Study Scientific Methods for Small Project Selection in an Iraqi Environment

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Abstract

The Research aims to study the scientific methods of selecting the best project in a specific environment. The selection of the best small project is an important step for any executive authority or contractor and it is essential for achieving a specific goal (whether it is a profit or provision of certain goods or any other objective). In order to have a true choice, the project evaluation will be the basis of choice. ، Project evaluation defined as the an organized assemblage of data about the activities characteristic and results of actions or activities, for determining its value. It can afford a plurality of significant information project's outcomes; it is a systematic method of reflecting on and calculating the wealth of what is being done (i.e. project, events, and program). Evaluation is usually understood as a product or an activity taking place at the end of a project. However, evaluation should be considered as a process, occurring across all phases of a project, used for determining what does occurred and if the early project objectives have been achieved. The aim of this paper is to study the scientific approaches and steps to make a decision to select the best small projects in a specific environment for implementing within the constraints of the investor and the governorate strategic plan.

Keywords: Small Projects, Projects Evaluation, MCDM.

1. Introduction

Projects have been undertaking since the earliest days of organized human activity. Small projects recognized as a main provenance of work and revenues in many countries. The small enterprises contribution to the new works creation has been a controversial topic everywhere in the world, it has matching machineries and production fundamentals for big projects but differ in investment size and project processing period (the project lifecycle).

2. Project Definition

The project in dictionary is a huge or main commission, specifically one involving extensive money, workers and equipment or a precise job of investigation specifically in scholarship. It has become the new method of accomplishing and managing business activities. It is a one-time work for accomplishing a clear purpose in a particular time [1]. Each project is distinctive although parallel projects may be present. Projects are usually having common characteristics:

1. A project is tentative in that it has duration. It always has a defined start and end date, it begins with a confirmation of work or some form of description of the product, service, or result to be supplied by the project, and it ends when the objectives are complete or it is determined that the objectives cannot be met and the project is canceled.
2. A project is unique in that the product, service, or outcome created because of the project is dissimilar in some unique manner from all parallel products, services or results. Unique also indicates that although a project might appear to be similar to another project because both producing the same type of deliverable, it really is not.
3. A project is characterized by gradual development. This means the project develops in steps and grows in detail [2].

3. Small Projects

A small project can be defined as a privately owned and operated business employing a small number of people for introducing product or service with shorter schedules and fewer resources, it is usually are not managed using detailed activity schedules. A project manager and a project team are involved in the project. They are the project deliverables. A small project generally:

1. Containing a small number of skill areas.
2. Ought to a narrowly defined scope.
3. Have a particular aim and an explanation that is readily accomplishable.
4. Low budget.
5. Few team members.
6. Most of its requirements are available locally
7. Arise according to the needs of the local market
8. Whose goal is often to achieve profit by relying on the need of the environment in which the service or product arises
9. Its competitors are few with high productivity and efficiency in addition to low administrative costs

Small projects are those whose size characterized by simplicity and low risk allow:

• Single director to manage the project.

•Marketing is usually for the same environment and society in which production requirements exist.

 •Less than the full application of the complete project management process for the project category (selected basic forms, approvals, plans, schedules, budgets, controls, reports, less frequent project review meetings, with less detail required in each) [2],[3]

4. Small Project Requirement

The best operative directors who can efficiently attain and allocate the five M's.: money, manpower, methods, materials, and machinery

1. Money: Means revenues and destruction, resources, economics, accounting, collections, etc. Presently they created to grant that the whole thing in the institute used the money to reach business goals.

2. Manpower: The operating forerunner identifies that the positive utilization of each of the four capitals will be the direct outcome of the scope to which the men power source is used for fitting, industrialized for performance, and inspire for excellence.

3. Material: It can be identified by means of the touchable supplements to the goods creation.

4. Machine: Both noticeable and unnoticeable are sort out by equipment and/or machines to have the final creation (service or product).

5. Method: this element contain the tasks series required to construct, plan, deliver, and sell an item (product) or service, as well as the organisms shaped by the basis to funding the accomplishment of business outcomes [3].
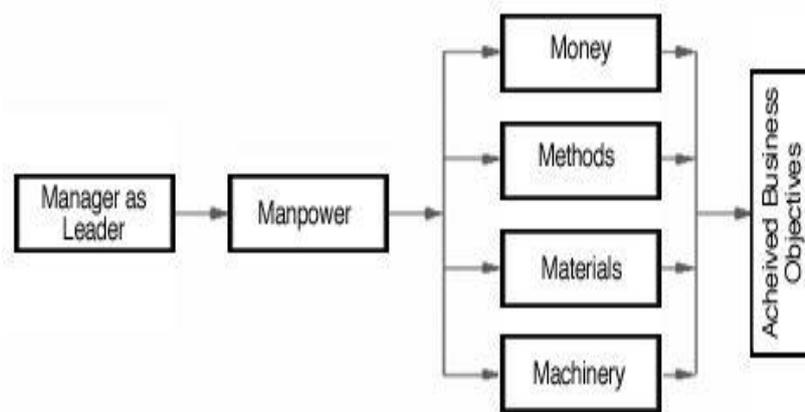
Fig (1-1) Operational Definition of Management

5. Project Evaluation Methods

The choice of the right project for forthcoming investment is an important choice for the extended period survival for the investor .There are finite capitals and the investors cannot implement all projects they need or requisite to. Consequently, the use of scientific evaluation methods will sort projects on the base of advantages to the investors; some of them are reviewed below

5.1 Value Analysis

Value analysis is one of the tools used in decision-making process in many applications and for the improvement process. The organizations are facing harsh defies that dilate in improving commercial attractiveness while accomplishing a variation of the maximum excellence, minimum-cost, and as much as the circumference. In such a complicated condition, a simple and smooth procedure for an exhaustive and difference commercial breakdown of an industrial organization under any marketplace and circumference situations can be very advantageous for accomplishing the finest activities. The Value analysis methods may support and help companies-engineering divisions, industrialized, procurement, advertising, and controlling- by getting well replies to their particular difficulties in providing what the client want or desire at minimum production expenditures [2].

5.2 Function Analysis System Technique (FAST) Diagram

Function Analysis System Technique (FAST) is developed by "Charles" By the way and defined as "a powerful value analysis technique to analyze the relationship of functions which are considered the most important phase of value analysis". There are differences in the applications of FAST with some being additional suitable to current products, problematic description and new product growth. Conversely, they all have in communal the fact that they all intention to improved considerate of the problematic under study. FDAST known as a system without dimensions i.e. it will demonstrate functions in a logical series, rank them and check the dependence but it does not known you how well a task should be implemented, what time, by whom, for how much, therefore there is no "correct" FGAST diagram for comparing it by other solution, on the other hand there is a "valid" FZAST diagram. The FAAST chart is a powerful tool and supreme significant stage in the value analysis job strategy for the following purposes :

1. It displays the particular relations for all functions with reverence for each other.

2. Testing functions under study validity.

3. Helping the mission functions definition.

4. Extends all team members understanding with reverence to the project.

5. Crucially develops communication, as it characterizes team consensus for project scope [4].

5.3 Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis

Strengths, weaknesses, opportunities, and threats (SZWOT) breakdown is a tool that assistances business superiors to estimate the strengths, weaknesses, opportunities and threats involving at each trade enterprise, comprising farmhouses and ranches. SZWOT breakdown intents to define the strengths and weaknesses of an organization and the opportunities and threats in the circumstances. Having defined these elements approaches are improved which may construct on the strengths, reduce the weaknesses, adventure the opportunities or stand the threats. The strengths and weaknesses are acknowledged as an interior assessment of the institute and the opportunities and threats by an exterior assessment. The interior assessment studies all sides of the institute wrapper, for example, staffs, services, position, products and facilities, for identifying the institution strengths and weaknesses. The exterior assessment scans the governmental, financial, common, technological and competitive circumstances with a vision to define opportunities and threats. A variation of SXWOT analysis is the SWDOT matrix, table(1-1).

Table (1-1) SWOT analysis matrix

	Strengths	Weaknesses
Opportunities	How do I use these strengths to take advantage of these opportunities?	How do I overcome the weaknesses that prevent me from taking advantage of these opportunities?
Threats	How do I use my strengths to reduce the impact of threats?	How do I address the weaknesses that will make these threats a reality?

5.4 Multi Criteria Decision Making (MCDM)

A multi-criteria decision making approach denotes to the finest alternate determination in the situations anywhere there is a great numeral of, mutually incompatible criteria. There are three phases that all MDCDM techniques follow:

1. Determining the related alternates and criteria.

2. Awarding mathematical measures to the relation significance of criteria and to the alternative influences on these criteria.

3. Treating the numerical values for determining each alternative sequence.

Different classifications of MSCDM problems and methods were known. A MZCDM problems are characterized with respect to the alternatives nature either separate or continuous [5], [6].
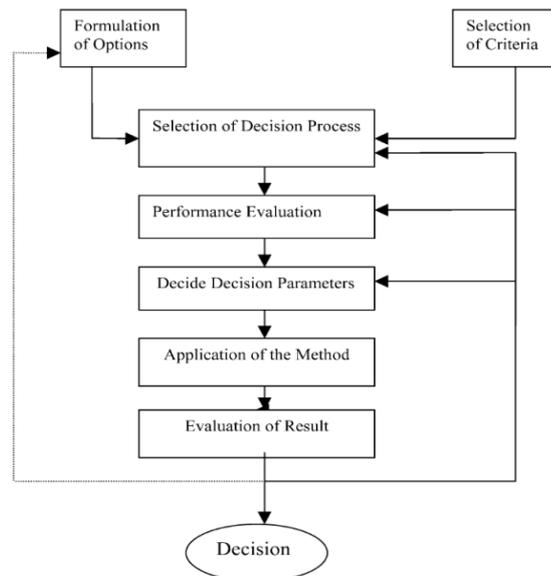

Fig (1-2) Multi Criteria Decision Making Process [7]

5.4.1 Techniques for Order Preference by Similarity to Ideal Solution (TXOPZSIS).

It was developed by Hwang and Yoon (Hwang & Yoon, 1981), where alternatives arranged with respect to their expanses from the best and the worse ultimate solution. The best alternate has concurrently the shortest space from the ultimate solution and the furthest space from the worse (negative) ultimate solution. The ultimate answer is identified with a theoretical alternate that has the finest worths for all considered criteria while the worse ultimate solution is known with a hypothetical alternative that has the poorest criteria magnitudes. TZOPSIS has been effectively used to resolve collection/estimation problems with a predetermined alternatives number because it is intuitive and simple to comprehend and implement. It starts with the regulation of criteria magnitude, using vector normalization [8], [9].

5.4.2 The Weighted Sum Model

The WDSXM is the utmost universally used manner, specifically in single dimensional problems. When there are M of alternatives and N of criteria then the finest alternate is the one that fulfills the following expression:

$$(1.2) \qquad \textit{1ax} \sum_{i}^{j} a_{ij} w_j \quad \text{for} \quad i = 1, 2, 3, ... M$$

Where:

A_WSM is the WSM score of the best alternative.

M is the number of decision criteria,

aij is the actual value of the ith alternative in terms of the jth criterion

wj is the weight of importance of the jth criterion.

The overall value for each alternative is equivalent to the summation of products. The application of the WSM needed the valuation of each option on a 0-100 local scale for all criteria, with a higher mark showing the well performance on the conforming criterion. The model is accepting of numerical data like budget and effectiveness figures, which are automatically diagramed onto the 0-100 local scale. When there are no measureable data offered, decision-makers are requisite to straight proportion the performances of options on a numerical scale. These direct ratings usually take a value between zero (worst option) and 100 (best option) [10].

5.4.3. Analytical Hierarchy Process (AHP)

It is a systematic multi - criteria estimation manner that assists personalities to building difficult problems in a formula of hierarchy for estimating quantifiable and qualitative elements, and it reports how to determine the comparative significance of a set of choices in a multi criteria decision-making environment. It aids decision creators to determine the numerous factors with their weights, which are pointing out their significance, and putting out the hierarchy of the decision [11].

AHP has been industrialized by T. Saaty, who proven a reliable way of changing such pairwise comparisons into a set of numbers indicating the relation priority of each of the criteria, as shown in Table (1-2), Saaty developed the following stages for employing the WASHP :

1. Constructing the Hierarchy

Structuring of the decision problematic to a hierarchical model with an objective or a goal at the upper of the pyramid, criterions and sub-criterion at stages and sub-stages of the hierarchy, the choice alternatives at the lowest of the hierarchy. At this phase we can see the benefit of the analytical hierarchy belonged to how many elements are involved in the decision making process.

2. Creating a Pair-wise Comparisons Matrixes

The elements of a specific level are compared with respect to a particular element on the higher level. The decision-maker opinion is stimulated for comparing using a assessment measure (1–9) [8].

3. Computing the Priority for Criteria with Respect to the Goal

The normalized matrix is created to reduce unplanned data on the basis of the equation (1.2). The resultant matrix is by adding summing the numbers in each column of pairwise comparison matrix A.

Then each entrance in the column must divided by its column sum to yield its normalized score. The summation of each column is equal 1.

By supposing that aij define the element (i, j) of matrix A:

$$Cij = \frac{aij}{\sum aij} \qquad \ldots\ldots(1.2)$$

Where Cij is the normalized pairwise comparison matrix of criteria i with criteria j

4. Computing Alternatives Priorities with Reverence to Each Criteria

The alternatives scores are determined to each criterion from the normalized matrix by finding the row average of each alternative in the matrix, as in the previous step.

Not all the criteria will have the equal significance. Consequently, this stage in the AHFP process is to find the relative priorities (weights) for the criteria.

Table (1-2) Fundamental Scale of the Absolute Numbers (Saaty Scale)

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Very strong importance	An activity is strongly favored and its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals of above nonzero	If activity I has one of the above nonzero numbers assigned to it when compared with activity J, then J has the reciprocal value when compared with I.	

5. Consistency examination valid.

Before using the scores derived from the normalized comparison matrix, the preferences specified in the original pairwise comparison matrix must be checked for consistency.

$$C.I. = (\lambda_{max} - n)/(n-1) \qquad \ldots\ldots(1.3)$$

n = comparing elements no.

is obtained by the summation of products between each element of the overall priority vector (Pc) and the sum of columns of the pairwise comparison matrix (*aij*) as in the following eq.(2.6).

$$\lambda_{max} = \sum_{j=1}^{n} * \left[\sum_{i=1}^{n} a_{ij} * \theta_{ij} \right] \qquad \dots (1.4)$$

6. Consistency ratio (CR)

$$CR = CI/RI \qquad \dots (1.5)$$

In this method consistency ratio is definite as CZR where a consistency ratio of 0.10 or fewer is satisfactory for continuing the AHP analysis. If the consistency ratio is more than 0.10, it is crucial to review the results to localize the reason of the variation and moderate it.

Where RI is the average random consistency and obtained from table (1.3) depending on n [7].

Table (1.3) the average Random Consistency

Size of matrix	1	2	3	4	5	6	7	8	9	10
Random consistency	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

5.4.4. The Analytic Network Process (ANP)

The ADNP is the most common formula of the Analytic Hierarchy Process, fig(1.3) show the difference between two methods. It affords an organized procedure for multi-criteria decision analysis without supposing independence in the system. The ADNP take on a network structure to develop the unbending hierarchy of the AHP, and later can be used to prototypical the interdependencies amongst alternatives at variant levels. The ANP hierarchy is decided by control criteria or sub-criteria, there are two kinds of controlling criteria: comparison-"linking" criteria which are traditional linked to the configuration as the hierarchy goal, and comparison criteria which are not linked to the configuration but encourage comparisons in a grid [13].
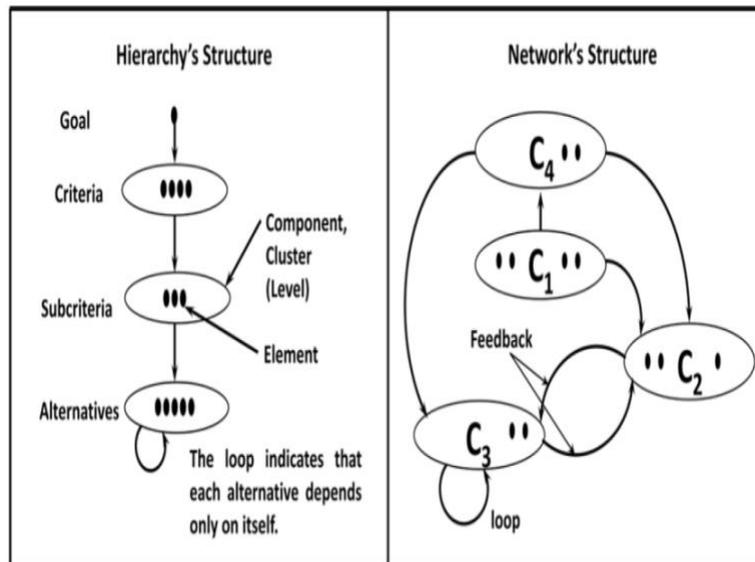

Fig (1.3) Hierarchy's and Network Structure

5.4.5 Weighted product method (WPM)

The WSPM is very similar to WASM. The chief variance between the two methods is that instead of adding in the model there is multiplication. Each alternative is paralleled with the others by multiplying the number of percentages, one for each criterion. Each percentage is upraised to the power equal to the comparative weightiness of the conforming criterion.

Generally, in order to parallel the alternatives AZK and AZL the following product is found:

$$R(A_K/A_L) = \sum_{j=1}^{N}(a_{kj}/a_{Lj})^{w_j} \qquad (1.6)$$

Where N is the number of criteria.

aij is the actual value of the ith alternative in terms of the jth criterion.

wj is the weight of importance of the jth criterion .

5.5 Numeric models

Numeric models presented also called financial model, and all of these models have a limiting factor based on forecasted cash flow.

5.5.1 Payback Period

It is the period reserved to achieve the commercial resume equivalent to the basis investment. This while is typically stated in months and years. To compute the payback period, basically check how long it will proceed to recover the early outlay.

5.5.2 Return on Investment (ROI)

This manner determines the average of annual profit firstly, which is simply the project outlay decrease from the overall rewards, dividing by year's number investments will run. The income is then transformed into a ratio of the overall outlay via the following equations:

$$\textbf{AAP = gt –ot/ no. of year} \qquad \textbf{(1.7)}$$

Where AAp = Average Annual Profit

gt = Total gain

ot = Total outlay

$$\textbf{ROI = (AAP / Oi) * 100} \qquad \textbf{(1.8)}$$

Where ROI = Average Annual Profit

Oi = Original investment

5.5.3. Net Present Value (NPV)

The NPV is a computation of the worth or value added to the enterprise by excuting the project. If it is positive the project merits further consideration. When ranking projects, preference should be given to the project with the highest NPV.

$$\textbf{Pv = Df * Cf} \qquad \textbf{(1.9)}$$

Where: Pv = the present value

Df = Discount factor

Cf = Cash flow

$$\textbf{Df =1/(1+i)\textasciicircum n} \qquad \textbf{(1.10)}$$

Where i= The forecast interest rate

n= The number of year from the start date

5.5.4 Internal Rate of Return (IRR)

The IRXR is the value of the discount factor when the NPV is zero. It is a determinate of the return on investment; therefore choose the project with the highest IRR. One of the limitations of this method is that it uses the same interest rate through the project and as the project's duration extends, this limitation will become more significant [14].

Conclusions

It is clear from the foregoing that the evaluation methods are many and vary according to the type of problem. Through the researcher's study to the project environment and the small projects proposed there, the problem is multifaceted and needs to identify several comparison criteria to have the choice of the best project. Therefore, the appropriate type of such difficulties is the multi criteria decision making models (MSCFDM) which allows the consideration of multiple-criteria and it gives the results of the alternatives ranked according to their importance to the given criteria

CONFLICT OF INTERESTS.

- There are no conflicts of interest.

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دراسة الطرق العلمية لاختيار مشروع صغير في بيئة عراقية

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الخلاصة

يهدف البحث إلى دراسة الأساليب العلمية لاختيار أفضل مشروع في بيئة محددة. إن اختيار أفضل مشروع صغير هو خطوة مهمة لأي سلطة تنفيذية أو مقاول وهو ضروري لتحقيق هدف محدد (سواء كان ربحًا أو توفيرًا لبعض السلع أو أي هدف آخر). من أجل الحصول على اختيار حقيقي، سيكون تقييم المشروع هو أساس الاختيار. إنه الجمع المنهجي للمعلومات حول الأنشطة المميزة ونتائج النشاط أو الإجراء، من أجل تحديد قيمته أو جدارة. يمكن أن يوفر العديد من المعلومات الهامة عن نتائج المشروع؛ إنها طريقة منتظمة للتأمل وتقييم قيمة ما يجري (أي مشروع أو برنامج أو حدث). عادة ما يتم تفسير التقييم على أنه منتج نهائي أو نشاط يجري في نهاية المشروع. ومع ذلك، ينبغي اعتبار التقييم بمثابة عملية، تحدث في جميع مراحل المشروع، وتستخدم لتحديد ما حدث وما إذا كانت الأهداف الأولية للمشروع قد نفذت وحققت. تهدف هذه الورقة إلى دراسة الأساليب والخطوات العلمية لاتخاذ قرار لاختيار أفضل المشاريع الصغيرة في بيئة محددة للتنفيذ ضمن قيود المستثمر والخطة الاستراتيجية للمحافظة.

الكلمات الداله: المشاريع الصغيرة، تقييم المشاريع، طرق اتخاذ القرارات متعددة المعايير.