

## **Application of Delphi Method on Critical Success Factors in Joint Venture Projects in Malaysian Construction Industry**

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### **Abstract**

This paper discusses the application of the Delphi Technique to validate the findings from previously administered questionnaire surveys and in-depth interviews into joint venture projects in Malaysia. The aim of the Delphi Technique is to achieve consensus of opinion amongst the selected expert panellists in Malaysia on the primary factors in JV projects. It is primarily concerned with using selected expert panels to assist in gathering data and information to achieve research objectives, by designing a progressive series of questions to which a selected panel of expert responds. A rationale for the use of Delphi is given, its benefits and limitations and recommendation for its use are provided. The main crucial to joint venture success was identified from literature review identified twenty-one factors as critical to the success of the joint venture projects. The Delphi Panel confirmed that inter-partner trust, mutual understanding, criteria for partner selection, agreement of contract, compatibility of objectives, conflict and commitment were the critical success factors and fourteen factors were also identified as Failure Reduction Criteria. The application of Delphi Techniques helped to identify the primary factors, which will be useful to support the successful application of joint venture arrangements in construction projects in Malaysia.

### **Keywords**

Delphi, CSF, Joint Venture, Malaysia Construction Industry

### **1. Introduction**

A joint venture is a procedure used to handle specific phenomena such as access to new market, competition, government policy, or economic of scale. Careful analysis of the economic, political, social and the cultural environment within which the venture will be implemented and managed must assess the feasibility and the desirability of a JV. A planned approach to JV necessitates a thorough and careful evaluation of these aspects by both partners to ensure successful implementation. Construction JVs in Malaysia are

becoming increasingly popular both with multinational construction firms and local government in order to achieve their individual objectives. There were already established JV between Malaysian indigenous and foreign contractors (CIDB, 2000). Careful analysis of the pros and cons of any venture in evaluating the probabilities of success of the JVs (Datta, 1987). The contractors need to know the factors, which were considered critical if they want their JV projects to be successful. The aim of this paper is to report the how the Delphi Technique was used to validate and confirmed a list of factors that was considered critical from the literature review, questionnaire survey and interviews on the critical success factors on construction JV projects in Malaysia. Secondly, to derive a consensus on the most critical success factors from expert panellists for the final findings. The effectiveness of the Delphi method will be evaluated and the difficulties in conducting Delphi survey will be discussed.

## **2. Objective of the Research**

The objective of the research is to identify the primary factors, which support the successful application of joint venture arrangements in construction projects in Malaysia. The basic research question is it possible to identify these factors by the adoption of a robust and replicable methodology and if identifiable, can these factors be ranked and weighted and considered critical. The results of this study are expected to provide useful guidelines for forming and operating effective and efficient JVs both in Malaysia and in other similar economies.

## **3. Literature on Delphi Background**

The name Delphi was taken from the Greek Oracle's skills of interpretation and foresight. The Delphi was developed in the 1950's by the Rand Corporation for the US Air Force concerning the use of expert opinion (Robinson, 1991). The procedure was designed to obtain the most reliable consensus of opinion of a group of experts by a series of intensive questionnaires interspersed with controlled opinion feedback, with the results of each round being fed into the next round (Linstone and Turoff, 1975). It involves the selection of procedures for suitable experts, development of appropriate questions to be put to them and analysis of the answers given by them (Outhred, 2001). The intended outcome is that by the final round the experts will have reached a consensus of opinion on the issues put before them.

Delphi is an iterative forecasting procedure characterized by three features (Dickey and Watts, 1978): anonymity; iteration with controlled feedback; and statistical response. Panel members remain unknown to one another and respond to a series of questionnaires. The iterative nature of the procedure generates them to modify their assessments and project them beyond their own subjective opinions. It can represent the best forecast available from consensus of experts (Corotis, et.al.1981). The process is continued until a consensus is reached on the various issues under consideration, or until it becomes evident that no further consensus can be developed. Generally, Delphi runs to two to seven rounds of questioning, at most. The major difficulties of Delphi, however, lie in

maintaining the high level of response and in reaching and implementing a consensus (Robinson, 1991).

#### **4. Research Methodologies and the Application of Delphi Technique for the Research Study**

Following a thorough literature research, 21 factors critical to the success of construction JV projects were identified. These factors were then assembled into questionnaire survey that was distributed to 1630 local and 70 foreign contractors in Malaysia in August 2002. A response rate of twenty (20%) 341 was obtained. The purpose of the questionnaire survey was to discover which companies had experience of JV projects, the extent of that experience and their views of key factors associated with joint ventures.

The 2<sup>nd</sup> part of the research involved in-depth interviews conducted in Malaysia end November 2002 to mid February 2003, which involved 43 participants from various foreign and local companies. It was carried out with the Chief Executive Officers, General Managers to provide detailed information in their company structure, management and experience of any JV projects undertaken in Malaysia. Results from interviews confirmed the postal survey results of having at least 90 per cent the same 12 ranking CSF.

To confirm that the CSFs discovered by this process are reliable, a Delphi Technique which involved expert panels in Malaysia were conducted from mid May to end of July 2003 to validate/confirmed the final findings. A triangulation approach had been adopted for this study, which enables to integrate the quantitative results (questionnaire surveys) with the results from the qualitative method (interviews). This will prove useful; as the research process will be more robust enable a much higher quality reliable data to be gathered and results to be achieved.

#### **5. Implementation of Delphi Study**

In this study, 22 experts were selected based from the recommendation from the contractors involved in the previous in-depth interviews conducted in Malaysia. Emails were sent to the experts in Malaysia to get their approval to be in the Delphi group. The 19 expert panels were Chief Executive Officers, Executive Directors, and Senior General Managers with vast experience and numbers of past and present JV local and overseas works and 3 academicians from the Malaysian universities whom involved in JV projects.

##### **(a) Delphi Round 1**

The questionnaire consisted of 21 factors critical to success of construction JV projects were sent out in early May 2003 with a four week return period, followed by email phone calls to encourage participation. There was 86% response with 19 experts (out of 22) returned the questions. The experts were asked to rate each statement on a 4 point Likert-type rating scale in terms of their criticality. They were encouraged to add additional

comments at the end of the questionnaire. Cabanis (2002) suggested that “an expert may be defined as someone with special skills or knowledge evidence by leadership in professional organizations, holding office in professional organization, presenter at national conventions, published in recognized journals.

**(b) Delphi Round 2**

Round two of the study provided the expert panel with the 21 statements of contents with some amendments given by the comments from the experts during the first round. They were given the numbers of response of each factor based on the scale of criticality again. To achieve consensus in the statements added by the panel during the first round, the experts were directed to review their rating again in terms of their criticality. The second questionnaire was sent early July 2003 and there was 77% responses with 17 experts returned the questionnaire. Most of the experts had reconsidered and make adjustments to their score.

**6. Results and Analysis**

The responses were then compiled and analyzed using the above procedure and formula. The question were analyzed by providing numerical scores on each of the scale of criticality with 100 points on Extremely Critical (4), 50 points on Critical (3), 10 points on (Less Critical) and 0 points on (Not Critical). These scores were then transformed to importance indices to determine the relative ranking of the attributes. A Relative Importance Index (RIX) was then developed to convert the E-Scores into a decimal figure using the following formula taken from Kometa et.al (1994):

$$\frac{\sum W}{A \times N}$$

Where W = weighting given to each factor in the evidence scale, A = the highest weight applied, N = total number in sample.

**Table 1: Perceptions of the Finalized Project Success Factors From Round 1 and 2**

Rank	Round 1	RIX	Round 2	RIX
1	Criteria For Partner Selection	0.87	Inter-partner Trust	1.00
2	Mutual Understanding	0.77	Mutual Understanding	0.96
3	Inter-Partner Trust	0.74	Criteria For Partner Selection	0.94
4	Agreement of Contract	0.75	Agreement of Contract	0.91
5	Compatibility of Objectives	0.72	Compatibility of Objectives	0.88
6	Conflict	0.59	Commitment	0.85
7	Commitment	0.57	Conflict	0.82
8	Partner Experience	0.56	Communication	0.61
9	Cultural Understanding	0.54	Cultural Understanding	0.55
10	Coordination	0.54	Profit	0.54
11	Profit	0.53	Partner Experience	0.54
12	Communication	0.53	Financial Stability	0.53
13	Management Control	0.47	Cooperation	0.53

14	Cooperation	0.45	Equity Control	0.53
15	Equity Control	0.44	Management Control	0.48
16	Organizational Structure	0.43	Coordination	0.46
17	Equity Control	0.42	Effective HRM	0.43
18	Effective HRM	0.39	Motivation	0.30
19	Motivation	0.38	Organizational Structure	0.24
20	Knowledge Transfer	0.27	Knowledge Transfer	0.17
21	Size Compatibility of Partner Firms	0.15	Size Compatibility of Partner's Firms	0.12

Consensus was achieved on 7 CSFs, which include inter-partner trust, criteria for partner selection, mutual understanding, agreement of contract, and compatibility of objective and management control. Mitchell (1991, p347) points out that consensus can simply mean a 'group opinion, general agreement or group solidarity in sentiment and belief. The panel selected these CSFs as being high importance to the implementation of construction JV work in Malaysia.

These factors scored 0.80 or more on the RIX scale and were considered as extremely critical success factors where if the factors were included, may increase the chance of success but if left out will increase the chance of failure (Morledge & Owen, 1999). The factors that score less than 0.80 on the RIX scales were not considered as critical. Fourteen factors were designated as Failure Reduction Criteria (FRC), which if included in the project, might reduce the chance of failure but would not increased the chance of success (Morledge & Owen, 1999). In addition, to the RIX scale, the percentage of respondents scoring 4 (extremely critical) with 80% and more was used to rank the most critical success factors. If the RIX were equal, the distribution of the percentage of each scale will be taken into account. These were confirmed too by the scores of 50% to 74% from results in Round One.

There were increased on convergence of opinion among the responses agreed in the factors during the second round. Although a three round sequences seems to be the most popular and recommended method, there were cases where two rounds were found to be satisfactory (Olsen, 1982). It was judged from the response of the experts to the second round that the marginal gain from the third round may be small compared to the effort required to perform it, because of the declining participation and it was agreeable to stop the Delphi study at the second round. This confirmed with Dalkey (1969) that answers are most accurate on Round Two and became less accurate on subsequent rounds. The Delphi final results confirmed the questionnaire surveys and in-depth interviews, which produced the similar results where 85% of the respondents agreed on the seven CSFs and the fourteen FRCs.

## **7. Difficulties in conducting the Delphi techniques**

It is important that panel members treat the work seriously, and devote the time necessary to provide thoughtful and reasoned responses to the questions. Secondly, the wording of the questions and the presentation format of the survey were extremely important (Robinson, 1991). It is very important to keep the whole panel responding to each round of Delphi and finally, the successful rounds of Delphi technique were time consuming.

This study was taken with relative success in that a response rate of 77% was achieved and considered relatively high and acceptable for the purposes of this research.

## 8. Conclusion

The Delphi method was preferred to validate the final findings as it involved selected panellists whom are knowledgeable in their areas of expertise to provide the reliable data on JV projects in Malaysia. This is because they were experts whom could confirm the results of this study. The Delphi Expert Panel resulted in the identification of seven critical success factors as being extremely high importance to the construction JV in Malaysia, which require a significant level of application in order to facilitate additional success. Fourteen factors were identified as FRCs and without these elements a project will risk the significant chance of failure. The results of this study are expected to provide useful guidelines for forming and operating effective and efficient JV both in Malaysia and in other similar economies.

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