



**Multi-Criteria Decision Making for Contractor Selection**

**Using Analytical Hierarchy Process (AHP)**

**(Case Study in Jordan)**

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## **DETECTION**

*I would like to dedicate this research study to my father and mother, whom taught me the value of education and supported me through my educating years and their endless love, prayers and continuous sacrifices.*

*I also would like to thank my family for their continuous support in order to reach my dreams.*

*I pray that Allah, the most gracious, the most merciful to grant them paradise as a reward for their patience and efforts.*

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*(P.B.U.H).*

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works.*

**Multi-Criteria Decision Making for Contractor Selection by Using Analytical Hierarchy  
Process (AHP) in Jordan**

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*By:*

*Maram Abdel Rahman Almuhsen*

*Supervisor:*

*Associate Prof. Dr. Ibrahim A. Mohammed*

**ABSTRACT**

The main objective of this thesis is to develop a model for selecting the appropriate contractor for the project being implemented by taking advantage of the analytical hierarchy process as a methodological basis for the selection process. This model will be tested by applying it to a realistic scenario, where the contractors participating in the tender are subject to the evaluation process for the selection of the best contractor for the proposed project.

In order to achieve the objectives of this study, the main criteria and sub-criteria used in this study were determined through constructive interviews and distribution of questionnaires designed to determine the main criteria and sub-criteria and their quantitative weights. In the first phase respondents were asked to evaluate the importance of the main criteria and sub-criteria mentioned in the first questionnaire. The same respondents were then asked to make reciprocal pair-wise comparisons through the second questionnaire which was based on the methodology of the analytical hierarchy process distributed in the second phase in order to determine the weights of the main criteria and sub-criteria. Then, a contractor selection model was developed. The main criteria and sub-criteria were organized using the geometric mean and Satty's linear scale. The open decision maker (ODM) software was then

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used to determine the weights of the selected criteria in the first phase and determine the winning contractor.

As a result of the study conducted, The main criterion which had the highest relative importance was Technical Capability in comparison with the local determined factor used for selection which was Bid Price.

## ABSTRACT IN ARABIC

### صنع القرار المتعدد المعايير لاختيار المقاولين في الأردن

الهدف الرئيسي من هذه الأطروحة هو وضع نموذج لاختيار المقاول المناسب للمشروع الذي يراد تنفيذه من خلال الاستفادة من عملية التسلسل الهرمي التحليلي (Analytical Hierarchy Process) كقاعدة منهجية لعملية الاختيار وسيتم اختبار هذا النموذج بتطبيقه على سيناريو واقعي ، حيث يخضع المقاولين المرشحين للعطاء لعملية التقييم الخاصة باختيار المقاول الافضل للمشروع الذي تم طرحه .

ولتحقيق الاهداف المرجوة من هذه الدراسة تم تحديد المعايير الرئيسية والمعايير الفرعية المستخدمة في هذه الدراسة من خلال المقابلات البناءة وتوزيع الاستبيانات المصممة لتحديد المعايير الرئيسية والفرعية وتحديد اوزانها الكمية حيث طلب من المستجيبين في المرحلة الاولى تقييم أهمية المعايير الرئيسية والفرعية المذكورة بالاستبيان الاول وبعد ذلك طلب منهم أنفسهم إجراء مقارنات زوجية تبادلية من خلال الاستبيان الثاني المبني على منهجية التحليل الهرمي الموزع في المرحلة الثانية من أجل تحديد أوزان المعايير الرئيسية والفرعية ثم تم تطوير نموذج لاختيار المقاول ، وتم ترتيب المعايير الرئيسية والفرعية باستخدام الوسط الهندسي ومقياس ساعاتي الخطي وبعد ذلك تم استخدام برمجة صانع القرار (Open Decision-maker) لتحديد الأوزان للمعايير المختارة في المرحلة الاولى وتحديد المقاول الفائز بالعطاء .

وأكدت النتائج التي تم جمعها وتحليلها على ضرورة استخدام عملية التحليل الهرمي للمقاولين المتقدمين خلال مرحلة الاختيار لتضمنه على عوامل هامة غالبا ما يتم تجاهلها في أساليب الانتقاء التقليدية . ونتيجة لهذه الدراسة، كان المعيار الرئيسي الذي له أعلى أهمية نسبية هو القدرة التقنية بالمقارنة مع المعيار المحلي المستخدم في الاختيار المعتمد على سعر العطاء المطروح .



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**LIST OF ABBREVIATIONS**

|        |  |
|--------|--|
| AHP    | Analytical Hierarchy Process                                   |
| ANP    | Analytical Network Process                                     |
| CCPQ   | Construction Contractor Prequalification                       |
| CI     | Consistency Index  |
| CR     | Consistency Ratio  |
| DCE    | Discrete Choice Experiment                                     |
| GM     | Geometric Mean   |
| MCDM   | Multi-Criteria Decision Making Methods                         |
| ODM    | Open Decision Maker  |
| QBS    | Qualification Based Selection                                  |
| SPSS   | Statistical Package for Social Science                         |
| TFN    | Triangular Fuzzy Number  |
| TOPSIS | Technique for Order Preference by Similarity to Ideal Solution |
| VIKOR  | ViseKriterijumska Optimizacija I Kompromisno Resenje           |