UNIVERSITI PUTRA MALAYSIA

DEVELOPMENT OF A FUZZY INTEGRAL GROUP MODEL BASED ON LINGUISTIC REASONING FOR PROJECT MANAGER SELECTION

ALI REZA AFSHARI

DEVELOPMENT OF A FUZZY INTEGRAL GROUP MODEL BASED ON LINGUISTIC REASONING FOR PROJECT MANAGER SELECTION

By

ALI REZA AFSHARI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

September 2012

Abstract of thesis to be presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Doctor of Philosophy

ABSTRACT

DEVELOPMENT OF A FUZZY INTEGRAL GROUP MODEL BASED ON LINGUISTIC REASONING FOR PROJECT MANAGER SELECTION

By

ALI REZA AFSHARI

June 2012

Chairman: Professor Rosnah bt. Mohd. Yusuff, PhD

Faculty: Engineering

An important phase of human resource management is project manager selection, which is concerned with identifying an individual from a pool of candidates suitable for a vacant position. As in many decision problems, project manager selection problem is very complex in real life. Some of the techniques in decision making are multi criteria decision making (MCDM) can be used for project manager selection process. Although many studies have investigated this problem, there are three missing links in existing studies: Firstly, based on literature review, there is no systematic and valid method for specifying the jobs requirements criteria have been presented. Secondly, group decision making (GDM) is a very important factor for solving the problem comprehensively. However, it has not been considered in the majority of the reviewed studies. Thirdly, possible dependencies between the criteria in the project manager selection model have not been considered in the existing studies.

The main objective of this research is to develop an analytical hybrid methodology for project manager selection problem in order to identify criteria for project manager selection by an extension of Delphi method, to evaluate a candidate by a new group multi criteria decision making (GMCDM) model based on fuzzy set theory, and develop a model based on linguistic extension of fuzzy measures and fuzzy integrals for ranking candidates. The methodology of this research includes four stages. The objective of the first stage is to eliciting criteria hierarchy for project manager selection. In this stage, after reviewing pertinent literature, the Delphi based method was used to seek the criteria from managers and experts. The objective of the second stage is project manager evaluation based on new group fuzzy linguistic modeling for determining criteria importance and candidate ratings. The objective of the third stage is fuzzy aggregating and the objective of fourth stage is ranking the candidates based on new linguistic fuzzy measure and fuzzy integral model.

The models were validated using three case studies of project manager selection in three project based companies for a project manager position. The effectiveness of the three new methods was demonstrated in these three case studies. The results showed that the proposed models are appropriate for selecting project manager considering dependency between criteria. Firstly, this study developed a structured method for criteria selection. The use of a structured criteria selection method encourages experts to focus on explicit and functional criteria, rather than to use inappropriate criteria. As a contribution to the knowledge, this study extended the classical Delphi technique through using the results of relevant literature review and discussion with experts to identify the selection criteria. Secondly, this study

developed a linguistic extension for evaluation. Decision makers cannot express judgment in accurate numerical terms and use of linguistic labels makes decision judgment more reliable and informative for decision making. Thirdly, this study developed non additive method for aggregating stage in project manager selection. In the real world, in dealing with the multiple criteria decision making problems, the criteria are not independent. So they cannot be evaluated by conventional additive measures and there must be better methods to distinguish the preferences by applying a new nonlinear and non additive model, in which it is not necessary to assume independence.

Abstrk tesis dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

PEMBANGUNAN MODEL KUMPULAN KAMIRAN SAMAR BERDASARKAN PERTIMBANGAN LINGUISTIK UNTUK PEMILIHAN PENGURUS PROJEK

Oleh

ALI REZA AFSHARI

Jun 2012

Pengerusi: Rosnah bt. Mohd. Yusuff, PhD

Fakulti: Kejuruteraan

fasa penting dalam pengurusan sumber manusia adalah pemilihan pengurus projek, yang melibatakan mengenal pasti individu daripada kumpulan calon yang sesual untuk pengisian jawatan kosong. Seperti dalam banyak masalah keputusan, pemilihan pengurus projek adalah masalah yang sangat kompleks dalam kehidupan sebenar. Beberapa teknik dalam membuat keputusan adalah keputusan pelbagai kriteria membuat boleh digunakan untuk proses pemilihan pengurus projek.Walaupun banyak kajian telah dijalankan untuk masalah ini, terdapat tiga hubungan yang hilang dalam kajian yang sedia ada: Pertama, tidak ada kaedah yang sistematik dan sah untuk menentukan kriteria keperluan pekerjaan yang telah dibentangkan. Kedua, kumpulan membuat keputusan merupakan faktor yang sangat penting untuk menyelesaikan masalah secara menyeluruh. Walau bagaimanapun, ia tidak dipertimbangkan dalam majoriti kajian semula. Ketiga, mungkin kebergantungan antara kriteria dalam pemilihan model pengurus projek tidak dipertimbangkan dalam kajian yang sedia ada.

Objektif utama kajian ini adalah untuk membangunkan satu kaedah analitikal hibrid untuk masalah pemilihan pengurus projek bagi mengenal pasti kriteria pemilihan pengurus projek melalui lanjutan kaedah Delphi, untuk menilai calon dari kumpulan baru kriteria membuat keputusan berbilang model berdasarkan kabur set teori, dan membangunkan model berdasarkan lanjutan linguistik langkah kabur dan kabur kamiran untuk kedudukan calon. terdapat empat peringkat untuk metodologi dalam kajianini. Objektif peringkat pertama adalah untuk memperlihatkan hierarki kriteria pemilihan pengurus projek. Pada peringkat ini, selepas mengkaji kesusasteraan penting, kaedah Delphi telah digunakan untuk mendapatkan kriteria daripada pengurus dan pakar. Objektif peringkat kedua adalah penilaian pengurus projek berdasarkan kumpulan baru kabur bahasa pemodelan untuk menentukan kepentingan kriteria dan penilaian calon. Objektif peringkat ketiga adalah kabur mengagregat dan objektif peringkat keempat ialah kedudukan calon-calon berdasarkan kepada langkah baru linguistik kabur dan model penting kabur.

Model ini disahkan menggunakan kajian kes pemilihan pengurus projek dalam syarikat berasaskan projek untuk jawatan pengurus projek. Keberkesanan tiga kaedah baru telah ditunjukkan dalam kajian kes. Hash l kajian menunjukkan bahawa model yang dicadangkan. adalah sesuai bagi memilih anggota berdasarkan pergantungan antara kriteria. Pertama, penggunaan model kriteria pemilihan sistematik menggalakkan pakar-pakar untuk memberi tumpuan kepada kriteria yang jelas dan berfungsi, dan bukannya sebaliknya. Sebagai sumbangan kepada pengetahuan, kajian ini meneruskan teknik Delphi klasik melalui penggunan hasil kajian literatur yang berkaitan dan perbincangan dengan pakar-pakar untuk mengenal pasti kriteria

pemilihan. Kedua, pembuat keputusan tidak dapat meluahkan penghakiman dari segi ketepatan berangka dan penggunaan label linguistik membuat keputusan penghakiman lebih dipercayai dan bermaklumat untuk membuat keputusan. Ketiga, dalam dunia sebenar, dalam berurusan dengan pelbagai kriteria keputusan membuat masalah, kriteria tidak terbatas. Jadi nnereka tidak boleh dinilai dengan langkah-langkah tambahan konvensional dan harus mempunyai kaedah harus mempunyai untuk nnembezakan keutamaan dengan menggunakan bahan tambahan baru linear dan bukan model, di mana ia tidak perlu semestinya dianggap kebebasan.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude and respect to my research supervisor and the chairman of my supervisory committee, Professor Dr. Rosnah Mohd Yusuff, for all his guidance, help and encouragement throughout my research studies. I am also thankful to the members of the supervisory committee Associate Professor Dr. Tang Sai Hong and Professor Dr. Yusuff Ismail for their support in this research work and entire preparation of this doctoral dissertation. Without their guide in these five years, I could not accomplish the thesis.

I am also deeply grateful to my wife, Vahideh, my son, Morteza, and my family for their tremendous support to my study and life.

Finally, for those people who are not listed above but have given me a hand or advice, I would also like to say a word of thanks for their support.

I certify that a Thesis Examination Committee has met on 11 June 2012 to conduct the final examination of Ali Reza Afshari on his thesis entitled "Development of a Fuzzy Integral group model based on Linguistic reasoning for project manager selection" in accordance with the Universities and University Colleges 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

Members of the Examination Committee are as follows:

Datin Dr Napsiah Ismail, PhD
Professor
Faculty of Engineering
University Putra Malaysia
(Chairman)

Dr Norzima Zulkifli, PhD
Faculty of Engineering
University Putra Malaysia
(Internal Examiner)

Dr Mohd Khairol Anuar Mohd Ariffin, PhD
Associate Professor
Faculty of Engineering
University Putra Malaysia
(Internal Examiner)

Dr Abid Haleem, PhD
Professor
Faculty of Engineering and Technology
University Jamia Millia Islamia
India
(External Examiner)

SEOW HENG FONG, PhD
Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Rosnah bt. Mohd. Yusuff, PhD
Professor
Faculty of Engineering
University Putra Malaysia
(Chairman)

Tang Sai Hong, PhD
Associate Professor
Faculty of Engineering
University Putra Malaysia
(Member)

Md. Yusof Ismail, PhD
Professor
Faculty of Manufacturing Engineering
University Malaysia Pahang
(Member)

_____
BUJANG BIN KIM HUAT, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

I declare that the thesis is original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institutions.

_____

ALI REZA AFSHARI

Date:

TABLE OF CONTENTS