

## Research Article

# **Pattern Designing of Portfolio Management of Hydro Projects with Implementation of Multi-Criteria Models**

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**Abstract:** Portfolio is a collection of projects, plans or activities which are managed integrally to facilitate the efficient management of works in order to reach the strategic goals. Portfolio management is one of the most important challenges of organizations and firms which manage several projects. Professional and scientific implementation of the principles of this kind of management is among essential methods to enhance management efficacy in enterprises that administer several projects. In many countries the techniques of portfolio management of projects are used to efficiently manage the projects of an organization. In this portfolio all projects should be seen and analyzed together and to reach the maximum profit should allocate the resources and compare them. Portfolio management is centralized management of several projects which includes identification, prioritization, authority, management and control of projects, plans and other relevant affairs to reach the strategic goals. Management range of portfolio is long beyond of investment on development projects or plans since there is a continuous balance and mutual relationship between the projects and the constitutive plans of a portfolio. Portfolio management has a closer relationship with public management and other criteria of management than the project and plan management and is the most strategic one among these three domains. Portfolio management is a holistic approach because of its direct and indirect value on the projects and on hand sources. In fact the portfolio management of projects is a dynamic decision making process which appraises, prioritizes, inactivates or accepts (kill/go) new projects and eventually reallocates the sources.

**Keywords:** Hydro Projects, Portfolio management.

## **INTRODUCTION**

The aim of portfolio management of projects is to realize the profits and revenues in an organization via implementation of an organizational approach in the management of projects. With regulation of objects, administration and reallocation of sources, survey of indexes and balance in management, portfolio management of projects minimizes the risk level in the projects. With periodical surveys, it decreases the error probability of planning and implementation and control and causes the sublimation of an organization [4].

Selection and planning of a project and allocation of limited sources of every organization among the projects is one of the important discussions about the management of projects. On the other hand the efficient management of this work is impossible unless all related and effective factors and criteria are considered. Therefore in this study it is tried to introduce a comprehensive system of decision making to choose an appropriate method of multi-criteria decision making and plan an optimal composition among the projects faced with the hydro portion of

ministry of energy. In this study, the portfolio management of a project is considered from two aspects. In the first step the long term strategies and objects of an organization is studied. For this reason, the objects such as fulfillment of lawful obligations of upstream organizations, profitability, establishment of public welfare, job creation and etc. are considered. Then all projects of an organization including current and future ones are analyzed in alignment with portfolio. In effect in this way a preliminary screen about the projects of hydro portion is done in which the related projects to strategic objects are registered and established in the relevant portfolio and other projects are ignored. In the second step the classification of portfolio projects is addressed and because of the consideration of several indexes and also the dependence of indexes to each other the multi-criteria methods of decision making are utilized [3].

The examinations showed that one of the organizations with considerable and effective problems in selection of a portfolio is ministry of energy. With a broad spectrum of different projects on the agenda of

this ministry and also high importance of these projects either in financial aspect or in national and practical ones, the selection of portfolio in this organization is very significant and practical. The multiplicity of selection criteria caused by the magnitude of the dimensions of projects intensifies the importance of this fact [9].

Performed meetings with some authorities in ministry of energy showed that in the previous years the problem of portfolio selection in the organization has not done scientifically and appropriately and this subject has had inefficient effects in the trend of accomplishment of projects. In other words, the selection of project in this organization has not been based on the skillful and scientific criteria and approaches and has rather been exquisitely. These irregularities in selection of portfolio projects seriously clarify the performance of a research in this aspect given that the selection of portfolio is a continuous and ongoing work (with due consideration of the changes of objects, criteria and shift of limitations or variation of projects aspects) [8].

It is clear that in selection of portfolio the subject of multi-criteria decision making is proposed which have multiple methods and it is necessary to examine these methods and select the proper method for this subject. These methods are simultaneously used for several items such as multi-criteria optimization, multi-criteria analysis, multi-criteria decision making and multi-functional (multifold) planning. In fact a huge content of the management difficulties of hydro projects such as planning of river bed, unique planning of project, multiple operations of reservoirs and management of water quality are solvable with these methods. These methods are utilized for all problems with deterministic or stochastic characteristics, discrete or continuous variables, theoretical or empirical problems and linear or nonlinear functions in most of developed countries of the world. But improper study of these methods and neglect of nativism of these methods in our country have led to absence of a comprehensive and precise system to select an appropriate portfolio for hydro projects in Iran and beside the available methods of multi criteria decision making don't respond to the current problems [2].

## **OBJECTS**

The main objects of this research are as follows:

- \* Identification and prioritization of effective criteria in selection of portfolio from ministry of energy point of view.
- \* Study and classification of the models of current multi-criteria decision making with emphasis on hydro projects.
- \* Suggestion of a new algorithm from the composition of current models to select the portfolio of special hydro

projects with emphasis on the characteristics of their objects.

## **SIGNIFICANCE AND NECESSITY OF RESEARCH**

Planning and proper control of the sources of every organization is in fact the vital artery of that organization and doing investment or absence of it on special plans can influence on the organization affairs and sometimes in execution the plans will emerge as projects. This organization can be either a governmental institution whom plans national projects or a productive corporation whom plans its productive or developing projects or schemes. On the other hand many plans can be found that their sub projects contradict with each other and sometimes there are plans which have remained incomplete because of neglect of proper budgets and facilities allocation. Or some areas can be found that executed projects in them have remained useless after accomplishment because of neglect of all effective criteria such as the project of water supply in Qom [6].

We know that project selection in every organization encounters with some limitations and difficulties in that organization and in selection of a proper portfolio it is necessary to consider all these problems and associate them with macro strategies and objects of that organization in specified periodic times and constitute a portfolio in that organization. Therefore conformity of a proper template from beginning till end of this trend must be applied including determination of organization objects, minimization of objects till appropriate level, collection of needed information and limitations, listing the projects and precise study of them, use of a proper method to assess the methods to enter the portfolio and validation of results. Major emphasis of all relevant analyses in previous 10 years has been on adaption of new methods to help the planners for advancement of strategies of hydro projects whilst the existent methods have planned for use in macro hydro schemes and macro management of hydro decisions so they are very expensive and time consuming to use in micro situations of decision making and will be omitted while use of these methods is also very important and necessary for some micro situations. It should be noted that in this research and in design of the model, the role of sagacity and intelligence of management in selection of projects and analysis of results will be examined in addition to the existent techniques. In other words, this research seeks to represent a flexible model for select of portfolio and in fact wants to represent an algorithm for choose of an appropriate model of multi-criteria decision making with examination and analysis of different modes of selection and also prediction, survey and analysis of created probable conditions in selection of every alternative with due consideration of effective and

inevitable variations on the organization and the trend of implement of projects, objects and strategies [7].

### RESEARCH METHODOLOGY

The present study is in fact a kind of practical research since it looks for a strategy and model for the problem of management and assessment and selection and allocation of projects portfolios of research oriented organizations and in other words wants to find a new approach in face with reality.

To execute this research the following methods are used:

- Library studies for comprehensive examination of literature of subject around titles of portfolio management in hydro projects and multi-criteria decision making methods.
- Field studies in ministry of energy and similar organizations.

These studies include following steps:

1. Examination of different projects of ministry of energy and selection of an appropriate composition from the projects [1].
2. Comprehensive examination of literature of the subject around title of portfolio management preferably in hydro projects and investment.
3. Examination and identification of effective criteria in selection of portfolio of hydro projects.
4. Examination of different models of multi-criteria decision making and selection of a compatible model with the problem.
5. Design of the model.
6. Execution of the model and selection of picked method.

### RESEARCH QUESTIONS

With consideration of these problems there are some essential questions and this research tries to answer them, such as:

1. What are the main problems and difficulties in formation of project portfolio in ministry of energy?
2. What are the main reasons of the current problems of decision making in ministry?
3. Is there a proper method to prioritize the projects in ministry at the moment?
4. What is the criterion for choose of the current method to rank the projects?
5. What are the macro objects of ministry of energy to clarify the structure of decision making?
6. To what extent does this method coordinate with the structure of decision making in ministry of energy?
7. Are collected data enough for decision making?

### FORMATION OF PORTFOLIO

For execution of politics and objects and continuous of growth and survival and conduct of the plans, every organization obliges itself to planning and control in direction with long term strategy and mission of the organization. Occasionally the programs will emerge as projects in execution. In other words it can be stated that almost all organizations somehow face with projects and consequently the selection of projects. The organization might be a governmental institution that follows planning of national projects or a productive corporation that plans its productive or developing projects and plans. So we find the importance of projects and plans in an organization and consequently the selection of projects. On the other hand there are many plans and projects in country which are not coordinated and sometimes are contradicted with other projects. Or sometimes we observe some schemes that are incomplete due to neglect of source limitations or Prerequisite projects. For example in national level we can refer to Karkheh dam that due to disconformity in advancement of different parts of scheme some portions of the project has been completed with spend of huge expenses while previous projects will be useless till a few years later due to incompleteness of supplementary parts [5].

We know that every organization faces with its objects, limitations, priorities, politics, chances, threats and special problems and should involve all these conditions in its decisions. One of the important decisions of organizations is selection of a project and one of the problematic items in organizations including many projects is selection of an appropriate composition of these projects among possible and economic projects which passed economic and technical assessments. Off course this composition must be made according to limitations, objects and strategies of an organization. So we should be able to choose a collection of projects which lead to the best result with consideration of present limitations and in accordance with objects and strategies. Now since every project has its own characteristics in age, life cycle, consumption rate of sources in different periods and other items, actualization of this work is very difficult and entails hard efforts. The number of selected moods will be very large especially when the number of projects is plentiful and assessment of every mood with regard to the criteria of selection of project portfolio (objects of an organization, tangible and intangible financial benefits, available sources, risk level of project portfolio and etc.) is very difficult and will more difficult when the following conditions exist: [10].

- Multiple and sometimes conflicting objects.
- Some qualitative objects and inherently in contradiction with quantitative objects.
- Interrelationship of some projects to each other.

- Limitations such as financial resources, work force, facilities and sometimes parameters such as project risk and time of its completion.

## CONCLUSIONS AND SUGGESTIONS

The results of this research beside some suggestions are as follows:

- Field examinations in ministry of energy show that this organization has serious problems in the management of projects portfolios that emerge in different steps of portfolio formation such as determination of aims, proper definition of criteria, emersion and provision of plan and etc. and furthermore there is not an appropriate method in the selection of plans and prioritization of them, so results of this method approve inappropriateness of this step.
- In examination of literature of the subject, about 23 methods of multi-criteria decision making are identified and studied and according to evidences these methods have not been yet analyzed and even identified.
- A general classification of methods based on their characteristics and nature of their operation is represented in this research.
- The problem of selection of portfolio projects in this organization is a routine and continuous work since the criteria and limitations of ministry of energy and also the alternatives of this organization change regularly according to conditions so there should be an appropriate method proportional to these conditions to form a portfolio.
- Examinations of this research affirm that the objects of an organization must define in different levels. The objects should break so that first the number of objects will not be high and second the last level objects will be measurable.
- The projects should separate to their constituent parts. In effect the projects divide to subprojects and subprojects divide to their annual working elements. In formation of portfolio, the preliminary contest is between the projects and low level competitions to prioritize the schemes between subprojects and annual working elements.
- Techniques of multi-criteria decision making each are suitable for special conditions and we cannot represent anyone as the better method than others.
- One of the significant problems in ministry of energy is unfamiliarity of experts of this organization with the methods of multi-criteria decision making, cases of using them, method of use and also analysis of the conditions of the problem. Therefore it is suggested that for more efficiency of decision making, some analytics with necessary specialties are utilized beside decision makers. Necessity and role of analyzer is obtained from the content of different chapters.
- It is suggested that training courses about multi-criteria techniques, conditions of decision making problems and eventually the method of work with the technique of target planning in ministry of energy are held and decision makers take part in these courses.
- Defined steps to form schemes and provision of them in ministry of energy are appropriate but for explained reasons, some projects do not pass these steps properly. One of the trends of ministry of energy might be emphasis on full pass of these steps by different projects.
- As noted earlier, projects must separate to their constituents, so in the reports of scheme agenda, represented information must be provided for different levels of project, subproject and annual working elements.
- Current method of projects selection in ministry of energy is in fact a mono-criteria method which is done in different steps with change of criterion and alternatives and all criteria are not considered together. Off course as stated earlier this method has similarities to dictionary access method.
- Interviews and questionnaires and personal analyses determined the selection criteria in ministry of energy. At first the number of these criteria was high but after final examination they reduced to 11 criteria. Final criteria are more efficient and include all preliminary appropriate criteria.
- Present criteria of ministry of energy for selection of projects (6 criteria) do not at all respond to all needed aspects of decision making.
- It is suggested that relevant references are represented with consideration of today problems and new criteria and necessary new information to execute the projects such as environmental, social and other issues are considered in provision of service descriptions of consulting engineers and these service descriptions are provided again according to real needs of organizations.
- Problem of the selection of an appropriate method of multi-criteria decision making among present methods is itself a multi-criteria selection and in this research the proper criteria for this problem are explained.
- The most important achievement of this research is to represent a new and integrated algorithm to select a proper method of multi-criteria decision making among the current methods. The represented method in chapter 5 chooses the proper method with analysis of problem conditions. Off course in this algorithm the method of target determination, collection of data and other steps of decision making are also described. Final respond of this algorithm is different in various conditions of decision making in ministry of energy. Analysis of the outputs of different steps of this algorithm

are efficient in clarification of decision making process and represent a better view to face with the problems of future decision making.

- At present the allocated budget of ministry of energy is announced after formation of portfolio and this event creates a further change step (in addition to other change steps which are applied in the portfolio) in portfolio of projects. These further changes remove the decision making process from the logical trend and direct to exertion of personal opinions. Therefore it is necessary to first specify the budget portion of ministry and then the steps of portfolio formation are applied.
- Proper determination of objects, identification and full exertion of appropriate criteria, selection of efficient method of multi-criteria decision making and use of it, separation of projects to their constituents and collection of information of every level of project and etc. are useless without exertion of a surveillance system to guarantee the use of selected method and does not lead to the appropriate respond. The need to a surveillance system to control the decision making in the proper path especially confronting with exertion of improper political views is one of the important works in maintenance of the concentration of decision makers.
- In present conditions of decision making in ministry of energy, the target planning method was selected with the provided algorithm. This method should be trained to decision makers of this organization in some courses to lead to proper results. Off course with change of conditions in ministry of energy there might be another multi-criteria decision making method by this algorithm for subsequent decision makings.

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