

# **Developing a Structural Method for Eliciting Criteria in Project Manager Selection**

**Ali Reza Afshari**

**Department of Industrial Engineering, Islamic Azad University, Shirvan Branch, Iran**

**Rosnah Mohd Yusuff**

**Department of Mechanical and Manufacturing Engineering, Universiti Putra Malaysia  
43400 UPM, Serdang, Malaysia**

## **Abstract**

As part of a comprehensive research, a structural model was conducted with experienced practitioners to identify the hierarchical structure for selecting project manager in MAPNA Company. Similar to many decision making problems, the choice of project managers in real life is very complicated. Although a good number of researches have examined these problems, no detailed and sound procedures have been stated to specify the requirement criteria. This paper presents a framework to help decision makers define and clarify the hierarchy of hiring criteria and sub criteria. The main objective of this paper it is to develop structural method to identify criteria for project manager selection by modifying Delphi method and as well draw out the hierarchical criteria. In this model, after investigating previous studies about project manager skills, the Delphi technique with some modification was used to seek best thinking from managers and experts for criteria selection. A case study was used to validate the models for the selection of project managers in a project based company. The results showed that the proposed model was satisfactory in choosing the criteria and are capable of improving the effectiveness in the decision making processes.

## **Keywords**

Project Manager Selection, Criteria Selection, Delphi, Project Management, Decision Making

## **1. Introduction**

Project manager is an important personality that drives the affairs of the entire project management. It has been established that choosing a project manager is key to a successful running of any project. However, the control of information communication is initiated by the project manager; which as well give instructions and important information from within and outside projects, which includes exchange and transmission. Moreover, the project manager is the policy maker and system planner. The operations of a project manager should include achieving profit for the firm's owner demand for the project, ensure social and sub-contractors requirements are met. Moreover, the firms' construction laws and regulations as well as other rules must be realized by the project manager. He should be different from other talented persons, and can be liken to the ships' helmsman. His functions cannot be substituted by other personnel in the project. However Herculean it is to find suitable project managers for engineering projects which are necessary for project implementation [1]. A suitable project manager has a very important promoting role to play in the smooth and successful implementation of the project. It is very difficult for enterprises to select an appropriate project manager. [2].

Normally, choosing a project manager for projects is one great consequence and difficult decisions that can be made. As a result of the fact that majority of the decisions are made by the project managers, this however, highlights the need for the choice of a highly experienced person for such a position. Choosing a project manager is a decisive decision to be taken in a project. The processes of selection include different criteria and should be in line with the company's ideologies, rules and specific projects. Under a normal circumstance interested applicants should be examined orally and the best and most qualified candidate be selected in line with the companies requirements for the project [3].

In the present study, detailed methodology was put forward for consideration to determine the level of criteria of structural arrangement for hire, and sub-criteria in a MCDM model for the selection of project managers. A qualitative approach was used in this study to identify the criteria that is best suited for project manager selection in a company based project. Panels are made up of experts with experiences in project based companies. A total of 14 standards for judgment were singled out in a structural order. The remainder of the paper was arranged thus: after introduction, section 2 presents a general survey for project managers' criteria for selection. Section 3 discusses the methodology and research design; Section 4 showed a case study of project managers' selection, which explained the methodology of this research. Discussions are presented in section 5 which centered on the effectiveness of proposed method as well as conclusions and suggestions for further research in Section 6.

## 2. Literature Review

Multi criteria decision making (MCDM) has been used in selecting project manager. For example Chen and Cheng [4] developed a fuzzy MCDM method for information system project manager selection. Zavadskas et al. [5] developed a multi criteria methodology for project manager selection based on grey criteria. Zhao et al. [2] adopted a fuzzy comprehensive evaluation methods in the selection of a project manager. Rashidi et al. [3] combined fuzzy systems, ANNs, and Genetic algorithm for choosing a qualified project manager. One of the initial steps in any MCDM problem is to identify the selection criteria. Insight into the relevant literatures to personnel selection reveals that majority of the reviewed studies do not provide a systematic method for criteria selection. No doubt, proper criteria selection is the building block for successful project manager selection. While, most of scholars do not pay that much attention to this step as they only focus on giving some numerical examples to justify their selection criteria. Some of scholars have already mentioned about eliciting criteria by using experts' opinions [6]. However, they again here do not specify their method in detail. Also, some other researchers just only have expressed that they have used certain criteria selection methods [7-9] without specifying clearly the methods used.

A project manager can be selected by companies that engage in project based on its selection criteria which mimics the company's conditions of project and priorities. Researchers have their own opinion on the project managers' selection criteria [10]. However, technical skills conceptual skills and human skills are considered by Godwin (1983), as the main four skills project managers cannot do without. In the study conducted by Jiang et al. (1998), the authors examined that IT PM skills, by spread of questionnaires to 118 information systems PMs from North America's six largest organizations. The respondents were asked to rate every skill's importance. The top skills were ranked by the group for interviewing, (managing and directing); while they are followed by communication (writing, speaking and listening); the next being interpersonal skills, (sensitivity, patience, cooperation, and diplomacy). Eighty five PMs were interviewed from the information system, electricity and agricultural sectors in Egypt, according to El-Sabaa [10] with respect to PMs best desirable traits. The results obtained showed that PMs at the initial phase were used to generate questionnaires that listed all the skills. The questionnaire was filled by 126 PMs from 3 similar sectors. Different factors and sub-factors affecting the project managers' match to project construction was identified by Ogunlana et al. [11]. After review of related literatures, and interviews from management personnel that took part in the project manager's selection. A general agreement among the management construction industry in Bangkok was based on the factors that affected the project managers' construction selection. Thailand's top 100 construction companies' detailed assessment was conducted to determine the factors which are used to assign projects to project managers in the industry. The application of Grays relations method for selecting project managers was considered by Zavadskas et al. [5]. The criteria and sub-criteria were identified in the model on conditions that thorough review of related literatures and interview for management personnel as partakers in the selection of project managers. Napier et al. [12] requested from 19 IT practicing project managers decided to explain the skills that showed IT projects managers' success. A semi structured methods of interview known as the repertory grid technique, was used to prolong these skills. The division of main skills of project managers into six groups, which includes organizational skills, coping skills, team skills, leadership and building skills, communication skills and technical skills were divided by Meredith et al. [13]. Soft competencies by phase projects, for the project success that project managers required for information system was investigated by Skulmoski and Hartman [14]. Thirty three questionnaire interviews were conducted by the authors to collect data from project managers, 22 IS samples and business leaders found in Calgary, Alberta, Canada. Key competencies were identified for every phase projects for IS (planning, initiating, implementation and closeout). In the field of petroleum and gas, road and transport, large building, dam construction questionnaires were sent by Rashidi et al. [3], to the chief managers of 28 large contractors.

A group decision making will be referred to a set of interdependent individuals who view themselves as a group and who have the common goal of selecting criteria. What distinguishes group from individual decision making is the existence of more than one information source and perspective that must be combined to arrive at a collective decision. In real world decision making problems, the number of decision makers is not one, but many. The problem of seeking consensus in group decision making (GDM) has been extensively studied in multi criteria problems. The Delphi technique and the Nominal Group Technique (NGT) are the most famous approach in group decision making [15]. The Delphi technique [16] is a set of procedures for eliciting and refining the opinions of a group of people without their being required to hold face to face meetings. Some distinct and compelling reasons for selecting the Delphi technique for use with GDM can be made:

- The Delphi provides a means of obtaining structure input without the requirement of a face to face meeting.
- The Delphi technique is inexpensive compared to convening a panel in one location for a series of meetings.
- It is inherently a simplifying device since consensus is attempted for as well as the clarification of views.
- Respondents receive feedback and are allowed to alter initial positions in successive rounds or passes.

A panel of experts is carefully selected and then asked to address an issue in written form. The initial responses are likely to spread over a wide range. A follow up questionnaire is sent to the respondents with a summary of the distribution of the initial response. Participants are then asked to consider previous answers or remarks, respond to this new information and revise opinion as they see fit. This procedure is continued until a consensus of opinion is reached, or until no further progress toward a consensus is evident. However, experience has shown that convergence usually occurs at the second iteration [17].

### **3. Methodology**

The following In this study we developed a model to identify criteria for project manager selection by using a new systematic method. The goal of this model is to form the panel of experts and determining the criteria hierarchy for project manager selection. In this study, the Delphi technique with some modifications was used to seek best ideas from managers and experts for criteria selection. The systematic method consists of feedback was proposed over other methods because of the advantages it offers pertaining to the time available for respondents and researcher, convenience for respondents. This method is a Delphi based extension and advantage of the Delphi is that it avoids direct conflict of the experts [17].

The selection of criteria is very important in the decision making process of the project manager selection problem. Decision makers with different backgrounds, experience and knowledge in the organization are working. It seems more logical that a group of experts to define criteria rather than by a single person. Usually it is better that experts from different departments participate in the selecting suitable criteria. Each expert thinks about set of criteria with own perspective. The new extension from modified Delphi method [18] is used to extract the suitable criteria for project managr selection. The primary reason for the using and modifying Delphi for use in this study is that it has been used successfully for similar purposes within the criteria selection [17]. The suggestion was made that group members working independently might be able to generate more innovative ideas; and such a process could reduce the diminution of the assessment capabilities of group members when there are face to face interactions. Then, a general consensus among experts can be reached to establish a hierarchical structure for criteria. Based on requirements of the specific job position and decision makers opinions criteria should be defined.

The systematic Delphi method is an approach that uses panel experts for elicit experts' opinion in a special subject [19]. This method is done by written communication only and without face to face grouping discussion. This method includes an iterative process that usually needs three or four rounds of survey with the panel experts. By the end of every round, the data are analyzed and sent for next round. The procedure will be finished while reach to group consensus. As a contribution on the work of Murry and Hammons [18] in current study it was suggested that instead of open ended questionnaire in first round which is used in classic Delphi method, one additional task must be include. Thus, before sending form for collecting experts' opinions, it is necessary that by investigating the previous studies and/or expert interview make a draft list of criteria. Therefore, this modified method will be led to do the process faster than the main Delphi method with more quality. In the next sections, the necessary steps for model will describe.

### **Step 1: Selecting experts for criteria selection**

The eliciting criterion is a group decision mechanism that requires qualified experts who have deep understanding of the problem. Therefore, the selection of panel experts is one of the most critical requirements for criteria selection [17]. Important in this process is to identify and determine the Group of Experts. The outcomes of the study are the expert's opinions. Following recommendations from literature, there will be 5 to 18 people in each panel.

### **Step 2: Investigate previous studies**

A list that included examples of personnel selection criteria are sent to panel members. This list is based on the researcher opinions during the previous studies pertaining to criteria for personnel selection problem. Furthermore, a brief description for each of criteria should be sent for panel members to use the listing of personnel attributes and competency as a guide for creating their individual listing.

### **Step 3: Generate Ideas**

An example of project manager selection criteria developed by the researcher is used in the first round form and is sent to experts. They are determined the key decision making criteria for personnel selection related to job position. From the respondents were asked to tick or cross before each criterion. They show whether the criterion was relevant to their decision making of project manager selection or not. Furthermore, the respondents were encouraged to create new ideas and describe many extra missing criteria as possible. To avoiding the confusion when the same criterion was raised by different terms, also were asked from experts to present the explanation and motivation of new criteria.

### **Step 4: Feedback to experts**

Data collected from the first round may not have sufficient accuracy and quality. For achieving consensus between experts, it is recommend that after proper analysis of its outcomes; the first round is typically followed by two more rounds. The panel members correct their ideas with seeing another ideas, in order to reach consensus between opinions [20]. In round two typically experts try to focuses on editing their ideas based on other opinions. They get some additional information for improvement and reach consensus. During rounds two and three, consensus will be achieved. Each expert is allowed to review other experts' opinions because the results of first round will send for another expert. Experts make comments or modify his or her original responses until consensus is reached by the end of round three.

### **Step 5: Developing hierarchy**

Second round responses are analyzed, categorized, and returned to the experts for developing a hierarchical structure of the assessment criteria. The purpose of round three is to obtain consensus among experts for hierarchy of criteria. Verification of the criteria hierarchy can be done by interaction with the decision maker. After this round and the final analysis, the hierarchical structure for project manager selection criteria is determined like this was shown in the Figure 2. In this study, the hierarchy shows a structure for the criteria that used for selecting personnel. The top level is the selection goal which is project manager selection. And following these are the criteria (the second level) and finally sub criteria (the third level).

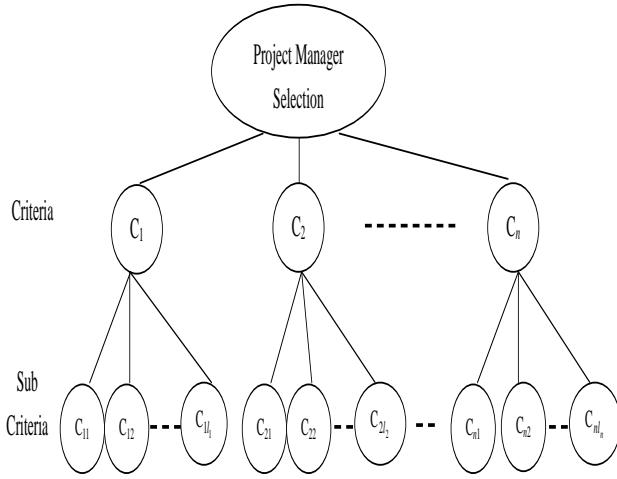


Figure 1: The criteria hierarchical for project manager selection

#### 4. Case study

To validate the fuzzy integral model, a case study was conducted in an Iranian company. MAPNA is a project based organization and engaged in development and implementation of power, oil & gas, railway transportation and other industrial projects. It has 371 employees and located in Tehran. 14 persons in this company have been able to obtain international certificate in Professional Project Management (PMP). From 1992, MAPNA has been involved in more than 85 projects valuing over 17 billion euro. This section discusses the results, analysis and finding of the using systematic method for developing selection criteria hierarchy for the project manager selection. A critical task for a project based organization is project managers' selection. The selection criteria should specifically be defined to cover the decision maker's requirements and corresponding to the specific job characteristics. For diverse job description varied criteria should be taken into consideration, e.g. for system analyst, project experts, etc. To specify the most suitable assessment criteria the new systematic and Delphi based method has been exploited.

A group of nine experts were chosen to form an expert panel. Then these experts were asked to specify the project manager selection criteria. The respondents were all among the company managers with relevant knowledge and more than five years of experience in project administration. Management had selected a panel consisting of procurement deputy, engineering deputy, executive deputy, administrative and financial deputy, planning deputy, quality and systems deputy, inspection manager, HSE manager, contracts manager, and the HR Department. The expert panel was responsible to elicit the most relevant criteria for a project manager position. The experts were asked to give their supposed selection criteria in an anonymous confidential form. Investigating existing studies for project manager selection demonstrate some criteria which need to be evaluated by the organization experts. Most of the times , a project is confined by limited resources which result in the rising of project manager selection importance [21]. For different projects, project managers with different skills and capabilities are needed. Based on the previous studies [5] and discussions with the experts, the selection criteria were defined and presented for Delphi rounds as shown in Table 1.

Table 1: Project manager selection criteria in previous studies

Citation Criteria	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]	[11]	[30]	[31]
Education	●			●				●			●
Planning and control							●		●		●
Communication		●		●		●	●	●	●		●
Experience	●		●	●	●	●	●			●	●
Leadership		●				●					
Negotiation skills						●	●		●		
General management									●		●
Team development	●					●			●		
Resource management	●							●			
Time management	●	●			●	●	●		●		
Human skills	●					●					●
Technical skills	●			●	●			●			
Computer			●					●			●
Problem solving				●				●			●
Quality Management	●				●	●					

Assessment carried out on earlier studies by investigating previous studies, 15 potential project managers' selection criteria were selected for assessment. A systematic technique was adopted for the response criteria. Potential criteria used to assess project managers were firstly presented in a form, which list include, criteria that has been identified from within the selected group. The determination of the major benefit of each criterion was performed by the panel experts in the first round and was agreed upon by all the respondents. According to the group interest about the criteria, the experts corrected their interest in the second round. Finally, the criteria that have more importance will be selected after a few discussions. Nine members of the expert team considered the results of first round and edited their opinions according to feedback. Consequently, 14 project manager selection criteria were selected in this step. During second round, the nine experts were asked to the decision about the two un-consensus criteria (Human skills, Technical skills). Eight of them agreed to delete these criteria because they believed that they were seen as integral parts of other criteria and no need to repeat.

Finally due to similarities of the skills, the chosen criteria were grouped by the experts according to their structural levels. Secondly the hierarchy of the criteria form for hiring project managers' selection was developed. The form asked experts to separate their criteria into similar groups while they suggest the group criteria names. After completing the form by the 10 experts the responses from individuals were put together in different comprehensive lists of four sub-criteria which include management skills, interpersonal skills, basic requirement and project management skills,. The structure of final criteria for selection of project managers for this study is shown in Fig 2.

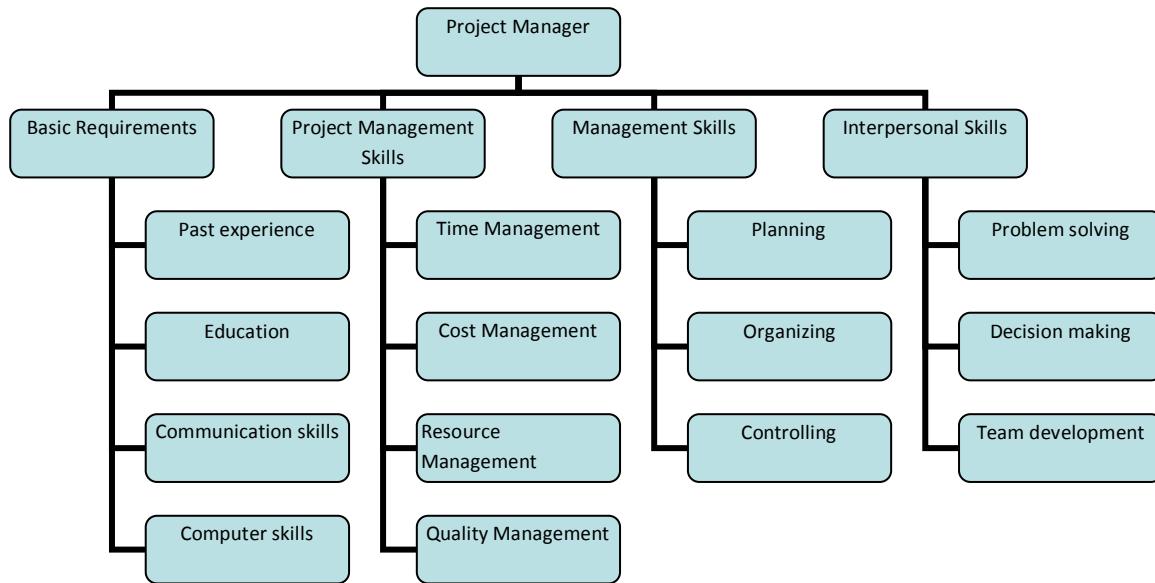


Figure 2: The hierarchical structure for project manager selection

## 5. Discussion

In this paper, one hierarchical structure consisting of selection criteria and sub criteria, by the help of the new proposed systematic method is created. In this way, experts are encouraged to focus on proper criteria, rather than to use inappropriate criteria. The proposed method is useful for unstructured problems that need to consensus between experts. The systematic method consist of some rounds solves disagreements of experts by feedback. Utilizing this framework as a group decision making for aggregating, by providing feedback to the experts about their ideas, will be increased their integration. Overall, this systematic criteria selection will help to increase the depth of analysis and finally will provide a decision making with more quality.

In a group decision environment, deference of opinions is normal and usual. Each expert has a different background and different knowledge and experience. Accordingly, each expert suggests different sets of criteria and preference. This difference is intensified with using the proposed method. It is true that each round of this method generates conflict, but it is also true that this method manages this conflict with feedback property. In the first round, experts contribute a diversity of viewpoints about producing selection criteria. However, in the next round they consider other comments, and they find an opportunity for rethinking about their ideas.

What distinguishes this research, relates to criteria selection method. Most of the previous researches did not provide the clear method for eliciting criteria [6]. This is the first study that employs a systematic method for this stage. As a contribution to the knowledge, this study extended the classical Delphi technique for the saving time and expenses, through using the results of previous studies and discussion with experts to identify the selection criteria. Thus, this systematic method consists of three elements: investigate previous studies, some rounds similar to Delphi technique and discussion with experts. This synergy increases the quality and quantity of the personnel selection process. Another thing that is required to be discussed here is about the number of expert panel. Usually in the Delphi method between 5 and 20 experts should be used in experts panel [32]. Because the panel size influences the effectiveness of decision process some researchers believed that the number of expert panels should not be too large, a minimum of 5 to maximum about 9 [16]. Therefore, in this study ten experts suggested for the formation the group of expert panelist.

## 6. Conclusion

According to previous studies in literature, there is no systematic method that can help companies in preparing and choosing project manager selection criteria. However, this research has showed that the proposed systematic method can be used as guidelines for companies and that can enable each project based company to determine the essential

criteria based on expert's opinion. This study selected the criteria for draft list in Delphi method, from previous studies. Review of previous studies and discussion with experts and using Delphi based method, this three together increase the efficiency of criteria selection stage. The proposed model can also be applied to problems such as nurse selection, material selection and many other areas of management decision problems or strategy selection problems.

## Acknowledgements

The researchers hereby thank those that have contributed in one way or the other in the form of advice for their support.

## References

1. Zhao, H., Wang, X.-Q., Yu, G., and Zhang, L.-F.: 'Study on Engineering Project Manager Selection', in Editor (Ed.)^(Eds.): 'Book Study on Engineering Project Manager Selection' (2008, edn.), pp. 1-4.
2. Zhao, L., Guo, Y., and Cui, W.: 'The Application of Fuzzy Comprehensive Evaluation Methods in the Selection of a Project Manager', in Editor (Ed.)^(Eds.): 'Book The Application of Fuzzy Comprehensive Evaluation Methods in the Selection of a Project Manager' (2009, edn.), pp. 1387-1391.
3. Abbas Rashidi, S., Jazebi, F., and Brilakis, I.: 'Neurofuzzy Genetic System for Selection of Construction Project Managers', Journal of Construction Engineering and Management, 2011, 137, pp. 17.
4. Chen, L.S., and Cheng, C.H.: 'Selecting IS personnel use fuzzy GDSS based on metric distance method', European Journal of Operational Research, 2005, 160, (3 SPEC. ISS.), pp. 803-820.
5. Zavadskas, E.K., Turskis, Z., Tamošaitiene, J., and Marina, V.: 'Multicriteria selection of project managers by applying grey criteria', Technological and Economic Development of Economy, 2008, 14, (4), pp. 462-477.
6. Kelemenis, A., Ergazakis, K., and Askounis, D.: 'Support managers' selection using an extension of fuzzy TOPSIS', Expert Systems with Applications, 2011, 38, (3), pp. 2774-2782.
7. Tavana, M., Kennedy, D.T., and Joglekar, P.: 'A group decision support framework for consensus ranking of technical manager candidates', Omega, 1996, 24, (5), pp. 523-538.
8. Jereb, E., Rajkovic, U., and Rajkovic, V.: 'A hierarchical multi-attribute system approach to personnel selection', International Journal of Selection and Assessment, 2005, 13, (3), pp. 198-205.
9. Shih, H.S., Huang, L.C., and Shyur, H.J.: 'Recruitment and selection processes through an effective GDSS', Computers and Mathematics with Applications, 2005, 50, (10-12), pp. 1543-1558.
10. El-Sabaa, S.: 'The skills and career path of an effective project manager', International Journal of Project Management, 2001, 19, (1), pp. 1-7.
11. Ogunlana, S., Siddiqui, Z., Yisa, S., and Olomolaiye, P.: 'Factors and procedures used in matching project managers to construction projects in Bangkok', International Journal of Project Management, 2002, 20, (5), pp. 385-400.
12. Napier, N.P., Keil, M., and Tan, F.B.: 'IT project managers' construction of successful project management practice: a repertory grid investigation', Information Systems Journal, 2009, 19, (3), pp. 255-282.
13. Meredith, J., and Mantel, S.J.: 'Project Management: A Managerial Approach, (W/Cd)' (Wiley-India, 2009. 2009).
14. Skulmoski, G.J., and Hartman, F.T.: 'Information systems project manager soft competencies: A project-phase investigation', Project Management Journal, 2010, 41, (1), pp. 61-80.
15. Hwang, C.L., and Lin, M.-J.: 'Group decision making under multiple criteria : methods and applications' (Springer-Verlag, 1987. 1987).
16. Delbecq, A.L., Van de Ven, A.H., and Gustafson, D.H.: 'Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes', 1975.
17. Okoli, C., and Pawlowski, S.D.: 'The Delphi method as a research tool: An example, design considerations and applications', Information and Management, 2004, 42, (1), pp. 15-29.
18. Murry, J.W., and Hammons, J.O.: 'Delphi: A versatile methodology for conducting qualitative research', Review of Higher Education, 1995, 18, (4), pp. 423-436.
19. Landeta, J.: 'Current validity of the Delphi method in social sciences', Technological Forecasting and Social Change, 2006, 73, (5), pp. 467-482.
20. Hartman, F.T., and Baldwin, A.: 'Using technology to improve Delphi method', Journal of computing in civil engineering, 1995, 9, pp. 244.
21. Gabriel, S.A., Kumar, S., Ordóñez, J., and Nasserián, A.: 'A multiobjective optimization model for project selection with probabilistic considerations', Socio-Economic Planning Sciences, 2006, 40, (4), pp. 297-313.
22. Figueira, J., Greco, S., and Ehrgott, M., Multiple Criteria Decision Analysis: State of the Art Surveys, 2005.

23. Collins, P.: 'Project manager selection and development process', PMI International Symposium in Long Beach, 1998.
24. Lord, R.G., and Brown, D.J.: 'Leadership, values, and subordinate self-concepts', *Leadership Quarterly*, 2001, 12, (2), pp. 133-152.
25. Adobor, H.: 'Selecting management talent for joint ventures: A suggested framework', *Human Resource Management Review*, 2004, 14, (2), pp. 161-178.
26. Lievens, F., Harris, M.M., Van Keer, E., and Bisqueret, C.: 'Predicting cross-cultural training performance: The validity of personality, cognitive ability, and dimensions measured by an assessment center and a behavior description interview', *Journal of Applied Psychology*, 2003, 88, (3), pp. 476-489.
27. Haynes, N.S., and Love, P.E.D.: 'Psychological adjustment and coping among construction project managers', *Construction Management and Economics*, 2004, 22, (2), pp. 129-140.
28. Chen, H.C., Chu, C.I., Wang, Y.H., and Lin, L.C.: 'Turnover factors revisited: A longitudinal study of Taiwan-based staff nurses', *International Journal of Nursing Studies*, 2008, 45, (2), pp. 277-285.
29. El-Sabaa, S.: 'The skills and career path of an effective project manager', *International Journal of Project Management*, 2000, 19, (1), pp. 1-7.
30. Ling, Y.Y.: 'A conceptual model for selection of architects by project managers in Singapore', *International Journal of Project Management*, 2003, 21, (2), pp. 135-144.
31. Mustapha, F.H., and Naoum, S.: 'Factors influencing the effectiveness of construction site managers', *International Journal of Project Management*, 1998, 16, (1), pp. 1-8.
32. Anderson, D.R., Sweeney, D.J., and Williams, T.A., *Quantitative Methods for Business*, 2004.