

CHAPTER 2

LITERATURE REVIEW

This chapter aim in providing the literatures related to the research and the definition of project which is the orientation of this research. This chapter begins with the review in the definition of project, followed by the review in project management, project selection and analytic hierarchy process to end the chapter.

2. 1. Definition of Project

The project based on Webster's New World Dictionary (Guralnik, 2014) is defined as:

“A proposal of something to be done; plan; scheme; an organized undertakings; a special unit of work, research, etc.; an extensive public undertaking, as in conservation, construction, etc.”

There are several publications which describe the definition of projects as follow which refer to (Turney, 2009):

- a. Something which has a beginning and an end.
- b. A human endeavor which creates change, is limited in time and scope, has mixed goals and objectives, involves a variety of resources and is unique (Andersen *et al*, 2004).
- c. A complex effort to achieve a specific objective within a schedule and budget target, which typically cuts across organizational lines, unique and usually not repetitive within the organization (Cleland and King, 1988).
- d. A one-time, unique endeavor by people to do something that has not been done that way before (Smith, 2009).
- e. Any series of activities and tasks that together achieve predetermined deliverables in accordance with a quality definition, have defined start and end-dates, intermediate milestones, funding limits, and utilize resources such as equipment, materials, people, etc. (Hamilton, 2001).

2. 2. Recent Studies in Project Management

The initial search in ProQuest Databases Engines for project management returned 1718938 documents. Then, the documents were sorted to peer reviewed and publication year between 2010 and 2016. Figure 2.1. shows the process of the search in literature review for project management. The number of selected documents to contribute in literature review for project management is four documents.

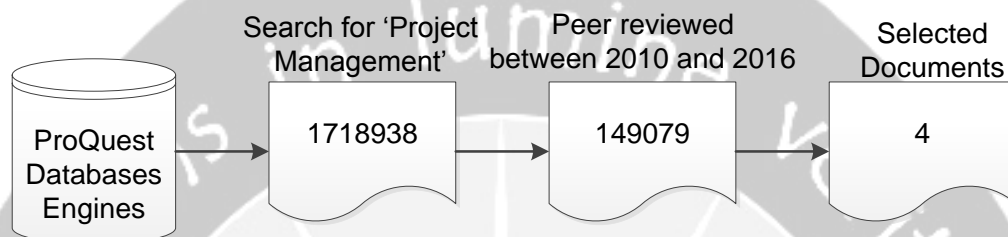


Figure 2.1. Illustration of Searching Process for Project Management

The implementation of the project in the organization is not always endure with the successful implementation which means that the project can be implemented within the given time or always has sufficient resources to complete the project implementation. The project management is needed in order to prevent the failure in project implementation. It is able to help in delivering a clear conception of the project implementation to the project team and reduce the risks which are caused by the lacks of information. A successful project management can be achieved by execute a careful project planning and a good knowledge within the project team (Little, 2011).

With the comprehension in the importance of the project in Small to Medium sized Enterprises, Turner *et al* (2012) proposed a suggestion in the needs of simpler forms of project management in Small to Medium sized Enterprises. This perception is based on the limitation of the resources availability in the Small to Medium sized Enterprises compared to the large organizations. The research conducted to identify the project management area of the projects used in Small to Medium sized Enterprises. The result of the research in the project management consideration in the Small to Medium sized Enterprises suggested that the consideration which is used a lot for Small to Medium sized Enterprises in project management is the requirements definition.

The innovation of agile approach in project management is investigated by Doherty (2010) in the projects of Learning Technology Units (LTU) at the

University of Auckland. The agile approach is necessary on its implementation because of the incapability of the environment in university culture to employ the required process on all projects. In this case, project management is a controlled and directed process with the potential to cause conflict and resistance in a collegial environment. The project start up begins with the requirement of the Expression of Interest Document as the determination of the project. The document will be assessed. The next stage is the project initiation which aims in the detailed definition of the project by completing Need Analysis Document. The initiation of projects will be followed by directing the project, managing product delivery and managing stage boundaries. The project management will end with the Project Close Out document.

Tynan *et al* (2010) investigate the same field of project management which is on Distance Education but with the detail of three different projects. The three projects are Sakai Distance Education, Postgraduate Business Programs Academic Renewal and 'Developing Our Staff' Project at a large Australian distance education University in three different departments. Sakai Distance Education is a project in School of Education to take advantage of the effectiveness on online learning and teaching with two phases such as Reconnaissance phase and the Action Research Cycle phase. Postgraduate Business Programs Academic Renewal is a project which implements the Three-Phase Design Model (3PD) on its project management. 'Developing Our Staff' is a project which develops a shared Graduate Certificate in Tertiary Education (GCTE) across participating universities.

The examination of the application of project management principles in organizational strategic planning has been done by Maddalena (2012) in health organization. The project management on health organization is useful to determine the required time and resources so the organization can ensure an effective and timely implementation of strategic goals. It has been proven that by the incorporation of the executive leader in the strategic planning and implementation process can increase the effectiveness and improve accountability.

The uncertainty of the project develops the risk in the project implementation. In order to reduce the risk in the project, Browning and Ramasesh (2015) conducted a research by suggested two categories of approaches in the project

management. Browning and Ramasesh classified the uncertainty to six project domains which are result subsystem, process subsystem, organization subsystem, goals subsystem, tools subsystem and the project's context. There are six factors in driving the uncertainty which are complexity, complicatedness, dynamism, equivocality, mindlessness and project pathologies. The two approaches in reducing the risk are product design approach and behavioral approach.

From the result of several studies and researches, the project management has found as a significant activity in support the organization in reducing the risk of the project implementation. The implementation of project management will has a different approach for every organization or even for every project based on the needs, types and size of the organization. Table 2.1. shows the phases for each project management from several studies and researches.

2. 3. Recent Studies in Decision Making

In every aspect, it is already a common to be confronted with many choices and options. Dealing with many choices and options, there are many factors which have to be considered in order to get the best decision. From the personal life, company, organization, society or even world sometimes have to deal with making decision and the result of the decision might gives just a small effect and also might be a decision which can has a great effect to the whole world. Based on the awareness of the importance in decision making, there is a discipline that largely used to solve a complex problem involves multiple criteria to be evaluated and analyzed and it is known as Multiple Criteria Decision Making (MCDM). The wide variety of MCDM application has been studied in many fields such as technology, environment, manufacturing and construction.

The initial search in ProQuest Databases Engines for MCDM returned 1213 documents. Then, the documents were sorted to peer reviewed and publication year between 2010 and 2016. Figure 2.2. shows the process of the search in literature review for MCDM. The number of selected documents to contribute in literature review for MCDM is eight documents.

Table 2.1. The Phases of Project Management in Literature Reviewed

No	Author(s)	Publication Year	Published Title	Phases
1	Doherty	2010	Agile Project Management for E-Learning Development	<ol style="list-style-type: none"> 1. Project Start Up 2. Project Initiation 3. Directing a Project 4. Managing Product Delivery 5. Managing Stage Boundaries 6. Project Close Out
2	Tynan <i>et al</i>	2010	Managing Project for Change: Contextualised Project Management	<ol style="list-style-type: none"> 1. Build 2. Enhance 3. Maintain

Table 2.1. Cont'd

No	Author(s)	Publication Year	Published Title	Phases
3	Maddalena	2012	A Primer on Project Management	<ol style="list-style-type: none"> 1. Preliminary Examination 2. Assemble the Right Team 3. Create an Accountability Framework 4. Determine the Probable Life Cycle of the Project 5. Implement and Monitor 6. Post-Project Follow-Up
4	Browning and Ramasesh	2015	Reducing Unwelcome Surprises in Project Management	<ol style="list-style-type: none"> 1. Decompose the project 2. Analyze scenarios 3. Use checklists 4. Scrutinize plans 5. Use long interviews 6. Pick up weak signals 7. Mine data

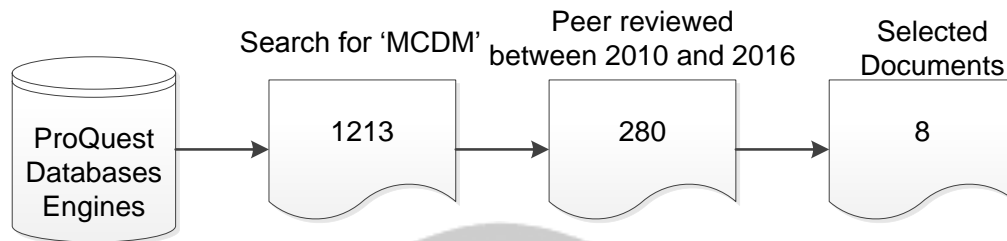


Figure 2.2. Illustration of Searching Process for MCDM

Rekik *et al* (2016) have done the study to classify the MCDM methods in assessing the quality of web sites. The classification is based on the features and limitation of the MCDM methods:

a. Scoring methods.

The fundamental of scoring or utility methods is to present the decision maker's preferences on the alternatives in the form of score or utility. The methods for scoring or utilization are the Analytic hierarchy process (AHP) and Analytic network process (ANP).

b. Compromising Methods.

The utilization of compromising methods in MCDM is to find a feasible solution closest ideal and to help the decision maker in achieving the final solution. The methods which classified as a compromising methods are VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS).

c. Outranking methods

ELimination and Et Choice Translating Reality (ELECTRE) and PROMETHEE are the methods belong to outranking method. Both of them can solve the uncertain choice problems which involves a preference relation called outranking relation among alternatives.

d. Other methods.

Genetic algorithm is a method in artificial intelligent field which can identifies the critical criteria from the multiple criteria by determining the degree of importance in criteria.

Sarmiento and Thomas (2010) have done the study in MCDM to implement a green initiative in supply chain as a green supply chain. The implementation focuses on the green raw material as the goal. The decision is made to identify the implementation period involves several suppliers as the tiers in the hierarchy.

The MCDM method used in the study is the multitier Analytic hierarchy process (AHP). Based on the Analytic hierarchy process or also known as AHP which is a method in decision making tools that can be used in multi-attributed, complex and unstructured problems, Rekik *et al* combined this method with the multitier approach in the implementation of green initiatives. AHP is a basic leading principle for the general structure of a complex problem using a hierarchical structure and the utilization of pair-wise comparisons.

The extension of analytic hierarchy process method is known as the analytic network process (ANP). While AHP presents the problem in the form of hierarchical structure, ANP builds the problem's model in the form of network. In structuring the ANP, the requirement is the definition of the element and their tasks in clusters, along with their relationship (i.e., the relation among elements which indicate the flow of influences between them). The previous study in analytic network process is done by Chakraborty *et al* (2010) in manufacturing supplier selection. The implementation of ANP in supplier selection proposed in 5 steps from network hierarchy development, pair comparison, weight calculation, super matrices formation and normalization, the last step is to converge into a super matrix.

The recent study in analytic network process on selection of converters for wave farms systems is to provide reliable methodology for the selection of the converters. The method is provided in three steps such as selecting the criteria, selecting the alternatives and aggregating the method. The totals of twenty parameters were used to select more suitable converters to be used in wave farms (Ghosh *et al*, 2016).

A research is conducted in the application of analytic network process combined with future search conference technique to select a sustainable Learning Technology Intervention (LTI) for a typical developing country. As a qualitative approach, the future search conference mind mapping is used to reduce the alternatives from nine alternatives to five alternatives and the parameters to three parameters per criterion. As a quantitative approach, the analytic network process is used to present the ranking or priority for each alternatives and the weight for each parameter (Raji and Zualkernan, 2016).

The combination of three methods which involves the analytic hierarchy process is found in the research by Wu *et al* (2016). The research is conducted to evaluate the enhancement and improvement in China's technology and financial services platforms innovation strategy. DEMATEL, Analytic Network Process and modified VIKOR are proposed to select and reconfigure the aspired technology and financial services platforms. The first method to be used in this research is DEMATEL technique which purpose is to show the network relation diagram in three steps followed by the application of ANP to DEMATEL to confirm the influential relationship of the criteria. After the application of DEMATEL and DANP, the modified VIKOR is applied to derive the optimal alternative/criteria/factor.

The utilization of multiple criteria decision making in the industry has been researched by Sen *et al* (2015) in the selection of the industrial Robot. In this study, Sen *et al* explored the preference ranking organization method for enrichment evaluation II (PROMETHEE II) method to select the best suited robot for specific industrial purpose. The application of PROMETHEE II is due to its ability to provide complete ranking order of all available alternatives which useful to avoid errors in decision making.

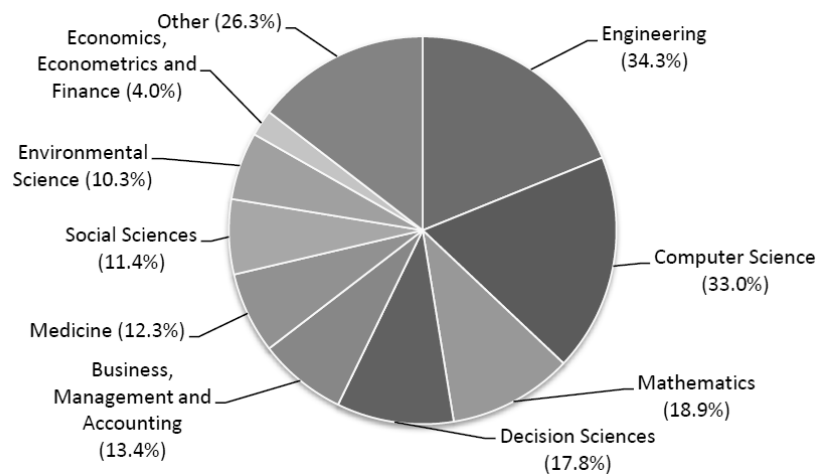
The multiple criteria decision making has been done to provide the African and Asian development bank with the selection of the countries as the fragile states for support facility. This research is based on the keen competition between the countries to get the assistances in support facility. The research explores the fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to solve the problem. TOPSIS is a famous method in multi-criteria decision making. It was first proposed by Hwang and Yoon in 1981. On the other side, AHP is a method using pair-wise comparison while TOPSIS is based on the principle which the ideal alternatives has the level for criteria and the negative ideal is the one with all the worst criteria values. The research ensuring the transparency and fairness by take into account the effect of variations in expert ratings as a result of possible influences. (Afful-Dadzie *et al*, 2015)

The various methods in multiple criteria decision making has made the flexibility in solving the selection problem. The variety of methods not only limited to the application of a single technique in selection problem, there are some research

which have been conducted in the modification of multiple criteria decision making by combining several methods.

A research has been done by Tučník and Bureš (2016) in the application of multiple criteria decision making by combining four methods which selected according to their appropriateness for computational processing in Agent-based Computational Economic applications. The Weighted Product Model is considered as the first option for the application based on the concept to start with the simplest alternatives and the WPM are found to be the prevalent method to provide it. The next method is Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) which gives the solution that hypothetically closest to the best and farthest from the worst. The use of TOPSIS in this research is followed by Vise Kriterijumska Optimizacija I Kompromisno Resenje (VIKOR) which gives the result by selecting the alternatives with conflicting criteria by comparing the measure of closeness to the ideal alternative. The last method to be applied in the research is Preference Ranking Organization Method for Enrichment Evaluation (PROMETHEE). PROMETHEE has been proposed to encompass six ranking formats such as PROMETHEE I (partial ranking), PROMETHEE II (complete ranking), PROMETHEE III (ranking based on intervals), PROMETHEE IV (continuous case), PROMETHEE V (net flows and integer linear programming), and PROMETHEE VI (representation of human brain). The PROMETHEE II is applied in the research to present the ranking of the alternatives is based on positive and negative flows.

Multiple criteria decision making has been proven to be used in various fields and can be useful to solve many complex decision problems. Figure 2.3. present the spread of the MCDM Techniques Areas based on Scopus database.



Source : Scopus Database

Figure 2.3. The Spread of MCDM Technique Areas

The classification of the literature reviewed based on the MCDM Technique areas is shown in Table 2.2.

2. 4. Previous Studies on Project Selection

The globalization of market has brings the firm to force and rely more on Research and Development. The firm is always operates in uncertain and dynamic environment and it makes their competitiveness is depend on their organizational improvement. However, the limitation on finance and resources restrain the firm to perform all of the improvement projects. To deal with those constraints, the firm has to take an important evaluation to make a prioritization to select a suitable project to be carried out.

The initial search in ProQuest Databases Engines for project selection returned 873729 documents. Then, the documents were sorted to peer reviewed and publication year between 2010 and 2016. Figure 2.4. shows the process of the search in literature review for project selection. The number of selected documents to contribute in literature review for project selection is four documents with an addition of a document which provides the research in Technology Road-Maps (TRM) for project selection.

Table 2.2. The Classification of Literature Reviewed in MCDM.

No	Author(s)	Publication Year	Method	Published Title	MCDM Technique						
					A	B	C	D	E	F	
1	Sarmiento and Thomas	2010	Multitier AHP	Identifying Improvement Areas When Implementing Green Initiatives Using a Multitier AHP Approach	√			√			
2	Chakraborty et al	2010	ANP	ANP for Manufacturing Supplier Selection	√						
3	San et al	2015	PROMEHTEE II	Multi-criteria Decision Making towards Selection of Industrial Robot	√	√					

Description:

A: Engineering

B: Computer Science

C: Social Sciences

D: Environmental Science

E: Economics, Econometrics and Finance

F: Other

Table 2.2. Cont'd

No	Author(s)	Publication Year	Method	Published Title	MCDM Technique						
					A	B	C	D	E	F	
4	Afful-Dadzie et al	2015	fuzzy TOPSIS	A Fuzzy TOPSIS Framework for Selecting Fragile States for Support Facility							√
5	Ghosh et al	2016	ANP	Application of ANP in Selection of Converters for Wave Farm Systems				√			
6	Raji and Zualkernan	2016	Future Search Conference Mind Mapping and ANP	A Decision Tool for Selecting a Sustainable Learning Technology Intervention					√	√	

Description:

A: Engineering

B: Computer Science

C: Social Sciences

D: Environmental Science

E: Economics, Econometrics and Finance

F: Other

Table 2.2. Cont'd

No	Author(s)	Publication Year	Method	Published Title	MCDM Technique						
					A	B	C	D	E	F	
7	Wu <i>et al</i>	2016	DEMATEL, ANP and modified VIKOR	Evaluating the Enhancement and Improvement of China's Technology and Financial Services Platform Innovation Strategy		√			√		
8	Tučník and Bureš	2016	WPM, TOPSIS, VIKOR, PROMET HEE II	Experimental Evaluation of Sustainability of Selected Multi-Criteria Decision-Making Methods from Large-Scale Agent-Based Simulation					√		

Description:

A: Engineering

B: Computer Science

C: Social Sciences

D: Environmental Science

E: Economics, Econometrics and Finance

F: Other

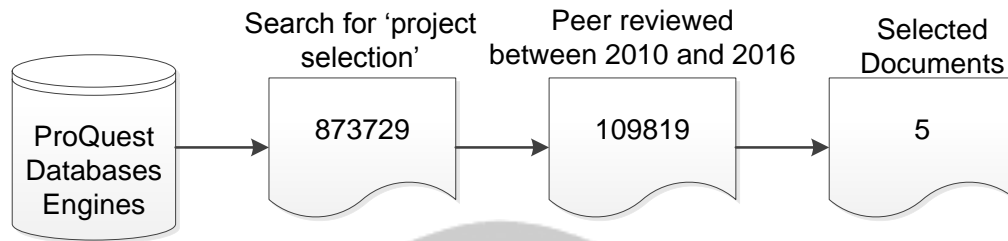


Figure 2.4. Illustration of Searching Process for Project Selection

The recent research which combines the project selection models and Analytic Hierarchy Process (AHP) has been done by Elahi and Najafzadeh (2012). The research aims in analyzing the Analytic Hierarchy Process as an innovative method in project selection. The Analytic Hierarchy Process is chosen based on the concept where the researchers use statistical tools, arithmetic logic and operational research methodology in making a proper decision while the decision maker often relies on the past experiences and specific policies and these factors should be taken as the important considerations.

A research in combining Analytic Hierarchy Process with another method called hybrid decision model has been conducted by Yang *et al* (2013) in the selection of information project. The hybrid selection model of Enterprise Information System will accelerate project evaluation and selection and help organizations optimize project selection while achieving sustainable development. In the research the first method is to convert the factors to build the final and complete assessment for information project selection. After the conversion, the Analytic Hierarchy Process is conducted to give the weight in each element. The criteria considered in this research are Benefits, Opportunities, Costs and Risks (BOCR).

Lee *et al* (2008) proposed a suggestion in Technology Road-Maps as a tool to assist with project selection and planning based on the evidence that the existing project portfolio methods have failed to take firms' long-term strategies into account. Technology Road-Maps is a method in project selection activities and planning activities integration and enabling a firm to carry out both strategic and detailed planning in the long term. It provides a graphical way of exploration and communicates the relation between elements. TRM applied in three constitutive phases such as initiation, deployment and implementation.

The complicated project portfolio selection often requires to considering the multiple selection criteria of project interaction and the preference information of decision maker. In this term, those requirements are have to be formulated first and it makes the Genetic Algorithm- based Nonlinear Integer Programming (GA-based NIP) is an appropriate method to solve this problem. In this study, the application of Genetic Algorithm aims in devise a feasible and effective solution while Non Integer Programming is the main approach to solve the project portfolio selection problem (Yu *et al*, 2012).

The exact numerical value is not always feasible to be applied on the project portfolio selection. In this term, the use of fuzzy number needs to be applied. Bolat *et al* (2014) has conducted a research in the exploration of Fuzzy Analytic Hierarchy Process (FAHP) and Fuzzy Multi-Objective Linear Programming (FMOLP) to be applied on the project portfolio selection. The Fuzzy Analytic Hierarchy Process is determined to gives the weights of project. The weights will be applied as the utilities in the evaluation process. Fuzzy Multi-Objective Linear Programming will be utilized to formulate four different objectives such as revenue, social benefit and utilities maximization while minimizing the constraint in the limitation of resources.

Table 2.3. The Criteria on the Literature Reviewed in the Project Selection

No	Author(s)	Publication Year	Method	Published Title	Area	Selection Criteria									
						A	B	C	D	E	F	G			
1	Lee <i>et al</i>	2008	TRM	Applying Technology Road-Maps in Project Selection and Planning	technological potential of the Korean BNM Industry		✓								
2	Elahi and Najafzadeh	2012	AHP	Project Selection and Prioritization in Iranian Aluminium Company (IRALCO)	Project in Iranian Aluminium Company	✓	✓	✓	✓	✓					
3	Yu <i>et al</i>	2012	GA-Based NIP	Genetic Algorithm-based Multi-Criteria Project Portfolio Selection	Two different amount of project's variables		✓		✓				✓		
4	Yang <i>et al</i>	2013	Hybrid AHP	Hybrid Decision Model for Information Project Selection	Information project in an airplane company		✓			✓			✓		✓
5	Bolat <i>et al</i>	2014	FAHP and FMOLP	A fuzzy Integrated Approach for Project Selection	Information system project in Turkish IS Company		✓					✓		✓	✓

Description:

A: Production

E: Marketing

B: Economic

F: Human resource

C: Politic and Law

G: Period of Implementati

D: Technology

2. 5. Previous Studies on Analytic hierarchy process (AHP) Approach.

An abundant number of researches in the variance of criteria of decision making process have been done for several years. Among several decision making approach, Analytic Hierarchy Process is one which commonly used to solve the complex decision problem. Analytic Hierarchy Process has been originated in 1970s in the United States and used for solutions with concerns in the construction and multi-criteria evaluation systems. AHP has been used with success to solve many practical problems. It is proposed by Thomas Lorie Saaty, A Professor at Wharton Business School in Philadelphia. The application of AHP in solving a problem is comprised into two phases. The first phase is the preparation of hierarchical structure and the second phase is the evaluation of elements and consistency (Cabala, 2010).

The initial search in ProQuest Databases Engines for AHP returned 8719 documents. Then, the documents are sorted to peer reviewed and publication year between 2010 and 2016. Figure 2.5. shows the process of the search in literature review for AHP. The number of selected documents to contribute in literature review for AHP is six documents.

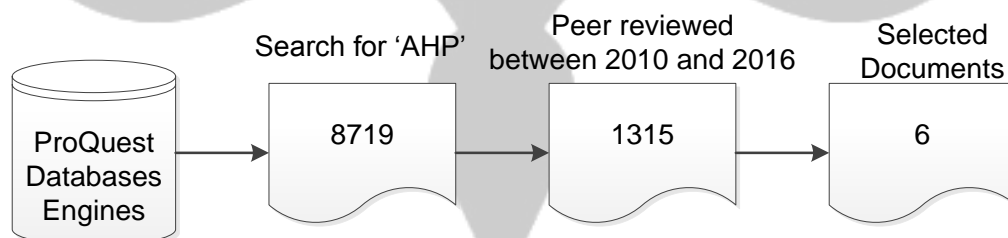


Figure 2.5. Illustration of Searching Process for AHP

Okoe *et al* (2013) conducted a research in bank selection using Analytic Hierarchy Process as a single framework. The research is the exploration of criteria in the bank selection based on the student in Institute of Professional Studies at Ghana. The hierarchical structure is determined based on the focus

group discussion with several participants which is the undergraduate student in Institute of Professional Studies in Ghana. The research is conducted base on the concept that the undergraduate student is currently the main target for the Banks sector and the finding is contributes in giving a knowledge of the criteria in Bank selection of the undergraduate students in Ghana.

There are several methods which can be combined with Analytic Hierarchy Process to yield some advanced features on this method. The research which combines Data Envelopment Analysis with Analytic Hierarchy Process to become an approach called Data Envelopment Analytic Hierarchy Process is conducted by Yadav and Sharma (2015) for supplier selection. The combination of Data Envelopment Analytic Hierarchy Process is applied base on the investigation in which the ranking will change in the addition of a new alternative. In DEAHP, the weight of each alternative is calculated separately and there is no arithmetic normalization.

Another improvement of Analytic hierarchy Process has been done to select strategic industrial location for Casablanca Industrial Zones by Boutkhoul *et al* (2015). The analytic hierarchy process is combined with fuzzy environment and Online Analytical Processing (OLAP) system. The research applied the analytic hierarchy process to obtain the weight of each criterion and the ranking of criteria. The weights of the criteria from Fuzzy AHP become an input for the evaluation and selection of strategic location using OLAP optimized model combined with Multi-Criteria Decision Making Analysis (MCDA) as the last step in the research.

The combination of earliest methodology in Multi Criteria Decision Making with analytic hierarchy process is found in the research for evaluation and selection of conveyor equipment by Nguyen *et al* (2015). The research using the analytic hierarchy process combined with additive ratio assessment to solve a decision problem in a flexible manufacturing cell. A Fuzzy Analytic Hierarchy Process is applied to generate the weights of the criteria to be used in the next step. The Fuzzy Additive Ratio Assessment is utilized to present the ranking of conveyor alternatives. The validation of the result is conducted using the Technique for Order Preference by Similarity to Ideal Solution.

The Technique for Order Preference by Similarity to Ideal Solution and Analytic Hierarchy Process are the common methods found in many research for Multi-Criteria Decision Making (MCDM) Problem. The combination of those methods

with Delphi and the implementation of the web-based network development are found in the research by Hanine *et al* (2016) for the selection of location for landfill waste in Morocco. This research is conducted in the field of Fuzzy Multi-Criteria Group Decision Making (FMCGDM). There are three phases in this research. The first phase is determination of the criteria based on the requirements of the expert and decision maker using Fuzzy Delphi Method. The second phase is the evaluation of the weights for the criteria using Analytic Hierarchy Process Method and those weights become the input in the application of Technique for Order Preference by Similarity to Ideal Solution to determine the best alternative.

The recent research in the project selection as one of multi criteria decision model problems using a linear model in the form of Linear Programming (LP) method combined with analytic hierarchy process in project selection has been conducted by Parvaneh and El-Sayegh (2016). The research is performed in the construction industry to select the best project with seven criteria. The first step is the application of Analytic Hierarchy Process to generate the priority of the projects based on the owner's goals and objectives. The weights from the Analytic Hierarchy Process model are used as an input in the form of coefficient of decision variables for the application of Linear Programming model. The linear Programming model is applied to perform the allocation of the available budget in an optimal way in order to maximize the benefit.

There are many researches in Multi Criteria Decision Making Problem using the Analytic Hierarchy Process to solve the problem. The researchers often combined this method with one or several methods to generate more precise result or to get additional features in MCDM problems. Table 2.4. shows the summary of the literature reviewed and the decision area of each research.

Table 2.4. The Decision Area of the Literature Reviewed

No	Author(s)	Publication Year	Method	Published Title	Decision Area
1	Okoe <i>et al</i>	2013	AHP	Using the Analytical Hierarchy Process Framework to Study Bank Selection Criteria of Students in Institute of Professional Studies in Ghana	Selection of Bank in Ghana
2	Yadav and Sharma	2015	DEAHP	An Application of Hybrid Data Envelopment Analytical Hierarchy Process Approach for Supplier Selection	Supplier selection in automobile company in India
3	Botkhoum <i>et al</i>	2015	FAHP-OLAP	An Improved Hybrid Multi-Criteria/ Multidimensional Model for Strategic Industrial Location Selection: Casablanca Industrial Zones as a Case Study	Strategic Industrial Location
4	Nguyen <i>et al</i>	2016	FAHP-FARAS	An Integrated MCDM Model for Conveyor Equipment Evaluation and Selection in an FMC Based on a Fuzzy AHP and Fuzzy ARAS in the Presence of Vagueness	Conveyor Equipment in FMC
5	Hanine <i>et al</i>	2016	FAHP-FDM-FTOPSIS	A New Web-based Framework Development for Fuzzy Multi-Criteria Group Decision-Making	Multi Criteria Groups Decision
6	Parvaneh and El-Sayegh	2016	AHP-LP	Project Selection Using the Combined Approach of AHP and LP	Selection of Construction Project