ABSTRACT: From among numerous opportunities, organizations must select the projects they decide to pursue. The consequences of poor decisions can be extremely expensive. This is why many methods and models for project portfolio selection have been developed. In this paper, we propose a project portfolio selection approach that combines essentially a business strategy method with a scoring model. The financial method is also present of the fact that the scoring model considers the financial value as an important criterion. The proposed hybrid approach also includes recommendations on the selection criteria provided. Two criteria are identified: the value and risk, the third is at the option of the organization for more flexibility. The approach provides a phase control on two elements: the management of resources and interactions between projects.

Subject Categories and Descriptors
I.6.4 [Simulation and Modeling]: Model Validation and Analysis

General Terms: Management, Verification

Keywords: Project Portfolio Management, Simulation, Resource Management

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1. Introduction

Currently, the world economic situation is such that it is imperative for companies to have a portfolio of successful projects. Indeed, companies find themselves with many opportunities to grasp, but no one has unlimited resources to concretize all these opportunities: choices must be made. Many managers develop priority systems to best ensure that they select the most viable projects. They design guidelines for balancing the opportunities and costs entailed by each alternative. The goal is to balance the competing demands of time and advantage. The pressures of time and money affect most major decisions, and decisions are usually more successful when they are made in a timely and efficient manner [1].

What are the difficulties to develop a portfolio of successful projects? According to [2] there are two important reasons: First, many projects that are undertaken are not aligned with the organization’s strategic directions. Second, poor portfolio decisions are made. Portfolio decisions are difficult because they are based on uncertain, evolving, conflicting and incomplete information.

Project Portfolio Management (PPM) meets those needs, it adopts structured methods to remove politics from project selection and to build portfolios that contain projects that are fully aligned with strategies, maximize benefits and Return on Original Investment (ROI), consider and contain risk, and make the most efficient use of limited resources [3].

The purpose of our article is to present an approach for the selection of projects in a portfolio. This is a hybrid approach for combining the business strategy method with a scoring model based primarily on the value and risk.

We will start in the background section by presenting PPM as a discipline that should interest any organization.
wishing to have more efficiency in the management of its project portfolio. We focus on methods and project selection models. In the third section, we will present our Hybrid Approach for Project Portfolio Selection (HAPPS) and its composition. The last section includes our conclusions.

2. Literature Review

2.1 Project Portfolio Management
Several definitions of project portfolio management exist in the literature, we try to take those in standard or reference documents in this domain.

In [4], Office of Government Commerce (OGC) defines portfolio management as: a coordinated collection of strategic processes and decisions that together enable the most effective balance of organizational change and business as usual.

Reference [5] defines portfolio management as a centralized management of one or more portfolios, which includes identifying, prioritizing, authorizing, managing, and controlling projects, programs, and other related work, to achieve specific strategic business objectives. Portfolio management focuses on ensuring that projects and programs are reviewed to prioritize resource allocation, and that the management of the portfolio is consistent with and aligned to organizational strategies.

According to [6], portfolio management is a dynamic decision process, where new projects are evaluated, selected and prioritized; existing projects may be accelerated, killed or de-prioritized; and resources are allocated to the active projects. The portfolio decision process is characterized by uncertain and changing information, dynamic opportunities, multiple goals and strategic considerations, interdependence among projects, and multiple decision makers and locations.

In the light of these definitions, we can say that PPM includes the identification, prioritization, authorization, management and control of the component projects and programs and the associated risks, resources and priorities [7].

This continuous process can be summarized in four key steps as shown in Figure 1. In this paper, we focus on the selection phase, which corresponds to the 2nd and 3rd stage of figure 1.

The selection phase can be defined as: the phase that involves the simultaneous comparison of a number of projects on particular dimensions, in order to arrive at a desirability ranking of the projects. The most highly ranked projects under the evaluation criteria are then selected for the portfolio, subject to resource availability [9].

Several methods and models exist for project portfolio selection phase, we consider in the next section the most important of them.

2.2 Methods and Models of Project Portfolio Selection
A project selection model must generate useful information for project choices in a timely and useful fashion at an acceptable cost [1]. It helps an organization to make optimal choices among numerous alternatives.

According to several authors [1] [10], the most common methods are: financial methods, business strategy, scoring models, bubble diagrams and check lists.

2.2.1 Financial Method
This method relies on financial analysis to make project selection decisions. Financial models are all predicated on the time value of money principle. The time value of money suggests that money earned today is worth more than money we expect to earn in the future [1]. It includes various profitability and return metrics, such as Net Present Value (NPV), Internal Rate of Return (IRR), Return on Original Investment (ROI), Return on Average Investment (RAI), Payback Period (PBP), and Expected Value (EV).

It is the dominant and most used method. By focusing on the value of projects, this method allows to select the best projects, but also the worst [10]. Neglecting the criteria other than financial can lead to bad decisions [1].

2.2.2 Business Strategy
This method is based on the allocation of money across different types of projects and into different envelopes or buckets. These are defined by the company strategy. Projects are placed in these buckets and are retained
within the limits of the capacity of each bucket.

Dimensions used to split spending into buckets are: type of market, type of development, product line, project magnitude, technology area and others. This method has a lot of advantages and few disadvantages according to [10]. Amongst its advantages: Projects are aligned with the business strategy, since they correspond to major objectives of the business, expenditures reflect the company's strategy and the number of projects selected is consistent with the company's capacity.

The greatest disadvantage is that the ranking of projects in different categories (or buckets) is carried mostly by non-formal method [10]. Consequently we can choose a "less good" project.

2.2.3 Scoring Models
In these methods, projects are rated or scored on a number of questions or criteria (for example, low-medium-high; or 1-5 or 0-10 scales). The ratings on each scale are then added to yield a total or project score, which becomes the criterion used to make project selection decisions [10].

We distinguish more important from less important criteria by assigning each criterion a weight. Our choice of projects will thus reflect our desire to maximize the impact of certain criteria on our decision.

The choice of criteria and their weightings depend on the company's strategy. Some of the most used criteria: strategic fit, financial reward, risk and probability of success, timing [10].

The most important advantages of these models are according to [1]: It is easy to use it to tie critical strategic goals for the company to various project alternatives. It is easy to comprehend and use.

However, scoring models have some limitations: The rating scale can be not accurate (scale from 1 to 3 for example). They depend on the relevance of the selected criteria and the accuracy of the weight given to them [1]. It is for these reasons that [10] recommends using scoring models only for prioritizations or decision support.

2.2.4 Bubble Diagrams
Profile or bubble models allow managers to plot risk/return options for various alternatives and then select the project that maximizes return while staying within a certain range of minimum acceptable risk [1].

Projects are categorized according to the zone or quadrant they are in.

2.2.5 Check Lists
Projects are evaluated on a set of Yes/No questions relating to the criteria chosen by the company. Each project must achieve either all Yes answers, or a certain number of Yes answers to proceed. The number of Yes's is used to make Go/Kill and/or prioritization (ranking) decisions [10].

Answers to questions can be also: high, medium, or low in order to see which project accumulates the most positive checks and may thus be regarded as the optimal choice [1].

It is the simplest method of project selection [1], but it presents some disadvantages:
• Subjective scores (high, medium, or low), such terms are inexact and subject to misinterpretation or misunderstanding.
• It fails to resolve cases where criteria are differentially weighted.

Check lists method is recommended to be used in a con

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Financial method</th>
<th>Business strategy</th>
<th>Scoring model</th>
<th>Bubble diagram</th>
<th>Check lists</th>
</tr>
</thead>
<tbody>
<tr>
<td>The projects alignment with business objectives</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Projects in the portfolio have a high value</td>
<td>+++</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Expenses reflect the strategy of the business</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Projects are done on time</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>The Portfolio has a good balance of projects</td>
<td>+</td>
<td>+++</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>The portfolio has an adequate number of projects</td>
<td>+</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 1. Comparison of the most common methods of project selection
2.3 Strengths and Weaknesses of Different Methods

In order to compare different methods and highlight the weaknesses and strengths of each of them, it is necessary to set comparative criteria.

We consider the most important criteria according to [10] namely:

* The projects alignment with business objectives.
* Projects in the portfolio have a high value.
* Expenses reflect the strategy of the business.
* Projects are done on time.
* The Portfolio has a good balance of projects.
* The portfolio has an adequate number of projects.

Table 1 summarizes the comparison between the different methods of selection of projects described previously, according to the criteria mentioned above. This amounts to applying a checklist of criteria for the chosen methods. We note: low, medium and high with the respective abbreviations +, ++ and +++ criterion satisfaction levels.

It is clear from Table 1 that the business strategy method has several advantages (highest rated), it will be retained in our approach. To overcome the major drawback of the possible worst ranking of projects and to consider several criteria, we choose the scoring model for the classification. And finally, to get the greatest benefit from the financial method which is the maximization of value, we consider the first criterion of the scoring model is the financial value to what we propose the highest weighting coefficient. The second criterion is the risk, and the third is at the option of the business for more flexibility. We limit ourselves to three criteria to avoid complicating the model. Our proposed approach will be detailed in the next section.

3. Hybrid Approach for Project Portfolio Selection (HAPPS)

3.1 Choice of approach

Good project selection approach must generate useful information for project choices in a timely and useful fashion at an acceptable cost, it can serve as a valuable tool in helping an organization make optimal choices among numerous alternatives [1].

As we saw in the previous section, each of the methods have advantages and disadvantages, and we cannot say that a method is the “best” compared to others.

The idea is to conceive a hybrid approach that combines two or more methods to reap the benefits of these methods and to avoid the most of their disadvantages.

The business strategy method realizes the best results [10], it will present the core of our proposed approach. This method will be combined with a scoring model that takes into account the three weighted criteria: maximizing the financial value, risk minimization and a third criterion.

Indeed, HAPPS consists of:

* A scoring model for project ranking according to the most important criteria [10] namely: financial value, risk and a third optional criterion.

* Business strategy method for resource allocation and project selection according to the company’s strategy.

The financial method is also present in HAPPS from the fact that the criterion of value maximization will have a high weight. Our approach combines the advantages of the three methods: business strategy, scoring model and financial method, while filling their deficiencies as explained previously.

3.2 Steps of the approach HAPPS

![Figure 2. Hybrid Approach for Project Portfolio Selection (HAPPS)]
As shown in figure 3, the HAPPS consists of:

**Initial state:** We have a list of all projects identified and categorized.

**Step 1:** Projects are classified by a scoring model based on three criteria: financial value, risk and optional criterion.

**Step 2:** Projects are selected based on their rankings (from step 1) and according to their category within the limit of the capacity of spending on each category defined by the business strategy: the portfolio is made up of all the projects in each category.

**Step 3:** Project Portfolio Control. This step includes all the controls on the portfolio resulting from the previous step, we restrict ourselves to the following two aspects: 1- Allocation of resources between the projects selected in the portfolio. 2- Interactions between selected projects in terms of cost and time.

In this paper, we assume that the following prerequisites are already made:

* The company’s strategy is defined.
* Ongoing and candidate projects are identified and categorized according to the strategic items already defined.
* The project sheets are established: the cost, risk, deadlines, financial value. The evaluation of these parameters is not in the scope of this work.
* Projects are categorized according to the headings defined by the company strategy. To facilitate the implementation of the business strategy method, a project is assumed to belong to one category. Interference management among the categories is not part of the scope of this work.

Once these prerequisites made, we will detail our approach phase by phase in the next sections.

3.2.1 Ranking Projects

The potentiality degree of a project depends not only on the value it is supposed to produce, but it depends on other important criteria that must be taken into account. The choice of criteria is very important, we must be sure that the set of the criteria is complete but avoid redundancies and dependencies. A review of the criteria for projects selection was done by [13]. It identified 73 studies published between 2000 and 2011, with 35 different criteria used. These criteria are classified into four main headings namely: strategic benefits, business benefits, technical difficulty and financial costs.

On the other hand, the greater the number of criteria, the most expensive the evaluation of these criteria is. Indeed, project portfolios managers must evaluate all candidate projects with the criteria chosen, these assessments are prerequisites for all project selection methods. So more numerous and complicated criteria are, more complicated the assessment task is. For less complexity, we must reduce the number of criteria.

In a previous work [11], we considered the three most important criteria: alignment, value and risk to rank projects.

Indeed, the three most important criteria in literature are [3] [9] [10]: strategic alignment, financial value and the risk or probability of success.

The strategy factor is so important that we judged to distinguish it by adopting the business strategy method in step 2, which will be decisive in the choice of projects.

We propose for our scoring model the remaining two criteria: value and risk, and optionally a third criterion left to the choice of the company, it can be: time, ease of doing, cost of development, project complexity, resource availability, commercialization capability, or others. The third criterion is introduced for more flexibility and agility.

For our scoring model, we propose the following formula:

$$V_c = a * V_f + b * V_r + c * V_t$$  \hspace{1cm} (1)

Where

$V_c$: Classification value;
$V_f$: financial value;
$V_r$: success probability value (inverse of the risk value);
$V_t$: value of the third criterion.

$a$, $b$ and $c$ are weighting coefficients, respectively, of the financial value, success probability value and the third criterion with: $0 <= a, b, c <= 1$ and $a + b + c = 1$.

**Financial Value:**

The financial value of a project is very important for businesses, it is for this reason that most of them opt for the...
financial method in project selection [10].

To calculate the financial value of a project, several metrics exist; we have mentioned some of them in the previous section.

Figure 3 shows in detail how to determine one of these metrics: Expected Commercial Value (ECV).

The choice of the metric depends on the company’s priorities. Indeed, when the absolute return is considered, the organization gives priority to projects that generate higher absolute profit (maximum profit, even if associated with higher risk). In case the relative return is used, the organization prioritizes investments that will certainly provide a return to the organization (maximum security, even if associated with lower profit). The use of the payback period allows to give priority to the rapid return on the amount invested (maximum return in the short term) [12].

As we have stated in the prerequisites, we assume that the metric is chosen and that we have the values for all identified projects, we denote F the value of this metric. The margin of the F values depends on the order of magnitude of company’s projects and the measuring unit chosen. To bring the values to a scale of 10, we propose to give the Vf value as follows:

If we note Fmax the maximum value (for all projects):

\[
Vf = 10 \times \frac{F}{Fmax}
\]  

Thus $V_f$ belongs to the segment $[0, 10]$. 

**Success probability value (# risk value):**

Risk is a combination of the probability of an event (usually an undesirable occurrence) and the consequences associated with that event [9].

As the financial value, we assume that the risk value is already calculated for all identified projects.

The risk is a qualitative criterion, and to be able to compare like with like, we require that risk’s values are in the same margin as financials: $0 < V_r \leq 10$.

Normally, the longer the project has a high risk more it is less interesting. That is why we consider the probability of success value, not the risk value.

**Third Criterion:**

Reference [12] identified 37 different criteria used in 73 studies conducted between 2000 and 2011; these criteria are classified into three broad categories:

- Project description (16 criteria, example: time involved, project complexity, ease of execution)
- Investment quantification (6 criteria, example: investment in infrastructure, in technology, in human resources)
- Benefit quantification (15 criteria, example: direct benefits, social benefits, environmental benefits)

The third criterion is added to take into account the specificity of the company. This is an optional criterion. To disable it, just put the weighting coefficient $c = 0$.

As for the other values of the criteria, $V_t$ must be between 0 and 10.

**Weighting Coefficients:**

The weighting coefficients $a$, $b$ and $c$ are determined by the business strategy, the higher the coefficient of a criterion, the greater importance to this criterion is given.

For example, a company who does not want to have a third criterion, that gives four times more importance to the financial value compared to the risk will have the following values: $a = 0.8$; $b = 0.2$ and $c = 0$.

**Result of step 1:**

At the end of this step, we obtain the list of projects ranked in order of potential.

3.2.2 Projects Portfolio Composition

The business strategy method is chosen for this step. As described previously, this method is to allocate the money according to the vision and strategic objectives of the company. Senior management makes forced splits of money across various dimensions which can be: product line, market, project type or another. For each split is associated a bucket.

Projects already sorted by the chosen dimension, called category in figure 3, and classified by the scoring method of step 1 will be put in the corresponding buckets until reaching the limit of spending targets assigned to each bucket.

![Figure 4. Ranking projects: step 1 of HAPPS](image)
At the end of this final step, we built the project portfolio by concatenating buckets made of the best rated projects by business category.

3.2.3 Projects Portfolio Control
In the previous steps, we have considered separately the projects. Indeed, the evaluation of all project parameters such as: the cost, value, risk ... is performed without considering portfolio management. This last step aims the portfolio readjustment taking into account two important aspects: the resources allocation and interactions between projects.

Resources Allocation:
The determination of portfolio components is made on the basis of an important resource namely: money (business strategy method). But there are other resources that must share projects. Management of resource allocation is important in so far as it predicts both resource conflicts and their underutilization.

Resource related decisions are one of the prominent aspects of multi-project environments, since the resource based relations define the environment as a multi-project problem by coupling individual projects [13].

The resource portfolio problem in a multi-project environment determines the general resource capacities for a given total resource budget. It determines also the dedication of a set of resources to a set of projects with assigned due dates according to the determined general resource capacities in such a way that individual project schedules would result in an optimal solution for a predetermined objective [13].

Several resource management policies in a multi-project environment exist in the literature [14] [15] [16] [17].

Resource management policy can differ with respect to the environment characteristics (e.g., geographical distribution of projects, specific resource characteristics, etc.) [13]. In the literature, a common approach for solving the multi-project scheduling problems assumes a resource sharing policy among the different projects. This policy cannot be applied in certain multi-project environments where resource sharing is not applicable because of various reasons.

An example of a different resource management policy in a multi-project environment is presented in [16]. This management policy is defined as the optimal dedication of resource capacities to different projects within the overall limits of the resources and with the objective of minimizing a predetermined objective function.


We content ourselves in this article to verify the possibility of launching projects selected in parallel depending on the availability of the identified important resources.

For simplicity, let us consider the important resources R1, R2, ... Rr, r is an integer representing the number of resources.

For each of them, enterprise has a certain capacity. We note the capacity of the resource Ri, with 1 <= i <= r. P1, P2, ... Pn denote the portfolio projects, n is an integer representing the number of projects in portfolio.

We can note Cij the Pi consumption from Rj resource, with 1 <= i <= n and 1 <= j <= r.

Cij = 0 if Pi does not use the resource Rj.

At all times, the portfolio must meet the following condition:

\[ \sum_{i=1}^{n} C_{ij} \leq V_j \quad (3), \text{ for all } j. \]

In other words, the sum of the portfolio projects consumption in a given resource should be as close as possible to the company capacity in this resource.

Optimizing planning portfolio projects and consumption by project phases resources can be performed with the previously mentioned approaches.

Interactions between Projects:
As in [18], we consider the impact on two important elements: cost and time.

The costs used in step 2 of HAPPS are determined for each project independently of others.

Each selected project Pi had a cost Ci and deadline Di, by considering the interactions between the selected projects, the project will have C'i and D'i as cost and duration.

It is proposed for this phase control check the following:
1- Is the revised cost C'i meet business strategy?

In other words, the sum of revised project cost (of one category) is within the budget allocated to this category.

2- It would be interesting to recalculate the scoring model with the new values of the financial value V'f, V'r risk value and the value of the 3rd criterion V't.

For this phase of control, we simply raise the points to check. Methods of recalculation of various parameters are not part of the perimeter of this article.

3.3 Illustrative Example
To illustrate the HAPPS approach, we consider the example of a telecommunication company.

* The strategy east by market: fixed telephony, mobile
telephony and data.

* The allocation of budget by market is as follows: $200 million for mobile, $100 million for the fixed and $100 million for the data.

* We will denote the identified projects: P1, P2, ..., P10.

* The third criterion is chosen by the company: time to market.

* The criteria weights are as follows: 0.2 for risk, the financial value 0.6 and 0.2 time to market. This means that 60% of the weight is given to the project value, risk and time account for 20% each.

* The table below includes the prerequisite data for the application of HAPPS approach.

![Figure 5. Project portfolio composition: step 2 of HAPPS](image)

<table>
<thead>
<tr>
<th>Projects</th>
<th>Vf</th>
<th>Vr</th>
<th>Vt</th>
<th>Cost (M$)</th>
<th>category</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5.3</td>
<td>8</td>
<td>4.5</td>
<td>50</td>
<td>Mobile</td>
</tr>
<tr>
<td>P2</td>
<td>4.1</td>
<td>2</td>
<td>9</td>
<td>6.7</td>
<td>Fixe</td>
</tr>
<tr>
<td>P3</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>58.5</td>
<td>Fixe</td>
</tr>
<tr>
<td>P4</td>
<td>4.6</td>
<td>3</td>
<td>9</td>
<td>43</td>
<td>Fixe</td>
</tr>
<tr>
<td>P5</td>
<td>5</td>
<td>2</td>
<td>8.5</td>
<td>36</td>
<td>Mobile</td>
</tr>
<tr>
<td>P6</td>
<td>9</td>
<td>7</td>
<td>6</td>
<td>48</td>
<td>Data</td>
</tr>
<tr>
<td>P7</td>
<td>2.6</td>
<td>6</td>
<td>4.5</td>
<td>51</td>
<td>Data</td>
</tr>
<tr>
<td>P8</td>
<td>10</td>
<td>1</td>
<td>5</td>
<td>49</td>
<td>Data</td>
</tr>
<tr>
<td>P9</td>
<td>3.8</td>
<td>2</td>
<td>2</td>
<td>130</td>
<td>Mobile</td>
</tr>
<tr>
<td>P10</td>
<td>5.7</td>
<td>3</td>
<td>7</td>
<td>110</td>
<td>Mobile</td>
</tr>
</tbody>
</table>

Table 2. The prerequisite data for the application of HAPPS
By applying step 1 of HAPPS, we obtain the project ranking values as shown in the following table:

<table>
<thead>
<tr>
<th>Projects</th>
<th>Vc</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5.68</td>
<td>4</td>
</tr>
<tr>
<td>P2</td>
<td>4.66</td>
<td>8</td>
</tr>
<tr>
<td>P3</td>
<td>7.4</td>
<td>2</td>
</tr>
<tr>
<td>P4</td>
<td>5.16</td>
<td>6</td>
</tr>
<tr>
<td>P5</td>
<td>5.1</td>
<td>7</td>
</tr>
<tr>
<td>P6</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>P7</td>
<td>3.66</td>
<td>9</td>
</tr>
<tr>
<td>P8</td>
<td>7.2</td>
<td>3</td>
</tr>
<tr>
<td>P9</td>
<td>3.08</td>
<td>10</td>
</tr>
<tr>
<td>P10</td>
<td>5.42</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3. Ranking projects: step 1 of HAPPS

We apply step 2 to determine the projects selected for the project portfolio:

<table>
<thead>
<tr>
<th>Mobile</th>
<th>Fixe</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (50 M$)</td>
<td>P3 (58.5 M$)</td>
<td>P6 (48 M$)</td>
</tr>
<tr>
<td>P (110 M$)</td>
<td>P4 (43 M$)</td>
<td>P8 (49 M$)</td>
</tr>
<tr>
<td>P5 (36 M$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>196 M$</td>
<td>101.5 M$</td>
</tr>
</tbody>
</table>

Table 4. Composition of portfolio: step 2 of HAPPS

P2, P7 and P9 are not retained in the portfolio because of their classification and reaching of the budget allocated to each market category.

Applying the control phase, we recalculate the cost estimates of the projects selected. The new estimates C'i are set in brackets.

<table>
<thead>
<tr>
<th>Mobile</th>
<th>Fixe</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (60 M$)</td>
<td>P3 (52.5 M$)</td>
<td>P6 (48 M$)</td>
</tr>
<tr>
<td>P10 (140 M$)</td>
<td>P4 (40 M$)</td>
<td>P8 (49 M$)</td>
</tr>
<tr>
<td>P5 (36 M$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>236 M$</td>
<td>92.5 M$</td>
</tr>
</tbody>
</table>

Table 5. Control of portfolio

- It is clear that the P5 project cannot be selected because the budget allocated to the mobile market is exceeded.
- In the fixe market, the budget allows the selection of project P2. The portfolio is then as follows:

<table>
<thead>
<tr>
<th>Mobile</th>
<th>Fixe</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (60 M$)</td>
<td>P3 (52.5 M$)</td>
<td>P6 (48 M$)</td>
</tr>
<tr>
<td>P10 (140 M$)</td>
<td>P4 (40 M$)</td>
<td>P8 (49 M$)</td>
</tr>
<tr>
<td>P2 (6.7 M$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>200 M$</td>
<td>99.2 M$</td>
</tr>
</tbody>
</table>

Table 6. Final portfolio
We can make another control on the resources used to further adjust our project portfolio. We just verify in this illustrative example the interactions between projects on project costs.

It is important to note that we can refine the selection by performing another iteration of the method: recalculate the rating system ... but this increases the complexity since we would have to reevaluate all criteria for all projects. The decision to refine or not the selection of projects depends on the context of the company.

3.4 Discussion and evaluation of results
We will evaluate the results of our proposed approach HAPPS by the same success criteria of a project portfolio in Table 1.

The project alignment with business objectives:
Projects selected by HAPPS come from buckets corresponding to the strategic objectives of the company, they can only be aligned with the business strategy. In addition, projects are classified initially according to their value, risk and other company specific criteria, the three criteria are weighted according to company strategy. All these elements enhance the alignment of projects selected with the strategy.

Projects in the portfolio have a high value:
One of the criteria for the scoring model used in the ranking of projects at Step 1 in HAPPS is the financial value.

This criterion generally has the highest weighting coefficient. So in order to be selected, projects must have a high value.

Expenses reflect the strategy of the business:
This is one of the highlights of this approach HAPPS, the company’s expenses are divided according to the strategic vision to the different categories. Each category has therefore target expenditure and projects in this category are selected until reaching the target cost.

We can therefore state that the expenses of the company well reflect its strategy.

Projects are done on time:
The notion of time is not part of HAPPS, but may be introduced via the optional third criterion.

The Portfolio has a good balance of projects:
Our approach is based among other on the business strategy method. With this method, money is allocated across different types of projects and into different envelopes or buckets. This allows having a well-balanced project portfolio.

The portfolio has an adequate number of projects:
For this point, it is also a result of the business strategy method. Indeed, projects are selected according to their type and category within the limit of expenditure allocated to each category. The number of projects in the portfolio is then adequate with company’s capabilities.

4. Conclusion

Literature shows that there are a lot of tools and techniques which help the organizations in selecting projects for its project portfolio [9]. Each method has its own advantages and disadvantages as we have seen for the most commonly used methods. We have developed in this paper an approach that helps organizations in accomplishing this very important task namely the selection of the most beneficial projects.

Our approach is well evaluated with the criteria identified by [10] as shown in the previous section. These criteria are similar to those mentioned by [1], which are mainly:

• Realism: An effective model must reflect organization’s goals and mission.
• Capability: It should respond to changes in the conditions under which projects are implemented.
• Flexibility: The model should be easily modified if trial applications require changes.
• Ease of use: A model must be simple enough to be used by people in all areas of the organization.
• Cost: It should be cost effective in terms of either time or money.
• Comparability: It must be broad enough to be applied to multiple projects.

Indeed, HAPPS reflects the organizational goals (relying among others on the business strategy), allow flexibility in choosing some parameters: the financial metrics and also the third criterion. It is easy to implement with only three criteria for the classification phase. And finally, in terms of cost in time and money and also the ease of use, it must be implemented to evaluate it. Hence the first perspective of this work is the implementation of the approach on real cases. A second perspective is to complement this approach by allocation of resources to projects selected.

References


