Establishment and Communication of Conflict Resolution Strategy (Factor 1)
This factor consists of nine items that focus primarily on the conflict-resolution method. Establishment of a conflict-resolution strategy includes the development of a control and resolution mechanism for dealing with problems, the establishment of an effective conflict-resolution strategy, and the improvement of mutual goals among project participants. In addition, this factor also explains the commitment to improving communication within the team, receiving adequate commitment from top to bottom, support from all levels of management on the partnering process, and the consistent endorsement by top management on partnering. The perception of gaining a fair deal from other partners and clear expectations communicated during the project are also contained in Factor 1.

Commitment to Win-Win Attitude (Factor 2)
This factor has 10 items concerning the attitude of participants. Win-win environments should be developed to replace a win-lose attitude. It also represents the open airing of problems among parties and a nondefensive manner during arguments. It explains that all team members could make decisions alone because of clear identification of responsibility and accountability. In addition, the establishment of sharing risks, rewards, and the willingness to exchange ideas are illustrated. The participants could make and keep real commitments. Therefore, a long-term commitment to the process among the parties could be created.

Regular Monitoring of Partnering Process (Factor 3)
Five items comprise the elements of Factor 3 regarding the monitoring of the partnering process. Monitoring methods include the evaluation of team performance, well-defined roles and responsibilities, and determining measurable goals of individual responsibilities. The monitoring process could be ensured by a team leader or partnering champion.

Clear Definition of Responsibilities (Factor 4)
This factor consists of three items that emphasize the responsibilities of participants. It clarifies that the parties should develop aligned relationships to support the objectives. They should also understand other parties' missions. The proper representation of the owner is included in this factor.

Mutual Trust (Factor 5)
This factor has five items pertaining to trust relationship. Each party should trust, rely on, and understand other parties' decisions. If this occurs, there will be no weak links among team members. The issues could be resolved in a timely and responsive manner.

Willingness to Eliminate Nonvalue Added Activities (Factor 6)
There are two items in this factor that examine the willingness to improve processes, reduce duplication, and eliminate waste and barriers.

Early Implementation of Partnering Process (Factor 7)
In this factor, there are three items regarding the stages of partnering implementation. To ensure the success of partnering, multiproject agreements and a list of partner-selection criteria should be developed and started at the design stage of a construction project.

Willingness to Share Resources among Project Participants (Factor 8)
This factor includes two items that are related to the willingness to share resources among project participants. The willingness to share resources and a great deal of involvement of end-users are included in this factor.

Ability to Generate Innovative Ideas (Factor 9)
Factor 9 is composed of one item that all parties seek new ways to lower costs and differentiate themselves to gain competitive advantages.

Subcontractor Involvement (Factor 10)
This factor explains the involvement of major subcontractors and manufacturers in the partnering process.

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Table 2. Factor Structure of Principal Factors Extraction and Varimax Rotation on Partnering Success Factor Items

Number item	Factor loading	Percentage of variance explained	Cumulative percentage of variance explained
Factor 1. Establishment and communication of conflict resolution strategy			
14 All parties were committed to improving communication within the team	0.730		
29 Top management consistently and publicly endorsed the principles of partnering	0.722		
23 Control and resolution mechanism was developed to deal with problems	0.692		
24 An effective conflict resolution strategy was established	0.659		
28 All levels of management supported the partnering process	0.635		
9 Each party felt that it got a fair deal from its partners	0.598		
4 Mutual goals were established among the project participants	0.546		
6 Adequate commitment was received from top to bottom of all stakeholder organizations	0.536		
16 Clear expectations were communicated in the project	0.525	13.011	13.011
Factor 2. Commitment to win-win attitude			
13 All parties broke from the win-lose mind-set to a win-win attitude	0.712		
15 Every party was willing to exchange ideas and visions	0.698		
11 All parties took appropriate risk commensurate with their rewards	0.695		
3 The participants were willing to provide a long-term commitment to the process	0.611		
36 Partners understood which decisions could be made alone and which decisions needed to involve others	0.630		
34 Responsibility and accountability were accepted by all team members	0.613		
33 Partners responded in a nondefensive manner during the argument	0.523		
17 All parties encouraged the open airing of problems and differences of opinion	0.483		
27 A method to reward the successful completion of the partnering objectives was developed	0.457		
5 Real commitments were made and kept	0.450	12.568	25.578
Factor 3. Regular monitoring of partnering process			
26 Parties agreed to evaluate the team performance as well as the partnering process on a regular basis	0.750		
38 Measurable goals determining individual responsibilities were developed in the partnering process	0.651		
18 Open exchange and consideration of ideas were promoted during the partnering process	0.643		
37 Roles and responsibilities were well defined in the partnering process	0.599		
31 A team leader or champion was appointed to ensure that partnering principles did not slip out of focus	0.546	9.728	35.306
Factor 4. Clear definition of responsibilities			
32 During the partnering process, the parties developed aligned relationships to support objectives	0.696		
35 Partners knew and were able to explain to others the mission of the organization	0.595		
30 Owner was properly represented in the project	0.577	8.142	43.448
Factor 5. Mutual trust			
7 Each party relied on the others to cooperate in the partnering project	0.770		
8 Each party trusted that its partner's decisions would be beneficial to its business	0.629		
10 Everyone understood the need for a shared vision and common mission for the partnering relationship	0.597		
19 There were no weak links in team members	0.493		
25 Issues were resolved in a timely and responsive manner	0.405	6.906	50.354
Factor 6. Willingness to eliminate non-value added activities			
22 All parties were willing to improve processes and reduce duplication	0.792		
21 All parties agreed to eliminate waste and barriers to improvement	0.686	5.895	56.249
Factor 7. Early implementation of partnering process			
41 The multiproject agreement was developed as a result of this partnering project	0.801		
40 A list of partner selection criteria was developed	0.756		
39 Partnering was started at the design stage	0.754	5.769	62.019
Factor 8. Willingness to share resources among project participants			
1 The end-user had a great deal of involvement in the project through the partnering arrangement	0.584		
12 Each party was willing to share resource with other partners	0.475	4.965	66.984
Factor 9. Ability to generate innovative ideas			
20 All parties sought new ways to lower costs and differentiate themselves to gain competitive advantage	0.766	4.056	71.040
Factor 10. Subcontractors' involvement			
2 Major subcontractors and manufacturers were involved in the partnering process	0.822	3.627	74.667

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Table 3. Stepwise Multiple Regression Results

Independent variable (underlying success factor)	Standardized coefficient (β)	R^2	Adjusted R^2	ΔR^2	p value
Factor 1: Establishment and communication of conflict resolution strategy	0.631	0.341	0.331	0.341	0.000
Factor 8: Willingness to share resources among project participants	0.368	0.513	0.449	0.173	0.000
Factor 4: Clear definition of responsibilities	0.224	0.555	0.534	0.042	0.017
Factor 2: Commitment to win-win attitude	0.216	0.591	0.564	0.036	0.022
Factor 3: Regular monitoring of partnering process	0.181	0.621	0.591	0.030	0.030
Size of samples adopted = 68					

Note: Dependent variable: ''I believe that this was a highly successful partnering project.''

Regression Analysis of Underlying Success Factors

A ''stepwise'' multiple regression was conducted between personal perception of partnering success as the dependent variable and 10 underlying success factors as independent variables, using the *SPSS REGRESSION* program. Table 3 shows the standardized regression coefficient (β), coefficient of determination (R^2), adjusted R-square value (adjusted R^2), change in R-square value (ΔR^2) and significance level (p). It should be noted that the sample size adopted for final results was 68. Outliners (ten cases in this study), with standard residuals greater than 3, were abandoned from the analysis. ''Mutual trust'' (Factor 5), ''Willingness to eliminate nonvalue added activities'' (Factor 6), ''Early implementation of partnering process'' (Factor 7), ''Ability to generate innovative ideas'' (Factor 9), and ''Subcontractors' involvement'' (Factor 10) were excluded from the regression model because they failed against the entrance criteria. That is, ''Establishment and communication of conflict resolution strategy'' (Factor 1), ''Willingness to share resources among project participants'' (Factor 8), ''Clear definition of responsibilities'' (Factor 4), ''Commitment to win-win attitude'' (Factor 2), and ''Regular monitoring of partnering process'' (Factor 3) were found to be significantly different from zero at $p \leq 0.03$.

Altogether, 62.1% of the personal perception of partnering success variance was explained by these five significant factors. The R-square value of 0.621 was reasonably within an acceptable range when compared to other similar research studies using multiple regression, such as 0.510 in Konchar and Sanvido's (1998) investigation of project delivery systems, 0.611 in Chan et al.'s (2001) study of design-and-build project success factors, as well as 0.644 in Emsley et al.'s (2002) prediction of total construction costs. Among the five significant underlying success factors identified, ''Establishment and communication of conflict resolution strategy'' (Factor 1) contributed considerably to the prediction of perception of partnering success ($R^2 = 0.341$, $p \leq 0.001$). ''Willingness to share resources among project participants'' (Factor 8), ''Clear definition of responsibilities'' (Factor 4), ''Commitment to win-win attitude'' (Factor 2), and ''Regular monitoring of partnering process'' (Factor 3) accounted for 17, 4, 4, and 3%, respectively, of variance in overall partnering success.

Discussion of Regression Results

Regression results were consistent with the findings of various previous studies such as CII's (1996) investigation in Australia. The most important factor contributing to overall partnering success was shown to be the ''Establishment and communication of conflict resolution strategy.'' Partnering requires that all parties are committed to improving communication within the project team. Mutual goals, unwavering commitment, and support from all levels of management are the essential elements of partnering projects (Moore et al. 1992). Top management must endorse the principles of partnering consistently and wholeheartedly. Also, communication among partners plays an instrumental role in problem identification and conflict resolution. Thus, a control and resolution mechanism should be developed to deal with disputed problems (Bates 1993). Partnering can allow problems to be solved in the shortest possible time. Good communication channels via regular site meetings, telephone, fax, and e-mail contacts are established and adopted to the fullest possible extent.

Table 3 shows that ''Willingness to share resources among project participants'' was the second critical factor for partnering success. To guarantee partnering success, participants should be willing to share power and resources that would benefit overall organizational goals (Brooke and Litwin 1997). A task force can be set up to work closely, using all possible resources available. Apart from this, the end-user should have a great deal of involvement in the project through the partnering arrangement. End-users should also inject their inputs into the layout of a building, so that resources and their opinions can be incorporated into the construction process (CII 1996).

''A clear definition of responsibilities'' was the third critical success factor. The development of aligned relationships to support could help partnering project success (Crane et al. 1997). The parties also need to know and be able to explain to others the mission of the organization and how it related to their job. For partnering to work, both the client and the contractor should develop a mutually agreed goal. The roles and responsibilities of all project participants should be properly defined. The extent of their decision-making powers and areas of authority should also be clearly specified (Chan and Kumaraswamy 1996). Otherwise, the requirements of clients may not be well introduced to project participants.

As indicated by the regression findings, ''Commitment to win-win attitude'' in the partnering project was observed to be the fourth critical contributor to the personal perception on partnering success. Win-win thinking is the essential element of the partnering concept (DeVilbiss and Leonard 2000), but equity is an important ingredient in developing win-win thinking among parties. Various team leaders should organize their team members to work cooperatively for locating and analyzing the causes of problems and focus on seeking solutions rather than working out the costs of variation. Solutions are worked out by brainstorming among team members and are put into action quickly. They should work hand-in-hand with one another from top management down to frontline staff.

The final critical factor that leads to the personal perception on partnering success was ''Regular monitoring of partnering process.'' The joint evaluation of project progress is one of the key outcomes of partnering workshops. Nielsen (1996) suggested that

measurable goals could be used to determine and evaluate individual progress performance. The appointment (nomination) of team leaders or partnering champions could also ensure that partnering principles do not slip out of focus and that the partnering process is regularly monitored (Chan and Chan 2002). The client should build up trust with the contractor, and a partnering culture (teamwork, openness, respect, fairness, and no abortive work) should be nurtured.

Practical Applications to Construction Industry

An evaluation of the critical success factors for running partnering projects, based on bringing together the views of different industry practitioners, is likely to lead to a better appreciation of partnering benefits and problems. Such an improved understanding could generate essential strategies to alleviate the root causes of poor project performance and ineffective communication. It could result in substantial performance improvements in terms of time, cost, and quality as a whole to future projects. Partnering is designed, in fact, to minimize job costs and schedule overruns.

The partnering process attempts to establish good working relationships between project stakeholders through a mutually developed, formal strategy of commitment and communication aiming toward a ''win-win'' outcome for all parties (CII 1991; CII 1996). The partnering process empowers all project personnel to accept responsibility and to do their jobs by delegating decision making and problem solving to the lowest possible level of authority.

Partnering derives many benefits to contracting parties, including the client, consultants, project mangers, main contractor, subcontractors, and on-site employees. Although partnering may not resolve all the problems encountered in the construction process, it creates an effective framework for conflict resolution, improved communications, reduced litigation, and cost containment on potential overruns (DeVilbiss and Leonard 2000). Indeed, partnering requires commitment at all levels, and each project stakeholder can accrue the perceived benefits of partnering.

On the basis of experiences drawn from projects adopting the partnering approach, cooperative, strong relationships have proven to be far more beneficial than the competitive, adversarial behavior characteristic of the Hong Kong construction industry today. For those who succeed in committing to partnering, the rewards are significant. Its essence is worthy of industry-wide attention, and project participants could be bestowed full benefits from its implementation.

Conclusions

This research program initiated a comprehensive investigation of project partnering in the Hong Kong construction industry. It provides an overview of foreign studies in terms of significant success ingredients for project partnering and an industry-wide questionnaire survey to glean local information and personal perceptions of various parties relating to the success of the partnering process in Hong Kong. The research findings were confirmed to be applicable and influential to the majority of local partnering projects.

Ten critical success factors were extracted by factor analysis on 41 variables developed through a synthesis of empirical studies and opinions from industry practitioners on project partnering. These factors formed a sound basis for the performance evaluation of partnering projects. Five of the success factors were identified as critical in explaining the personal perception of partnering success from the multiple regression results. ''Establishment and communication of conflict resolution strategy,'' ''Willingness to share resources among project participants,'' ''Clear definition of responsibilities,'' ''Commitment to win-win attitude,'' and ''Regular monitoring of partnering process'' proved to be essential in bringing successful outcomes to partnering projects.

A series of in-depth case studies on various partnering projects should be launched in the future to verify the applicability and reliability of the critical success factors identified in this study. The industry best practice of successful partnering projects can then be generated and used as a benchmark measure for future projects. Effective strategies can also be suggested for enhanced project performance and improved dispute resolution mechanisms. Partnering is at an infant stage of development in the Hong Kong area, and more partnering arrangements should be implemented across a broad spectrum of the construction industry on a precontract rather than a postcontract basis. As a result, the perceived benefits of partnering implementation can be fully realized.

Acknowledgments

The writers gratefully acknowledge Hong Kong Polytechnic University for providing funding to support this research study. Special gratitude is also extended to those industrial practitioners who have responded and contributed their valuable input in completing the survey questionnaires used in the study of project partnering in construction in Hong Kong. Those who have kindly participated in our interviews are acknowledged with sincere thanks as well.

Appendix. Extract of Empirical Survey Questionnaire

A list of 41 factors contributing to the success of partnering projects is shown here. The respondents were asked to rate each factor according to a five-point Likert scale (1 = strongly disagree and 5 = strongly agree) or assign a check mark in the ''Don't know'' box wherever appropriate.

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Assessment of the Partnering Project

Please rate your and other project participants' performance in this partnering project.	Don't know	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. The end-user had a great deal of involvement in the project through the partnering arrangement.	☐	☐	☐	☐	☐	☐
2. Major subcontractors and manufacturers were involved in the partnering process.	☐	☐	☐	☐	☐	☐
3. The participants were willing to provide a long-term commitment to the process.	☐	☐	☐	☐	☐	☐
4. Mutual goals were established amongst the project participants.	☐	☐	☐	☐	☐	☐
5. Real commitments were made and kept.	☐	☐	☐	☐	☐	☐
6. Adequate commitment was received from top to bottom of all stakeholder organizations.	☐	☐	☐	☐	☐	☐
7. Each party relied on the others to cooperate in the partnering project.	☐	☐	☐	☐	☐	☐
8. Each party trusted that its partner's decisions would be beneficial to its business.	☐	☐	☐	☐	☐	☐
9. Each party felt that it got a fair deal from its partners.	☐	☐	☐	☐	☐	☐
10. Everyone understood the need for a shared vision and common mission for the partnering relationship.	☐	☐	☐	☐	☐	☐
11. All parties took appropriate risk commensurate with their rewards.	☐	☐	☐	☐	☐	☐
12. Each party was willing to share resource with other partners.	☐	☐	☐	☐	☐	☐
13. All parties broke from the win-lose mind-set to a win-win attitude.	☐	☐	☐	☐	☐	☐
14. All parties were committed to improving communication within the team.	☐	☐	☐	☐	☐	☐
15. Every party was willing to exchange ideas and visions.	☐	☐	☐	☐	☐	☐
16. Clear expectations were communicated in the project.	☐	☐	☐	☐	☐	☐
17. All parties encouraged the open airing of problems and differences of opinion.	☐	☐	☐	☐	☐	☐
18. Open exchange and consideration of ideas were promoted during the partnering process.	☐	☐	☐	☐	☐	☐
19. There were no weak links in the team members.	☐	☐	☐	☐	☐	☐
20. All parties sought new ways to lower costs and differentiate themselves to gain competitive advantage.	☐	☐	☐	☐	☐	☐
21. All parties were willing to eliminate waste and barriers to improvement.	☐	☐	☐	☐	☐	☐
22. All parties were willing to improve processes and reduce duplication.	☐	☐	☐	☐	☐	☐
23. Control and resolution mechanism was developed to deal with problems.	☐	☐	☐	☐	☐	☐
24. An effective conflict resolution strategy was established.	☐	☐	☐	☐	☐	☐
25. Issues were resolved in a timely and responsive manner.	☐	☐	☐	☐	☐	☐
26. Parties agreed to evaluate the team performance as well as the partnering process on a regular basis.	☐	☐	☐	☐	☐	☐
27. A method to reward the successful completion of the partnering objectives was developed.	☐	☐	☐	☐	☐	☐
28. All levels of management supported the partnering process.	☐	☐	☐	☐	☐	☐
29. Top management consistently and publicly endorsed the principles of partnering.	☐	☐	☐	☐	☐	☐
30. Owner was properly represented in the project.	☐	☐	☐	☐	☐	☐
31. A team leader or champion was appointed to ensure that partnering principles did not slip out of focus.	☐	☐	☐	☐	☐	☐
32. During the partnering process, the parties developed aligned relationships to support objectives.	☐	☐	☐	☐	☐	☐
33. Partners responded in a non-defensive manner during the argument.	☐	☐	☐	☐	☐	☐
34. Responsibility and accountability were accepted by all team members.	☐	☐	☐	☐	☐	☐
35. Partners knew and were able to explain to others the mission of the organization.	☐	☐	☐	☐	☐	☐
36. Partners understood which decisions could be made alone and which decisions needed to involve others.	☐	☐	☐	☐	☐	☐
37. Roles and responsibilities were well defined in the partnering process.	☐	☐	☐	☐	☐	☐
38. Measurable goals determining individual responsibilities were developed in the partnering process.	☐	☐	☐	☐	☐	☐
39. Partnering was started at the design stage.	☐	☐	☐	☐	☐	☐
40. A list of partner selection criteria was developed.	☐	☐	☐	☐	☐	☐
41. The multi-project agreement was developed as a result of this partnering project.	☐	☐	☐	☐	☐	☐

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References

Abudayyeh, O. (1994). ''Partnering: A team building approach to quality construction management.'' *J. Manage. Eng.*, 10(6), 26–29.

Bates, G. D. (1993). ''Editor's letter.'' *J. Manage. Eng.*, 9(1), 1–3.

Bayliss, R. F. (2002). ''Partnering on MTR Corporation Ltd's Tseung Kwan O extension.'' *Hong Kong Inst. Eng. Trans.*, 9(1), 1–6.

Bayramoglu, S. (2001). ''Partnering in construction: Improvement through integration and collaboration.'' *Leadership Manage. Eng.*, 1(3), 39.

Bennett, J., and Jayes, S. (1998). *The seven pillars of partnering: A guide to second generation partnering*, Thomas Telford, London.

Black, C., Akintoye, A., and Fitzgerald, E. (2000). ''An analysis of success factors and benefits of partnering in construction.'' *Int. J. Proj. Manage.*, 18(6), 423–434.

Bresnen, M., and Marshall, N. (2000). ''Motivation, commitment and the use of incentives in partnerships and alliances.'' *J. Constr. Manage. Econom.*, 18(5), 587–598.

Brooke, K. L., and Litwin, G. H. (1997). ''Mobilizing the partnering process.'' *J. Manage. Eng.*, 13(4), 42–48.

Chan, A. P. C. (1996). ''Determinants of project success in the construction industry of Hong Kong.'' PhD thesis, Univ. of South Australia, Adelaide, Australia.

Chan, A. P. C., and Chan, D. W. M. (2002). ''Initial partnering workshop report for the construction of senior citizen residence at Jordan Valley, Kwun Tong.'' *Rep. submitted*, Hsin Chong Construction Co. Ltd., Hong Kong.

Chan, A. P. C., Chan, D. W. M., and Ho, K. S. K. (2002a). ''Critical success factors for partnering projects: A Hong Kong perspective.''

Chan, A. P. C., Chan, D. W. M., Ho, K. S. K., Chiang, Y. H., Chan, E. H. W., and Tang, B. S. (2002b). ''An analysis of project partnering in Hong Kong.'' Research monograph, Dept. of Building and Real Estate, The Hong Kong Polytechnic Univ., Hong Kong.

Chan, A. P. C., Ho, D. C. K., and Tam, C. M. (2001). ''Design and build project success factors: Multivariate analysis.'' *J. Constr. Eng. Manage.*, 127(2), 93–100.

Chan, D. W. M., and Kumaraswamy, M. M. (1996). ''An evaluation of construction time performance in the building industry.'' *Build. Environ.*, 31(6), 569–578.

Cheng, E. W. L., Li, H., and Love, P. E. D. (2000). ''Establishment of critical success factors for construction partnering.'' *J. Manage. Eng.*, 16(2), 84–92.

Construction Industry Board (CIB). (1997). *Partnering in the team: A report by the Working Group 12 of the Construction Industry Board, UK*, Thomas Telford, London.

Construction Industry Institute (CII). (1991). ''In search of partnering excellence.'' *Special Publication No. 17-1, Rep.*, Partnering Task Force of CII, Austin, Tex.

Construction Industry Institute (CII). (1996). ''Partnering: Models for success.'' *Publication No. 8, Rep.*, Partnering Task Force of CII, Sydney, Australia.

Construction Industry Review Committee (CIRC). (2001). ''Construct for excellence.'' *Rep.*, Construction Industry Review Committee, Hong Kong SAR Government, Hong Kong.

Cowan, C., Gray, C., and Larson, E. (1992). ''Project partnering.'' *Project Manage. J.*, 22(4), 5–12.

Crane, T. G., Felder, J. P., Thompson, J. P., Thompson, M. G., and Sanders, S. R. (1997). ''Partnering process model.'' *J. Manage. Eng.*, 13(3), 57–63.

Crowley, L. G., and Karim, M. A. (1995). ''Conceptual model of partnering.'' *J. Manage. Eng.*, 11(5), 33–39.

DeVilbiss, C. E., and Leonard, P. (2000). ''Partnering is the foundation of a learning organization.'' *J. Manage. Eng.*, 16(4), 47–57.

Dunston, P. S., and Reed, A. G. (2000). ''Benefits of small projects team initiative.'' *J. Constr. Eng. Manage.*, 126(1), 22–28.

Eckert, T. (1994). ''Partnering: A creative, cost-effective concept for the medium-sized construction project.'' *PM Network*, 8(9), 6–8.

Emsley, M. W., Lowe, D. J., Duff, A. R., Harding, A., and Hickson, A. (2002). ''Data modelling and the application of a neural network approach to the prediction of total construction costs.'' *Constr. Manage. Econ.*, 20(6), 465–472.

Harback, H. F., Basham, D. L., and Buhts, R. E. (1994). ''Partnering paradigm.'' *J. Manage. Eng.*, 10(1), 23–27.

Hellard, R. B. (1996). ''The partnering philosophy—A procurement strategy for satisfaction through a team work solution to project quality.'' *J. Constr. Procure.*, 2(1), 41–55.

Konchar, M., and Sanvido, V. (1998). ''Comparison of U.S. project delivery systems.'' *J. Constr. Eng. Manage.*, 124(6), 435–444.

Larson, E. (1995). ''Project partnering: Results of study of 280 construction projects.'' *J. Manage. Eng.*, 11(2), 30–35.

Latham, M. (1994). ''Constructing the team: Joint government/industry review of procurement and contractual arrangements in the United Kingdom construction industry.'' *Final Rep.*, HMSO, London.

Lazar, F. D. (2000). ''Project partnering: Improving the likelihood of win/win outcomes.'' *J. Manage. Eng.*, 16(2), 71–83.

Mohr, J., and Spekman, R. (1994). ''Characteristics of partnering success: Partnering attributes, communication behaviour, and conflict resolution techniques.'' *Strategic Manage. J.*, 15(2), 135–152.

Moore, C., Mosley, D., and Slagle, M. (1992). ''Partnering guidelines for win-win project management.'' *Proj. Manage. J.*, 22(1), 18–21.

Nielsen, D. (1996). ''Partnering for performance.'' *J. Manage. Eng.*, 12(3), 17–19.

Norusis, M. J. (1993). ''*SPSS* for Windows, Professional Statistics, Release 6.0.'' Statistical Package for Social Sciences, Inc., Chicago.

Romancik, D. J. (1995). ''Partnership toward improvement.'' *Proj. Manage. J.*, 26(4), 14–20.

Sanders, S. R. (1994). ''Partnering on the Wangaratta Bypass.'' *Austr. Proj. Manage.*, 12, 21–25.

Sanders, S. R., and Moore, M. M. (1992). ''Perceptions on partnering in the public sector.'' *Proj. Manage. J.*, 22(4), 13–19.

Schriener, J. (1991). ''Partnering paying off on projects.'' *Eng. News Record*, 227(115), 25–27.

Skues, D. (1996). ''Partnering and its relevance to Hong Kong.'' *Rep.*, Crow Maunsell Management Consultants Ltd., Hong Kong.

Slater, T. S. (1998). ''Partnering: Agreeing to agree.'' *J. Manage. Eng.*,14(6), 48–50.

Tam, C. M., and Chan, A. P. C. (1996). ''The effect of safety management strategies on safety performance in Hong Kong.'' 1996 *Construction Industry Board, Beijing*, Inter. Conf., Beijing.

Tam, C. M., Hui, M., and Chan, A. P. C. (1995). ''The new reality in managing quality in a public transport organization: Total quality management.'' *Proc., 1995 Nat. Conf. of the Australian Institute of Project Management*, Adelaide, 129–134.

Uher, E. T. (1999). ''Partnering performance in Australia.'' *J. Constr. Procure.*, 5(2), 163–176.

Walker, D. H. T. (1997). ''Choosing an appropriate research methodology.'' *Constr. Manage. Econ.*, 15(2), 149–159.

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