AHP APPLICATION IN A FINANCIAL INSTITUTION[1]

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ABSTRACT

This paper deals with the application of the Analytic Hierarchy Process (AHP) to solve decision making problems in the Development Bank of Ethiopia project financing process. This paper presents an AHP model to select the most feasible project among alternatives. The model has seven criteria including: technical, market and demand, financial, socio-economic, institutional, discounting and non-discounting factors. For these main criteria there are twenty seven sub-criteria. The application of this method in a financial institution ensures reduction of the project evaluation time and increases reliability of the decision made. Furthermore, since the decision made can be traced back to the model at any time, the new method will reduce corruption and promote employees' confidence.

Key Words: Decision making, AHP, project financing
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1. Introduction

Project financing is one of the most critical roles of financial institutions, despite the risks associated with it. To minimize project failure after disbursing the finances, financiers carry out a rigorous evaluation and appraisal of the projects being considered for support. These decision making processes often take a long period of time, and are also highly susceptible to corruption.

In Ethiopia the Development Bank of Ethiopia, the Commercial Bank of Ethiopia, and the Construction and Business Bank are the predominant project financing institutions. This research is mainly focused on the Development Bank of Ethiopia (DBE) since it specializes in project financing. In addition, DBE is an instrument the government uses to

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implement its policy and strategy for the country's development. Basically, DBE uses the following process to finance a project: project proposal preparation by the client, pre-qualification evaluation of the project, pre-approval evaluation, appraisal of the project, decision by committee and finally the financing and follow up of the project.

The decision making process, particularly the two stages of project appraisal and decision by a loan committee, take a long time. At the project appraisal stage, the task of the project evaluator is to provide their recommendation for the loan committee after a thorough analysis. Based on the evaluators' recommendation other people, who do not know the project, decide whether or not to fund it. This system is in place to avoid a conflict of interest and to control the members in the appraisal team. However, since the loan committee does not have in-depth knowledge about the projects, it reduces the transparency, accuracy and reliability of the decision making process. It also extremely prolongs the time of the decision making process because the loan committee needs to write a detailed recommendation after understanding the project.

Another problem in the bank is that there are decision makers with managerial responsibility who try to safeguard themselves as much as possible. It is indeed an irony to see that people are holding managerial positions, and yet they are not willing to make decision and/or take actions. This state of paralysis on the part of the decision makers leaves the economic sector suffering from inefficiencies due to indecision. Managers authorized to make decisions at various levels in the bank are observed to either not make decisions at all, not make decisions on time, or not make the best or even the right decisions. In general, the decision makers in the bank always strive to reduce the risk of a financed project's failure by taking a longer time to perform the analysis and evaluation. Currently the total process requires a minimum of four to six months. These delays create a paradoxical situation of underutilized (idle) cash on the one hand, and a cash hungry (starved) economy on the other.

The aim of this study is to introduce a multi-criteria decision making approach known as the Analytic Hierarchy Process (AHP) in the DBE project financing system to reduce the decision making time, and at the same time to increase the accuracy of the decisions made.

The Analytic Hierarchy Process (AHP) was developed by Thomas L. Saaty in the 1970s. It provides a flexible and easily understandable way to analyze and decompose a decision problem. In its general form, it is a framework for performing both deductive and inductive thinking. AHP in essence is a procedure for measuring priorities in a hierarchical goal structure. It requires making pairwise comparison judgments about the criteria to derive their relative importance to the goal and pairwise comparison judgments of the alternatives with respect to the criteria for preference. These judgments can be expressed verbally, and enable the decision maker to incorporate subjective experience and knowledge in an intuitive and natural way (Ababutain, 2002).

According to Sipahi (2010), research in the field of AHP is growing exponentially. There are applications of AHP in the areas of manufacturing, environmental management, agriculture, power and energy industries, transportation industry, construction industry, healthcare education, logistics, e-business, IT, R&D, telecommunication industry, finance and banking, urban management, defense industry and military, government, marketing,

tourism and leisure, archaeology, auditing, and the mining industry. It is widely applicable since it is a general process for determining measurements.

There has also been some research conducted on applying AHP in evaluating research projects (Liang, 2003; Wang, 2005; Shin, 2007; Sun, 2008; Huang, 2008). In banking, the AHP has been used in strategic planning (Arbel, 1990). However, up until now, no research has been undertaken on the application of AHP in financial institutions allocating money for projects. Therefore, this research will be important for financial institutions in general and the DBE in particular.

2. Methodology

In order to achieve the aforementioned objectives a step-by-step methodology was followed. First, the critical factors and parameters of the success factors for an industrial project were examined and identified. Project financing experts from the Development Bank of Ethiopia, Construction and Business Bank, and Commercial Bank of Ethiopia participated in identifying the success factors. Furthermore, these financers' also provided the basic criteria used to evaluate the projects. After the AHP structure was developed, it was evaluated by a group of experts consisting of six members from the Development Bank of Ethiopia including the Vice President for loan service, the head of a technical project study and other experts who evaluate projects during the loan provision process.

Three projects from the Development Bank of Ethiopia were selected for use in validating the AHP model. Finally, a general decision making process for financial institutions is proposed along with an implementation strategy. The limitation of this paper is that it does not explain the details of the actual projects that were evaluated since it is bank policy not to disclose project information to a third party.

Given that different projects have different characteristics with different success and failure factors, Ethiopian banks overall, and the Development Bank of Ethiopia in particular, have developed general criteria to evaluate individual projects from a wide perspective in order to select and finance the most viable projects. Some drawbacks to their process are that the criteria do not consider all the factors that affect a project, nor is there a systematic way to measure the effect of individual factors on the overall performance of a project. Furthermore, the overall performance of the projects on the criteria cannot be aggregated. The other limitation of the current decision making process is essentially the departmental paralysis.

In this study, we structure the criteria in a hierarchy so the decision can be made by a group of experts and professionals making judgments. As a result, Development Bank of Ethiopian should be able to reduce the time required to evaluate and decide on the viability of a project, and can measure the overall effects of all the criteria and at the same time increase the reliability of the decision made.

3. Identification of criteria

The identification of project evaluation criteria is the most important stage in the application of AHP for project selection. Extensive criteria and sub-criteria were identified including all the characteristic aspects of a project that trigger failure (Chandra, 2005; Commercial Bank, 2005; Construction Bank, 2006; Development Bank, 2006; Harrison, 1992). However, the decision maker can suspend any criteria which are not relevant to the projects under consideration. The main criteria and the sub-criteria we developed are explained below and summarized in Table 1. The main criteria are technical, market and demand, finance, socio-economic and institutional. The sub-criteria are discussed for each criterion.

3.1 Technical criteria

The main factors considered in evaluating a project from a technical point of view include: the availability of raw materials, appropriate location and site, production capacity, production process and technology, machinery and equipment, project charts and layouts, and schedule of project implementation. The sub-criteria for this criterion include:

1. Raw materials: The evaluator should assess the availability of raw materials in terms of right amount, place, and quality. The raw material supply program also should be taken into consideration. There is an intimate relationship between the raw materials and the other parts of the project formulation, particularly those concerned with location, technology, and equipment. The greater the availability of raw material for the designed project, the better it is and the higher the project will rank.

2. Production process/technology: Appropriate technology refers to those methods of production which are suitable to the local economic, social, and cultural conditions. The production process/technology should be evaluated for: (1) Utilization of local raw materials, (2) Utilization of local man power, (3) whether the goods or services produced cater to the basic needs of the society, (4) whether the technology protects ecological balance, (5) whether the technology is harmonious with social and cultural condition. The greater the feasibility of the production process/technology, the higher the rank.

3. Machinery and equipment: Requirements for machinery and equipment depend on the production technology, plant capacity and type of project. The machinery and equipment should be evaluated for: (1) its feasibility to the production technology, plant capacity, and the type of project, (2) availability of spare parts, and (3) availability of machinery operators. The greater the feasibility of machinery and equipment design, the higher the rank.

4. Plant capacity: Plant capacity (production capacity) should be evaluated for: (1) technological appropriateness, (2) availability of the inputs, (3) amount of investment cost and (4) market availability. The greater the feasibility of plant capacity for the designed project, the higher the rank.

5. Location and site: Location and site should be evaluated for: (1) proximity to raw materials and markets, (2) availability of infrastructures such as electric power,

transportation, water, communications and other utilities, (3) labor availability, and (4) government policies. The greater the location and site suitability for the designed project, the higher the rank.

6. Project charts and layout: Evaluation of project charts and layout includes: (1) general functional layout, (2) material flow diagram, (3) production flow diagram, (4) production line diagram, (5) transport layout, (6) utility consumption layout, (7) communication layout, (8) organizational layout, and (9) layout. The greater the feasibility of the project charts and layout design, the higher the rank.

7. Schedule of project implementation: Evaluation of project schedule and implementation should include: (1) list of possible activities from project planning to commencement of production, (2) the sequence in which various activities have to be performed, (3) the time required for performing the various activities, (4) the resources normally required for performing the various activities. The greater the feasibility of the schedule of project implementation design, the higher the rank.

3.2 Market and demand criteria

Products and services should be marketable. To ascertain this, project market and demand analysis is vital. These include: the availability of customers for the products/services, identification of other suppliers and/or substitutes for the items in demand and a way to penetrate the market (marketing strategy). The sub-criteria for market and demand criteria include:

1. Demand: The demand for the product/services should be evaluated for: (1) the availability of customers for the products/services, (2) the total demand for the products/services in a particular period of time and the life time of the products/services. The greater the demand for the products/services that are produced, the higher the rank.

2. Supply: The supply of alternative product/services in the market should be evaluated for: (1) availability and nature of the product and services, (2) local production level, (3) import, and (4) the export level of the product or services. The supply analysis is important to determine the gap between the demand and the supply. The lesser the number of alternative suppliers, the higher the rank.

3. Marketing strategy: The evaluators of the marketing strategy should assess the distribution channels, promotional strategy, pricing and positioning of the products/services. The greater the feasibility of the strategy designed, the higher the rank.

3.3 Financial criteria

To measure the affordability and profitability of a project, financial analyses should be conducted that include the total cost of the project, the cost of production, the means of financing and profitability projections. The sub-criteria of project financial criteria include:

1. Cost of the project: Project cost should include (1) land and site development, (2) building and civil works, (3) plant and machinery, (4) technical know-how and

engineering fees, (5) expense of foreign technicians and training, (6) preliminary and capital issue expenses, (7) pre-operative expenses, (8) margin money for working capital, (9) initial cash losses. The less the project cost and affordability, the higher the rank.

2. Cost of production: The major costs of production such as material cost, utilities cost, labour costs and factory overhead costs should be evaluated. The less the production cost, the higher the rank.

3. Means of finance: The evaluator should assess the potential source of finance for the project implementation and operating cost. The greater the feasibility of financing, the higher the rank.

4. Profitability projections: Given the estimates of sales revenues and costs of production, the next step is to prepare the profitability projections or estimates of working results. The greater the profitability of the designed project, the higher the rank.

3.4 Socio-economic criteria

At large, any activity should contribute to a society's well-being and economic development. In order to justify that this will occur, socio-economic analyses is necessary including: project effect on employment, project effect on net foreign exchange of a country, the impact of a project on net social benefits and welfare. The sub-criteria of socio-economic criteria include:

1. Employment effect: While assessing the impact of a project on employment, both unskilled and skilled labor has to be taken into account. Not only direct employment, but also indirect employment opportunities created within the project have to be taken into account. Furthermore, employment opportunities created in the input and output sides of the project should be considered. The greater the potential employment the project will generate for the country, the higher the rank.

2. Net foreign exchange effect: A project may be export-oriented or it may reduce reliance on imports. In such analysis the effect of the project on the balance of payments for the country and the potential for import substitution is necessary. The assessment of the project on the country's foreign exchange could be done in two stages: first, the balance of payments effects and, second, the import substitution effects of a project. Net foreign exchange flows need to be calculated. The greater the positive net foreign-exchange effect on the country, the higher the rank.

3. Impact of the project on net social benefits or welfare: The evaluation of the sociological aspect of the project should focus on the extent to which it adequately takes into account four main factors: (1) the socio-cultural and demographic characteristics of local beneficiaries, (2) the social organization of productive activities of the population in the project area, (3) the actual acceptability of the project and its compatibility with the behavior and perceived needs of the intended beneficiaries, and (4) the social strategy for project implementation and operation needed to elicit and sustain beneficiary participation. The greater the net social benefits or welfare of the project designed, the higher the rank.

4. Environmental impact: The evaluation of environmental effects should include: (1) existing environmental base line conditions, (2) potential environmental impacts, including opportunities, for environmental enhancement, (3) preventive, mitigatory and compensatory measures, in the form of action plan, (4) monitoring. To the extent possible, capital and recurrent costs, environmental staffing, training and monitoring requirements and the benefits of proposed alternatives and mitigation measures should be evaluated. The less the negative impact on the environment, the higher the rank.

3.5 Institutional criteria

During project preparation and analysis, the suitability of the organization, the competence and availability of management and manpower should be examined. The objective is to make sure that the project can be adequately carried out. The sub-criteria of institutional analysis include:

1. Management: The management of the project should be evaluated to measure its ability to plan, direct, coordinate, motivate, control and implement the overall activity. Project management analyses should include: knowledge of the business and experience, financial management, technical management, personnel management, management ability to cope with changing environment. The greater the ability of management, the higher the rank.

2. Manpower: Project manpower should be evaluated to understand the worker's capability in knowledge, wisdom, know-how and character to implement a project idea according to the plan. The greater the ability of the workers, the higher the rank.

3. Organization: Evaluation of the project's organization is needed to ensure it has the structural ability to integrate the activities and functions of various departments as well as external organizations involved in the project work. The greater the feasibility of project organization the higher the rank.

3.6 Discounting criteria

Evaluating a project by considering time value of money is important in measuring the worthwhileness of a project. Evaluation of a project can be done by using discounting criteria that include: Net Present Value, Internal Rate of Return and Benefit-Cost Ratio. The sub-criteria include:

1. Net Present Value: The evaluator of the project should assess the direct linkage to the objective of maximizing the value of the project by using the net present value. The greater the net present value of the project, the higher the rank.

2. Benefit-Cost Ratio: The valuation of a project with benefit-cost ratio determines the amount of benefit that a project sponsor will earn. The greater the benefit-cost ratio, the higher the rank.

3. Internal Rate of Return: The evaluation of a project based on the internal rate of return provides the rate of return of the project over its lifetime. The greater the internal rate of return the higher the rank.

3.7 Non-discounting criteria

It is possible to measure the worthwhileness of a project and prioritize projects through non-discounting criteria evaluation. Non-discounting criteria include: payback period, urgency, accounting rate of return. The sub-criteria of the non-discounting criterion include:

1. Payback period: An evaluation of the payback period is important in measuring the risk of the project in its life time. The less the payback period the higher the rank.

2. Urgency: Including an evaluation of the project's importance and urgency can help in prioritizing and selecting projects. The greater the urgency the higher the rank.

3. The accounting rate of return: Evaluating a project's accounting rate of return is important to measure profitability which relates income to investment. The greater the accounting rates of return, the higher the rank.

Table 1
Main selection criteria and their sub-criteria

Criteria	Symbol	Summary
Technical		
Raw materials	1RM	The greater the availability of raw material, the higher the rank
Production process	2PP	The greater the feasibility of production process, the higher the rank
Machinery and equipment	3ME	The greater the feasibility of machineries, the higher the rank
Plant capacity	4PC	The greater the feasibility of plant capacity, the higher the rank
Location and site	5LS	The greater location and site suitability, the higher the rank
Project charts and layout	6PCL	The greater the feasibility of the project charts and layout design, the higher the rank
Schedule of project implementation	7SPI	The greater the feasibility of the schedule of implementation, the higher the rank
Market and demand		
Demand analysis	1DA	The greater the demand, the higher the rank
Supply analysis	2SA	The lesser the alternative supplies of goods/services expected to be produced in the market, the higher the rank
Marketing strategy	3MS	The greater the visibility of the strategy, the higher the rank

Financial Analysis		
Cost of the project	1CP	The lesser the project cost, the higher the rank
Production cost	2PC	The lesser the production cost, the higher the rank
Means of finance	3MF	The greater the viability of means of finance, the higher the rank
Profitability projection	4PP	The greater the profitability, the higher the rank
Socio-economic		
Employment effect	1EE	The greater the employment effect, the higher the rank
Net foreign exchange effect	2NFE	The greater the plan to export goods manufactured, the higher the rank
Impact of the project	3IP	The greater the net social benefits, the higher the rank
Environmental impact	4EI	The lesser the environmental impact, the higher the rank
Institutional		
Managerial analysis	1MA	The greater the ability of managers, the higher the rank
Organization	2OG	The greater the feasibility of project organization, the higher the rank
Manpower	3MP	The greater the skill of man power, the higher the rank
Discounting		
Net present value	1NPV	The greater the NPV, the higher the rank
Benefit-cost ratio	2BCR	The greater BCR, the higher the rank
Internal rate of return	3IRR	The greater IRR, the higher the rank
Non-discounting		
Urgency	1UG	The greater the urgency to implement the project, the higher the rank
Pay back period	2PBP	The lesser the pay back period the higher the rank
Accounting rate of return	3AR	The greater the ARR, the higher the rank

4. AHP model

Based on the above criteria and sub-criteria, an AHP model for project selection was developed. The model is made up of four levels of hierarchy (See Figure 1).

- The top level or the goal is to select the most viable project(s) to finance.
- The second level or the criteria includes the main seven criteria: technical, market and demand, financial, socio-economic, institutional, discounting, and non-discounting criteria.
- The third level or the sub-criteria level includes the 27 sub-criteria discussed under each criterion in the section above.
- The fourth level or the alternatives includes the available projects being proposed with the objective being to select the best project from among the alternatives, or to rank all the available projects by their viability. In this case, we have three alternative projects with their unique characteristics. According to reports the first alternative, project 1, had sufficient market, excellent social impact, and the project owners were experienced enough to carry out the project design according to the plan. The second alternative, project 2, was an innovative

business with an untapped market. There was no question on the profitability of the project, but the technical viability was the main issue raised for discussion. The third alternative, project 3, was a mature business. In addition, the project sponsor did not have experience in modern project implementation and operation, but the project was technically excellent. All three alternatives have their own advantages and disadvantages.

The AHP model was built using the Super Decisions software for testing. The pairwise comparisons for the criteria, sub-criteria and alternatives were carried out by experts from the Development Bank of Ethiopia through group discussion followed by consensus, and finally, the judgment was put into the software. Each set of pairwise comparisons was checked for consistency and revised if necessary until the maximum inconsistency was below ten percent, which is considered the minimum standard level in the literature. The results were synthesized throughout the model to yield the overall priorities of the alternatives, shown in Table 2, and the criteria and sub-criteria, shown in Table 3. The priorities of the criteria rank in the following order: discounting, institutional, non-discounting, market and demand, financial analysis, socio-economic and technical. The priorities of the alternatives rank as follows: alternative 2, alternative 1 and alternative 3.

Table 2
Final results: overall synthesized priorities of the alternatives

Name	Graphic	Ideals	Normals
Alternative 1		0.846470	0.366201
Alternative 2		1.000000	0.432621
Alternative 3		0.465022	0.201178

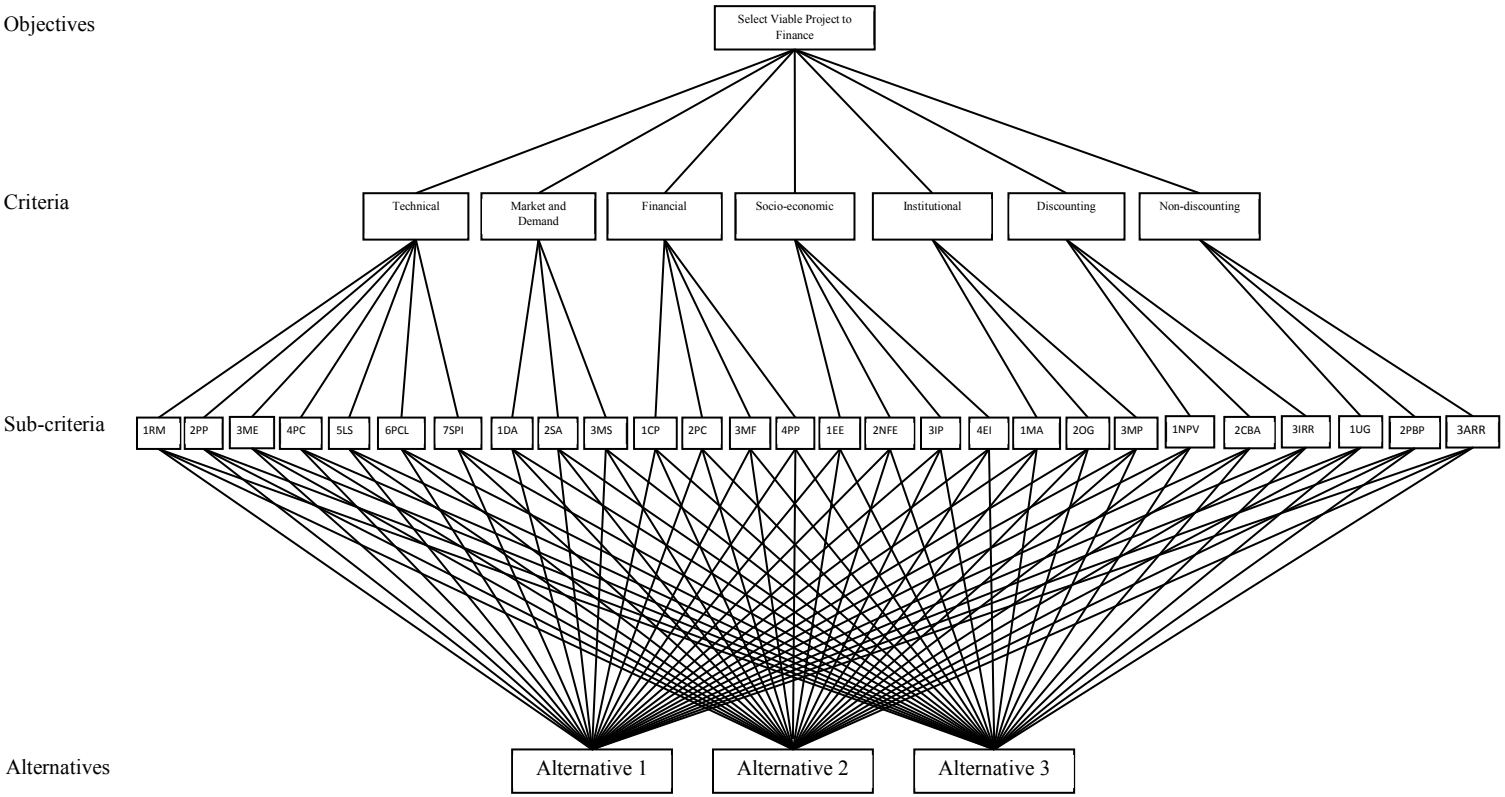

Figure 1 AHP model to select project from alternatives

Table 3
Overall synthesized priorities of the criteria and sub-criteria

Criteria	Weights of Criteria	Sub-Criteria	Weights of Sub-Criteria
Technical	0.002	1RM	0.102
		2PP	0.417
		3ME	0.096
		4PC	0.028
		5LS	0.258
		6PCL	0.096
		7SPI	0.003
Market and demand	0.168	1DA	0.291
		2SA	0.590
		3MS	0.120
Financial Analysis	0.142	1CP	0.246
		2PC	0.083
		3MF	0.424
		4PP	0.246
Socio-economic	0.117	1EE	0.472
		2NFE	0.101
		3IP	0.149
		4EI	0.278
Institutional	0.189	1MA	0.387
		2OG	0.240
		3MP	0.373
Discounting	0.204	1NPV	0.615
		2BCR	0.308
		3IRR	0.077
Non-discounting	0.180	1UG	0.200
		2PBP	0.683
		3AR	0.117

Sensitivity analysis was carried out by varying the weights of the criteria and sub-criteria to determine the stability of the decision reached by using the decision model proposed in this study. Sensitivity is performed by selecting a criterion (or sub-criterion) and changing its priority, redistributing the change among the other criteria (sub-criteria), and recalculating the priorities of the alternatives to observe if any change occurred in their ranking.

A graphical representation of sensitivity for the discounting criterion is shown in Figure 2 and Figure 3. Criterion priorities are read from the x-axis; the alternatives' priorities are read from the y-axis. In Figure 2, the priority of the discounting criterion, indicated by the vertical line, is set to its original priority of 0.20 (from Table 2). The priorities of the alternatives are then read from the y-axis at the points where the vertical line crosses the alternatives' lines (also given in the legend below the graph: 0.366, 0.432, 0.301). These are the original overall synthesized priorities for the alternatives shown in Table 1.

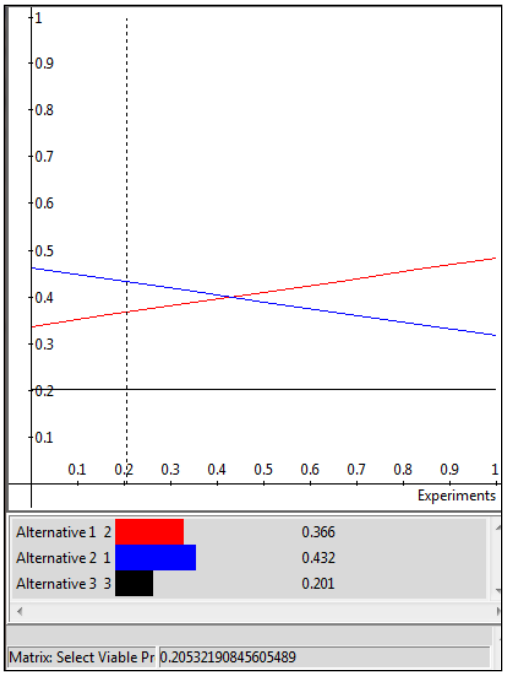

Figure 2 Sensitivity graph with discounting criterion priority set to 0.20

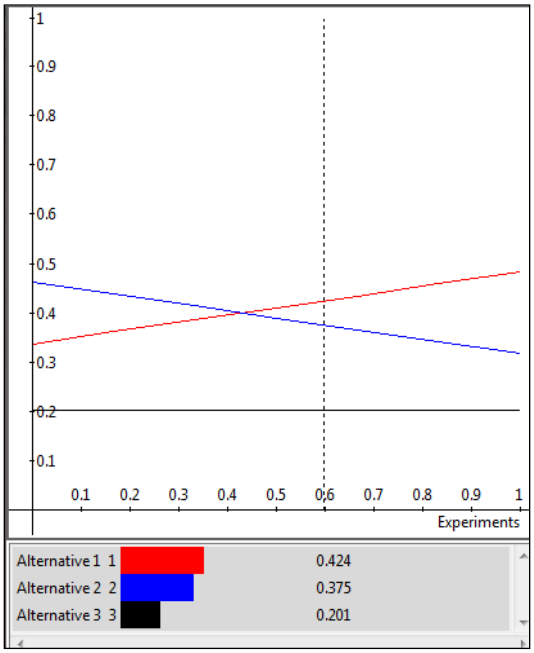

Figure 3 Sensitivity graph with discounting criterion priority set to 0.60

Sensitivity is performed by varying the priority of the discounting criterion by moving the vertical line and determining the corresponding alternative priorities. In Figure 3, it has been moved to the right to a priority of about 0.60 and the order of the alternatives

has changed from 2 (0.432), 1 (0.366), 3 (0.201) to 1 (0.424), 2 (0.375), 3 (0.201). The ranks of alternatives 1 and 2 have switched places. In fact, by examining Figure 3, we can observe that for any priority for the discounting criterion greater than about 0.43, alternative 1 will rank higher than alternative 2.

Performing sensitivity on the criteria of technical, financial, socio-economic, institutional and non-discounting did not affect the first ranked alternative, but in some cases the second and third ranked alternatives switched places. Similarly, sensitivity analyses of the sub-criteria was also conducted and showed that the priorities of the alternatives will not change. Therefore, this analysis reveals the fact that alternative 1 and alternative 2 are competing projects.

5. Proposed decision making process

In order to select the most viable project by using the new model, a project submitted to the Development Bank of Ethiopia will have to pass through the following stages: client prepares a proposal, client submits a proposal to the bank, checking data and price proposal invoices (the client is expected to submit the profile of potential contractures which can implement the project and their quotation with the proposal to the bank), the bank forms a group of experts in the fields related to the client's proposal, the group makes the pairwise judgments, checks the consistency of their judgments and finally selects the top ranked project.

1. Client prepares proposal – While the client prepares the project proposal, the bank should deliver or introduce all the necessary requirements: the feasibility study, curriculum vitae, and borrowers' detail, among other things. Furthermore, the bank should also provide the available data identified related to the project idea. These simplify working time and reduce money spent by both parties (the bank and the borrower). Since the bank has a lot of data in the relevant business area through rigorous research; Using the large amount of data in a relevant business area that the bank already possesses through rigorous research to prepare the proposal increases the validity of the proposal, reduces the bank's time in checking the proposal and reduces the effort of the borrower to find data. Hence, providing the necessary information and data for the client to prepare the proposal definitely decreases the effort of both the banker and the client in approving the proposal and allows for a decision in a shorter period of time.

2. Client submits the proposal to the bank – At this point, the bank checks the content of the proposal to see if it has all the necessary requirements of the bank. If the proposal does not include a necessary document the bank can provide information on the part of the proposal which needs improvement by the client. If the proposal meets all the necessary requirements a disclaimer agreement between the bank and borrower will be created. The agreement at this stage is basically to create a bridge for information flow about the proposal between the bank and the borrower.

3. Check the data and price proposal invoices – Before the bank goes into a detailed analysis of the project for its validity, the foundational building blocks (the data

and invoices) should first be valid. If the data and invoices are correct, an agreement between the bank and the borrower will follow, or the bank may return the proposal to the client for further improvements.

4. Forming a group – According to the type and character of projects, a group consisting of experts from different disciplines should be formed that includes: experts from the project area, technical experts, marketing experts, socio-economic experts, and financial experts, both from among the bank's employees and external experts.

5. Make the pairwise judgments – The group first confirms that the criteria are valid and sufficient. That means, if the group believes that the criteria in the model that was developed are not sufficient they can add additional criteria, or if they found some unnecessary criteria they can eliminate them. Finally, the group performs pair-wise comparisons throughout the model.

6. Check the consistency – The quality of the decision made is supported by checking the degree of consistency and making sure it is sufficiently low for every set of pairwise comparisons. After the group finishes each set of judgments, they should check the consistency ratio, and if they find it greater than 0.1, they should review their judgments.

7. Selection – After the bank's people perform the analysis and their judgments are combined, the projects will be rank ordered either manually or by using the software available. The top ranked project would be selected as the most viable project that would be further investigated using sensitivity analysis.

6. Step-by-step implementation guide

Even though the new approach developed for project financing can solve many of the DBE funding decision problems, if it is not implemented properly the desired objective will not be achieved. In this study, after developing the model, three projects from the bank were selected to test the model. As was explained in the methodology section, a group was formed including experts and decision makers from the DBE. Using the AHP approach described above, the priorities of the projects were established. Although, the experts who participated in the group were convinced by the model's usefulness, it is impossible to directly apply the new approach in the day-to-day activities of the bank because it would require major steps including revision of the policies of the bank. In general, the following activities would have to be appropriately dealt with before implementing AHP modeling in the bank: planning, creating awareness, revising policy, deploying policy, providing training, conducting demonstrations, implementing the new approach, and finally monitoring and reviewing results.

1. Planning – A detailed plan of the implementation procedures and instructions should be drafted first. In addition, the necessary budget, the time frame required, and the infrastructure necessary to support the program would have to be established The resources necessary to begin implementing the new approach

would have to be earmarked and secured. These are important basic steps that need to be taken to prevent mix-ups while the implementation is getting started.

2. Creating awareness – When the implementation begins, a financial institution needs to create awareness among top management, employees, evaluators of institutional performance and the society at large. The awareness that should be created includes: the need to specifically identify the criteria for selecting projects, how AHP modeling works and the need to follow the procedures detailed above. In general, the society should be aware that funding decisions in the future will be made systematically and scientifically in a way that can be traced back to the model and that can be used to improve the evaluation process itself as the bank's people gain experience with the system.

3. Revising credit policy – Currently the banks use control and check as a method of project financing. In order to apply the AHP in the decision making process, the banks' credit policies and strategies should be revised to accommodate the new methodology which is group multi-criteria decision making.

4. Deploying the policy – The macro level objectives set by the leaders of a bank may not necessarily lead to the desired goals unless they are deployed in the daily activity procedures and instructions. Deploying the policy is intended to change the decision making process into a transparent one of manageable size.

5. Training – Training should be given to all employees of the bank on AHP modeling for making project financing decisions. The training should be given continuously for different types of projects and different cases. This training may also trigger employees to use MCDM in solving other organizational problems.

6. Demonstration – Demonstrating how the process is working is essential for the society and for the employees. The main objective of the demonstration is to change attitudes about the decision making process and to inculcate new principles of awareness and behavior.

7. Implementing – After awareness is created and the policy is revised to support the new paradigm, it can be deployed into procedures and instructions. After the employees are well trained, and have practiced the process that was demonstrated, a totally the new method for project financing can be implemented in a financial institution.

8. Evaluating – Implementation results need to be checked against a plan. Then if there is gap between the objectives and the implementation results, corrective action should be taken. This will lead to continuous improvement of the decision making process. As a result, the quality of the decisions will also be improved.

7. Conclusion and recommendations

The research aim was to solve problems in the DBE project financing process through the application of the AHP to ensure improvements in the decision making process so that

more reliable decisions could be made. The time required to evaluate one or multiple projects should not be more than one month. In addition to this, the following conclusions may be drawn from our research.

- There are many criteria and variables that affect project selection. This research has developed seven criteria and twenty seven sub-criteria.
- Though the DBE did not fully implement the AHP model developed in this study, it was tested in the bank. Furthermore, the bank now actually considers most of the factors that we included in our project evaluation.
- The AHP is a convenient tool for selecting projects for financing. Since the decision is made by a group, the method provides an opportunity for experts, government officials, and the banker to participate and check their judgments through a consistency ratio. One of the benefits of using the group decision making process of the AHP is that people who rarely speak to each other learn from the other specialists in the group during the discussions that go on as they try to reach consensus judgments. Knowledge and information is shared and enhanced.
- Implementation of this research result can reduce corruption, facilitate development of the country, reduce wastage of time and labor and support entrepreneurs' efforts in creating new ventures.
- If the results of this research can not be implemented in the suggested step-by-step manner supported by additional research, the targeted objective may not be realized.
- This research was focused on project financing (long-term loans). The model developed was designed to work for long-term loans only. Hence, different models need to be developed for short-term and medium-term loans.

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