Paper Evaluation of 'Application of AHP in Project Management' by K.M.A.S-S. Al-Harbi*

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Abstract

This study focuses on the evaluation of an article about the AHP methodology in project area at 2001 edition. It is titled, "Application of AHP in project management," by K.M.A.S-S. Al-Harbi. This paper presents the Analytical Hierarchy Process (AHP) as a decision making method in project management. The evaluation by each section is based on the model by Fred Pyrczak (2008) in Evaluating Research in Academic Journals. This paper has an implication that evaluation method can be shown by quantitative numerical value.

Keywords : Evaluation of an article, AHP, Project management, decision making method

1. Introduction

The International Journal of Project Management provides wide ranging and comprehensive coverage of all facets of project management. It is published eight times per year and provides a focus for worldwide expertise in the required techniques, practices and areas of research. This journal introduced an article about AHP methodology in the project area in the 2001 edition. It is titled, "Application of the AHP in project management," by K.M.A.S-S. Al-Harbi (see Appendix A for the article's abstract)[2]. This paper presents the Analytical Hierarchy Process (AHP) as a decision making method in project management. The AHP implementation steps will be simplified by using the 'Expert Choice' professional software that is available commercially and designed for implementing AHP. We are going to evaluate this article for expanding the possibility of using the AHP method in project management. For example for expanding it, the articles of Younghwa et al [7], Lu et al[3], and Jendy et al [1] show the potential possibility for AHP application in project management. The evaluation of the following section is based on the model by Fred Pyrczak [4] in Evaluating Research in Academic Journals (151-156)***. All of the questions for evaluating this article are taken from Appendix D in the Pryczak's book[4].

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*** A number in ( ) means page numbers of an article or a book.

2. Evaluation

2.1 Evaluation of Title,

A proper title helps readers to identify articles of interest and reflect the contents of the articles. First, the title of this article is sufficiently specific and the title is reasonably concise with exactly 7 words. We think that the two primary variables (AHP and Project Management) are specified in the title of this article. In this paper, the author proposes that contractor prequalification will be used as an example of the possibility of using AHP in project management.

<Table 1> Evaluation of Title

Questions for Evaluating the Title	5	4	3	2	1	N/A	I/I
Is the title sufficiently specific?		X					
Is the title reasonably concise?		X					
Are the primary variables referred to in the title?		X					
When there are many variable, are the types of variables referred to?			X				
Dose the title identify the types of individuals who participated?					X		
If a study is strongly tied to a theory, is the name of the specific theory mentioned in the title?						X	
Has the author avoided describing results in the title?	X						
Has the author avoided using a "yes-no" question as a title?	X						
If the main title and a subtitle, do both provide important information about research?						X	
If the title implies causality, dose the method of research justify it?						X	
Is the title free of jargon and acronyms that might be unknown to the audience for the research report?	X						
Are any highly unique or very important characteristics of the study referred to in the title?						X	
Overall, is the title effective and appropriate?		X					

<Table 1> represents scoring of the "Application of the AHP in project management"(K.M.A.S-S. Al-Harbi, 19); the questions are based on Pyrczak's model (151).

However, the title does not show the types of individuals who participated. Because this article is not tied to a theory, the name of the specific theory is not mentioned in the title. The author of this article describes results in the title and the title is not a "yes-no" type question and does not have a subtitle. In this paper, causal relationships have not been examined because it does not contain the word "effects." The title is free of jargon and acronyms. There are no unique or characteristics of the study referred to in the title. We agree that the title is effective and appropriate. The score using a scale from 1 (being very unsatisfactory) to 5 (being very satisfactory) by the Pyrczak model (151) is 35 out of 45 points, deleting 4 questions as they are not applicable (N/A) <Table 1>.

2.2. Evaluation of Abstract

The objective of the abstract is to identify articles of interest and to show the purpose of the study clearly.

<Table 2> Evaluation of Abstract

Questions for Evaluating the Abstract	5	4	3	2	1	N/A	I/I
Is the purpose of the study referred to or at least clearly implied	X						
Does the abstract mention highlights of the research methodology?	X						
Has the researcher omitted the titles of measures (except when these are the focus of the research?)						X	
Are the highlights of the results described?		X					
If the study is strongly tied to a theory, is the theory mentioned in the abstract?						X	
Has the researcher avoided making vague references to implications and future research directions?	X						
Overall, is the abstract effective and appropriate?	X						

<Table 2> represents scoring of the abstract by K.M.A.S-S. Al-Harbi (19); the questions are based on Pyrczak's model (151-152).

The abstract of this article has 142 words and so, size of the abstract is appropriate (see Appendix A). The abstract provides

<Table 3> Evaluation of Introduction and Literature Review

Questions for Evaluating the Introduction and Literature Review	5	4	3	2	1	N/A	I/I
Introduction Specific Questions							
Dose the researcher begin by identifying a specific problem area?	X						
Dose the researcher establish the importance of the problem area?	X						
Are any underlying theories adequately described?	X						
Dose the introduction move from topic to topic instead of from citation to citation?	X						
Are very long introductions broken into subsections, each with its own subheading?						X	
Has the researcher provided adequate conceptual definitions of key terms?	X						
Has the researcher cited sources for "factual" statements?	X						
Do the specific research purposes, questions, or hypotheses logically flow from the introductory material?		X					
Overall, is the Introduction effective and appropriate?							
Literature Review Specific Questions							
Has the researcher avoided citing a large number of sources for a single point?		X					
Is the literature review critical?		X					
Is current research cited?		X					
Has the researcher distinguished between opinions and research findings?		X					
Has the researcher noted any gaps in the literature?		X					
Has the researcher interpreted research literature in light of the inherent limits of empirical research?					X		
Has the researcher avoided the overuse of direct quotations from the literature?	X						
Overall, is the literature review portion of the introduction appropriate?		X					

important information about the research methodology. Since the measure of this article is the focus of the research, this question can not be applicable to evaluation. We agree that the key point of the results is described. The researcher does not make vague references to implications and future research directions. Generally, the abstract of this article is effective and appropriate. The score by Pyrczak model is 24 out of 25 points, deleting 2 questions as which are not applicable <Table 2>.

2.3 Evaluation of Introduction and Literature Review

The objective of this section is to evaluate this article through five areas: a) introduce the problem area, b) establish its importance, c) provide an overview of the relevant literature, d) show how the current study will advance knowledge in the area, e) describe the researcher's specific research questions or purposes (Pyrczak 33).

The author of this article wrote a short introduction (2 paragraphs over less than one full page) and a separate literature review (20 paragraphs over three full pages). The researcher begins by encouraging the application of the AHP method in the whole area of project management. Also the researcher proposes the importance of the problem area: "Project managers are faced with decision environments and problems in projects that are complex. The elements of the problems are numerous, and the interrelationships among the elements are extremely complicated. Furthermore, human value and judgment systems are integral elements of project problems" (K.M.A.S-S. Al-Harbi 19). This article adequately describes the theory with separate sections: Multiple criteria decision analysis (MCDA), The analysis hierarchy process (AHP), Group decision making, Application of the AHP in project management (19-21). The Introduction of this article is well organized around topics rather than citations. If there are a number of issues to be covered in a long Introduction, The subheadings help guide readers through long Introduction. <Table 3> represents scoring of the introduction and literature review by K.M.A.S-S. Al-Harbi (19-22); the questions are based on Pyrczak's model (152).

However, the Introduction of this article is very short and not applicable to evaluation of this article. We agree that the researcher provides the conceptual definition of key terms and the conceptual definition of this article is very clear: "AHP is a decision-aiding method and aims at quantifying relative priorities for a given set of alternatives on a ratio scale"(19). The researcher of this article presents the statements that sound like "fact" with their sources. The specific research purposes and questions on which this study is based are stated in the last paragraph of the Introduction. Overall, the Introduction of this article is appropriate.

The researcher cites just single sources that support a point and refers to "well-designed"
studies. This article cites the literature within ten-years-old study. We think that the researcher uses wording that helps readers understand whether the cited literature presents opinions or research results. The researcher notes any gaps in the literature and emphasizes the possibility of using AHP in project management (21). However, the researcher does not interpret research literature in light of the inherent

limits of this method and does not use direct quotations from the literature. Overall, the literature review of this article is appropriate.

On a scale of 1-5 for total 17 questions combining the evaluation questions for the introduction and the literature review, this article earns 64 points out of 80 questions with 1 questions being eliminated for inapplicability <Table 3>.

2.4 Evaluation of Samples (when researchers do not generalize)

This article presents a project example for which contractors (that is, alternatives) A, B, C, D and E wish to prequalify (K.M.A.S-S. Al-Harbi 23). Also the 6 criterion factors (Experience, Financial Stability, Quality Performance, Manpower Resources, Equipment Resources, Current Works Load) is described in Table 3 (23). The researcher proposes that the hierarchy of the problem can be developed as shown in <Table 1 (24)>. For the next step, the decision-maker (experts) has to indicate preference or priority for each decision alternative in terms of how it contributes to each criterion in <Table 4 (24)>. AHP method focuses on purposive samples by the related experts on any project rather than random samples. Therefore, the evaluation of samples is based on the "when researchers do not generalize" Pyrczak model (69)

<Table 4> represents scoring of sampling by K.M.A.S-S. Al-Harbi (23-24); the questions are based on Pyrczak's model (153).

Since this article is a sort of pilot study or developmental test on application of AHP method in project management, the researcher does not describe the sample/demographics in detail. In general, the samples for AHP analysis are over 10 experts suitable for the project area. The important point on sample is that there is no exact guideline how experts are chosen for AHP application. That is, quality of samples (Whether the experts is true and right) is more important point than sample size. Furthermore, the researcher of this article does not indicate the basis for selecting participants. Therefore, the description of the sample is inadequate. Due to the sample problem, overall score is very low. The score by Pyrczak model is 4 out of 20 points, deleting 4 questions as hey are inapplicable or where insufficient information is available <Table 4>.

<Table 4> Evaluation of Samples

Questions for Evaluating Samples	5	4	3	2	1	N/A	I/I
Has the researcher described the sample/population in sufficient detail?					X		
For a pilot study or developmental test of a theory, has the researcher used a sample with relevant demographics?					X		
Even if the purpose is not to generalize to a population, has the researcher used a sample of adequate size?							X
Is the sample size adequate in terms of its orientation (quantitative versus qualitative)?							X
If a purposive sample has been used, has the researcher indicated the basis for selecting participants?							X
If a population has been studied, has it been clearly identified and described?					X		
Has informed consent been obtained?							X
Overall, is the description of the sample adequate?					X		

2.5 Evaluation of Instrumentation

This article uses Expert Choice software (http://www.expertchoice.com)[8] as an instrument to apply AHP method. The researcher proposes that the AHP software, Expert Choice, can calculate the results manually or automatically. The actual items have been provided in detail. For example, this article shows that the priority of contractor A is calculated by dividing the sum of the rows (0.08+0.082+0.073+0.073+0.118) by the number of contractors (K.M.A.S-S. Al-Harbi 24). It is desirable for the researcher to indicate the response format, but any specialized response formats including settings, and/or restrictions are not described in detail. This article does not present multiple methods used to collect data/information on each variable. And sources where additional information can be obtained have not been cited. Instead of this, this article focuses on the process of calculation through <Table 4> to <Table 12(24-27)>.

We think that this article does not have sensitive matter and has no relation to influence any overt behaviors that were observed. Also, AHP method itself has subjectivity on the collection and coding of observations but emphasizes the consistency of respondents. To avoid inconsistency and stability in the data, Consistency Ratio (CR) should be calculated. If the CR value for a matrix is less than 0.1, it is considered to have a good consistency in the calculation of the weights of the factors. If the CR value is over than 0.1, the researcher should again obtain a response through same questionnaire until the CR value is less than 0.1 [6], 1980). This article shows the pair-wise comparison matrix and priority vector for the validity (Pyrczak 25-26). Unfortunately, the researcher does not discuss obvious limitations of the instrumentation. We agree that the instrumentation section is mostly adequate. <Table 5> represents scoring of instrumentation by K.M.A.S-S. Al-Harbi (24); the questions are based on Pyrczak's model 153-154). The score by Pyrczak model is 35 out of 55 points, deleting 2 questions which are not applicable <Table 5>

<Table 5> Evaluation of Instrumentation

Questions for Evaluating Instrumentation	5	4	3	2	1	N /A	I/I
Have the actual items and questions (or at least a sample of them) been provided?	X						
Are any specialized response formats, settings, and/or restrictions described in detail?					X		
When appropriate,are multiple methods used to collect data/information on each variable?					X		
For published instruments, have sources where additional information can be obtained been cited?					X		
When delving into sensitive matter, is there reason to believe that accurate data were obtained?						X	
Have steps been taken to keep the instrumentation from influencing any overt behaviors that were observed?						X	
If the collection and coding of observations involves subjectivity, is there evidence of inter-observer reliability?			X				
If an instrument is designed to measure a single unitary trait, does it have adequate internal consistency?	X						
For stable traits, is there evidence of temporal stability?	X						
When appropriate, is there evidence of content validity?	X						
When appropriate, is there evidence of empirical validity?	X						
Do the researchers discuss obvious limitations of their instrumentation?					X		
Overall, is the instrumentation adequate?		X					

2.6 Evaluation of Analysis and Results (for quantitative research)

The objective of this section is to discuss the evaluation of quantitative research in this article. Most researches in quantitative analysis often use statistics including the descriptive and infripntial analysis. The AHP method used in this article focuses on 1 aculating the iplative weights of various factors through the quantitative method. AHP is copnosed of thipe main steps: (1) decopnosition (structuring the decision clublem), (2) copnarative judgment (judgment nfriach critriia at hierarchal anleveanby nairwise copnarison), and (3) detrimination of priors. (detrimination of the decision altrinatives' weight). And Consistency Ratio (CR)rixamines the consistency of a matrix. If the CR value for a matrix is less than 0.1, it is considered to have a good consistency in the calculation of the weights of the factors[5][6].

Originally, many researches using AHP show the underlying numbers of cases, but this article does not report the cases. Average for calculating the priority is used instead of calculating the means. Significance concept in AHP can be expressed by the CR value and the researchers noted that CR value is significant and small. We agree that the results section including the analysis is somewhat a cohesive essay. The researcher refers back to the research purposes, or questions originally stated in the introduction excepting for hypothesis. AHP method has not the hypothesis concept and just focuses on the calculation of priority. A number of related calculations in AHP have been presented in a table. This article shows the calculations from <Table 4> to <Table 12> (K.M.A.S-S. Al-Harbi 24-27). Also, the highlights of all tables are discussed in the narrative for explaining the process of calculation. AHP method is not related to inferential tests and so the researcher does not present descriptive statistics. We agree that the presentation of this section is comprehensible and adequate. The score by Pyrczak model (103-109) is 34 out of 45 points except for 1 question <Table 6>.

<Table 6> Evaluation of Analysis and Results

Questions for Evaluating Analysis and Results	5	4	3	2	1	N/A	I/I
When percentages are reported, are the underlying numbers of cases also reported?					X		
Are means reported only for approximately symmetrical distributions?				X			
If any differences are statistically significant and small, have the researchers noted that they are small?		X					
Is the results section a cohesive essay?		X					
Does the researcher refer back to the research hypotheses, purposes, or questions originally stated in the introduction?		X					
When there are a number of related statistics, have they been presented in a table?		X					
If there are tables, are their highlights discussed in the narrative of the results section?	X						
Have the researchers presented descriptive statistics before presenting the results of inferential tests?						X	
Overall, is the presentation of the results comprehensible?	X						
Overall, is the presentation of the results adequate?	X						

<Table 6> represents scoring of the analysis and results section in a research article by K.M.A.S-S. Al-Harbi (24-26); the questions are based on Pyrczak's model (155).

2.7 Evaluation of Discussion section

This section means the last section of a research article and is expressed by "Discussion and Conclusions," "Conclusions and Implications," or "Summary and Implications" (Pyrczak 121). This article just had the heading "Summary." Although summary of this article is very simple and brief, it is adequate for readers to understand the intention of this article. However, the researcher does not acknowledge specific methodological limitations and focuses on the summary.

The results are somewhat discussed in terms of the literature cited in the introduction and specific implications in the results are discussed. <Table 7> represents scoring of the discussion section including summary in a research article by K.M.A.S-S. Al-Harbi (26-27) ; the questions are based on Pyrczak's model (156).

<Table 7> Evaluation of Discussion

Questions for Evaluating Discussion	5	4	3	2	1	N/A	I/I
In long articles, do the researchers briefly summarize the purpose and results at the beginning of the discussion?	X						
Do the researchers acknowledge specific methodological limitations?					X		
Are the results discussed in terms of the literature cited in the introduction?			X				
Have the researchers avoided citing new references in the discussion?	X						
Are specific implications discussed?		X					
Are the results discussed in terms of any relevant theories?		X					
Are suggestions for future research specific?				X			
Have the researchers distinguished between speculation and data-based conclusions?					X		
Overall, is the discussion effective and appropriate?			X				

Author presents that AHP allows group decision-making and can also be implemented on computer. Although the researcher does not cite new references in the discussion, we agree that the results are discussed in terms of any relevant theories. Actually, the author does not suggest future research specific but infers various applications in project management. The researcher does not certainly distinguish between speculation and data-based conclusions. Generally, the conclusion including summary is short for an average conclusion but the summary is appropriate to some degree. The score by Pyrczak model (121-127) is 28 out of 45 points with all questions <Table 7>.

3. Conclusion

The objective of this section is to make an overall judgment by considering this article as a 'whole' (Pyrczak 129). Although the question in the evaluation ("Putting it all Together") are subjective, the following <Table 8> can show the problem of this article.

First, the author of this article does not select an important problem and is not reflective. Also the report is not cohesive. The report extends the boundaries of the knowledge on a topic, especially for understanding relevant theories. The paper has presented the AHP as a

decision-making method that allows the consideration of multiple criteria. And so, contractor prequalification in project management was created to demonstrate AHP application that allows group decision-making.

There are no methodological flaws unavoidable in the article. Although the research does not directly inspire additional research, the author emphasizes the use of AHP method in project management including application of the contractor prequalification. We agree that this article is likely to help in decision making for the further study. So, this article is worthy of publication in an academic journal. And we could not find any grammatical errors in this article. Overall score (Pyrczak 129-133) is 33 out of 45 points, with all questions applying to this article <Table 8>. <Table 8> represents scoring of the full research article by K.M.A.S-S. Al-Harbi (19-27); the questions are based on Pyrczak's model (156).

<Table 8> Evaluation of the Research Article

Questions for Evaluating the Research Article ("Putting it all Together")	5	4	3	2	1	N/A	I/I
In your judgment, has the researcher selected an important problem?				X			
Were the researchers reflective?				X			
Is the report cohesive?				X			
Dose the report extend the boundaries of the knowledge on a topic, especially for understanding relevant theories?		X					
Are any major methodological flaws unavoidable or forgivable?	X						
Is the research likely to inspire additional research?			X				
Is the research likely to help in decision making?	X						
All things considered, is the report worthy of publication in an academic journal?	X						
Would you be proud to have your name on the research article as co-author?	X						

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Appendix A
Abstract from 'Application of the AHP in project management' by K.M.A.S-S. Al-Harbi

This paper presents the Analytical Hierarchy Process (AHP) as a potential decision making method for us in project management. The contractor prequalification problem is used as an example. A hierarchical structure is constructed for the prequalification criteria and the contractors wishing to prequalify for a project. By applying the AHP, the prequalification criteria can be prioritized and a descending-order list of contractors can be made in order to select the best contractors to perform the project. A sensitivity analysis can be performed to check the sensitivity of the final decisions to minor changes in judgment. The paper presents group decision-making using the AHP. The AHP implementation steps will be simplified by using the 'Expert Choice' professional software that is available commercially and designed for implementing AHP. It is hoped that this will encourage the application of the AHP by project management professionals. (K.M.A.S-S. Al-Harbi 19)

프로젝트경영 관련 연구 논문 평가
- K.M.A.S-S. Al-Harbi의 'Application of AHP in Project Management' 논문을 대상으로 -

김민철 · 하태현

요 약

본 연구는 프로젝트 경영 분야 중 Al-Harbi (2001)의 논문을 Pyrczak (2008)이 제시한 평가절차에 의하여 분석하였다. 분석 대상으로 선정된 Al-Harbi (2001)의 논문은 프로젝트 경영에서 의사결정방법론으로서의 AHP (Analytical Hierarchy Process) 적용 가능성을 제시하였다. 이러한 논문의 평가를 위해서 여러 절로 구분하여 Pyrczak (2008)에서 제시하는 분석표에 의해 논문을 세부적으로 평가하였다. 본 연구는 연구 논문의 평가 방법을 정량화된 수치에 의해 보여줄 수 있음을 제안했다는 점에의 의미를 갖고 있다.

주제어 : 논문평가, 프로젝트 경영, AHP, 의사결정 방법론