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## Projects Selection and Prioritization: A Portuguese Navy pilot model

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### Abstract

In the face of rapid technological changes, short product cycles and strong global competition, it is vital that organizations know how to optimize their scarce resources and thus profit from investments with the goal of obtaining the expected benefits and successes. One of the great difficulties facing organizations is the large number of projects that they usually have in their portfolio. Therefore, it is necessary to select and prioritize which projects become essential, to guarantee the maximum return on investments and the sustainability of the organization. Although there are several approaches to analyzing and selecting projects, there is no unanimity about which methodologies to apply. When analyzed in more detail, all approaches presented advantages and disadvantages which need to be considered. Project selection also depends on the nature and profile of the managers and on the techniques, that best fit the organization's environment. This study analyzes and establishes the link between the academic literature and a pilot model of selection and prioritization of projects developed by the Portuguese Navy. The project was carried out to improve the support and allocation of the necessary resources and forces for the accomplishment of the Navy's missions in the context of Portugal's National Defense. The results obtained ensure the necessary alignment with the academic literature and reinforces the credibility of the proposal model for the selection and prioritization process.

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## 1. Introduction

The recognition of the strategic importance of managing projects in the corporate world is rapidly increasing<sup>1</sup>. One important reason for this may arise from the strong belief that the alignment between project management and business strategy can significantly enhance the chances for organizations to achieve their strategic objectives<sup>1,2</sup>. One of the great difficulties for organizations is the large number of competing projects in their portfolios. It is necessary to consider that the budget and resources are limited, and that this may delay or conflict with other projects, compromising the organization's strategy. Developing the ability to select and prioritize the appropriate projects is one of the key points to ensure maximum return on investments for the organization<sup>3,4</sup>. However, there are many organizations that only use financial methods to select projects, such as ROI, VAL or Payback. According to many authors, organizations that rely only on these financial methods have a worse portfolio performance<sup>4</sup>.

Tregear and Jenkins<sup>5</sup> identifies nine differences between public and private sector organizations that influenced the way the portfolios are built, namely; (1) The public interest; (2) Public accountability; (3) Political sensitivities; (4) Whole-of-Government ecosystems; (5) Budget cycle complexity; (6) Information exchange; (7) Regulating society; (8) Machinery of Government changes; (9) Culture.

Projects represent important challenges for organizations and ensuring that projects are aligned with strategy is one of the key factors for success of organizations<sup>6,7,8</sup>. There are no ideal models for selecting projects, however, portfolio management should be developed to help organizations strive for the best possible results<sup>4</sup>. The present case study was carried out within the framework of the Portuguese Armed Forces (PAF's), more specifically the Portuguese Navy. The main objective is to build a project portfolio, which is the main investment instrument of the PAF's. As in other sectors of the economy, selecting and prioritizing projects is equally vital for the organization's success. Projects selection and prioritization is aimed at constructing and sustaining the necessary forces and resources for the accomplishment of the PAF's missions, and this is considered extremely important for both the organization and the country. The strengths and weaknesses of the PAF's are identified and projects are developed to eliminate these shortcomings, which will have a distinct impact on the fulfillment of the PAF's missions, and consequently on the contribution of the PAF's to national defense policy, with internal and external repercussions.

The prioritization of these projects is determined at an early stage by a multi-criteria analysis, particularly considering the results of the risk assessment of each of the gaps for compliance with the PAF's missions. Subsequently, a cost-benefit and sensitivity analysis is carried out, which considers a set of constraints imposed on the level of available resources, mainly financial. The objective of this study is to identify the theoretical models established in the academic literature for the introduction of portfolios and to validate the PAF's pilot model for the selection and prioritization of projects, supported by the theoretical models, whilst considering the specificity of the military context.

## 2. Literature review

### 2.1. Project Portfolio

A portfolio refers to projects, programs, sub-portfolios, and operations managed as a group to achieve strategic objectives<sup>9</sup>. In a portfolio, the components do not have to be interdependent or have common objectives, but they must be quantifiable, classified and prioritized individually. A project portfolio is a group of projects that compete for scarce resources and are conducted under the sponsorship or management of a specific organization<sup>3,10,11,12</sup>. There are three well-known objectives of portfolio management<sup>10,12</sup>: (1) The maximization of the portfolio value; (2) The linkage of the portfolio to the strategy, and; (3) Balancing the portfolio. According to the literature, project portfolio success is comprised of several dimensions<sup>12,14,15,16</sup>: (1) Average project success - which includes the classical success criteria of budget, schedule, and quality adherence, as well as customer satisfaction of all projects in the portfolio<sup>10,12</sup>; (2) The use of synergies is also used to measure the success of a portfolio - which includes the use of technical and market skills that the projects in the portfolio produce among themselves<sup>10,12</sup>; (3) Strategic fit - which incorporates the extent to which all projects reflect the corporate business strategy<sup>17</sup>; (4) Portfolio balance - that balances the project portfolio with respect to risks and expected benefits<sup>3</sup>; (5) Preparing for the future - which deals with long-term aspects and considers the ability to seize opportunities that arise after the projects have been brought to an end<sup>10</sup>; and; (6) Economic

success – which addresses the short-term economic effects at the corporate level, including overall market success and the commercial success of the organization or business unit<sup>10,15</sup>. According to Meskendahl<sup>15</sup> project portfolio efficiency is based on four factors: (1) Strategy fit; (2) Single project success; (3) Interdependence between projects, and (4) portfolio balance.

The organizational focus on portfolio project management is an indicator that the management of individual projects will ultimately increase the efficiency of the business and help achieve the strategic objective of the organization<sup>8</sup>. Project portfolio is seen as a dynamic decision process which is constantly updated and revised<sup>18</sup>. In this process, new projects are evaluated, selected and prioritized; existing projects may be accelerated, abandoned, or de-prioritized, and resources are allocated and reallocated to active projects<sup>18,19,20</sup>. Many scholars and practitioners<sup>14,21,22</sup> claim that decision-making, prioritization and reprioritization, strategic alignment and realignment, allocation and reallocation of resources are all part of the ongoing processes of project portfolio management. Project selection is a strategic decision, and as such should be aligned with the organization's business strategy to ensure the maximum return of the selected portfolio<sup>3,8,15,19,20,23,24</sup>. The selection and prioritization process performed between many alternatives to ensure a correct portfolio is a complex issue, which needs clear and defined criteria<sup>25</sup>. The selection and prioritization process can lead to conflicts in the qualitative or quantitative profile, in alignment with the organization's strategic objectives, or conflicts in gains and costs and resource limitations<sup>26</sup>.

Although there are several methods for analyzing and selecting projects, there is no unanimity about the methodologies to be applied, since they all have advantages and disadvantages, and thus this choice also depends on the nature and profile of the managers, and on which techniques better fit the organization<sup>23,27</sup>. Portfolio projects should be prioritized according to the benefit they generate for the organization and they can be quantified by ROI, strategic alignment, or other measures<sup>8</sup>.

Archer and Ghasemzadeh<sup>3</sup> proposed an integrated framework for project portfolio selection, focusing on procedures and the utilization of several tools and techniques. This support-based decision-making process method included three main phases, as follows: (1) Strategic evaluation - considering the internal (strengths and weaknesses) and external (market place) environment to create competitive advantage in strategy development; (2) Individual project evaluation: measuring the benefit and value that each project contributes to portfolio objectives; (3) portfolio selection: involving the simultaneous comparison of many projects to rank and select projects for the portfolio, based on certain measurement criteria and the availability of resources.

Cooper<sup>28</sup> proposed a selection framework which consists of two levels. The first level is 'strategic portfolio decisions' (strategic buckets), which is very important for an organization that wants to divide projects into subsets or categories. The second level known as 'tactical portfolio decisions', which is largely a project selection process. At this level, different techniques and tools are used to select the right projects for each subset equivalent to each strategic bucket. Meskendahl<sup>15</sup> developed a reference model that highlighted the importance of the organization's strategy for its success, and suggests that the effect produced by strategic orientation is mediated by the portfolio's structure and its success. Khalili-Damghani and Tavana<sup>26</sup> developed a framework to create a sustainable strategy for project selection that aligns organizational strategy (mission, vision and value) with tactical and operational considerations. Several challenges make the correct choice of project selection portfolio framework difficult, such as: (1) Lack of information, unreliable cost data, time to completion, availabilities of resource, and benefits of projects<sup>14,29</sup>; (2) The annual plan review carried out by organizations, which automatically eliminate opportunities for new project proposals originating from different sources<sup>30,31,32</sup>; (3) Dynamic change, particularly in large organizations, which is mandatory to create the dynamic capabilities needed to survive and outperform competitors<sup>33,34,35,36</sup>; (4) The management difficulties in large organizations that have many business units, as each business unit has its own list of priority and preferences. In addition, project portfolio selection is not always rational, but rather is biased by the human being factor, lobbying being an example<sup>22,31,37</sup>.

### 3. Case study

#### 3.1. The organization

Just as in private companies, the prioritization and selection of projects is equally fundamental in the public domain, such as the Ministry of National Defense, acting on behalf of the Portuguese Government. The selection of projects

in the public domain has a different nature from that of the private sector, since it is of collective and national importance, and thus is strategic for the country's defense and the recognition of Portugal as a sovereign nation. Due to the peculiarity of the organization, the subject context, and difficulty of data collection, this study is considered a single case study<sup>38</sup>. The study was supported on the structural documentation of the military context of National Defense. These documents are the support for the country's military strategic objectives, the strands of military action, the achievement of the objectives and are the guidelines that define the necessary military capabilities for operations.

As a triangulation process, the study also interviewed several key people with different responsibilities and professional functions, namely the model creator, the developer and several key persons for the portfolio management process.

### 3.2. Model of Prioritization and Selection of Projects

The present model is based on risk and portfolio analysis methodologies and aims to assist the evaluation and prioritization of the gaps resulting from the comparison of the means and forces planned for 2018 to comply with the PAF's missions. It should be noted that, unlike that which occurs in other prioritization and selection models, all projects compete for the portfolio. Thus, the first step is the prioritization of all projects, and then, subsequently, the projects will integrate the portfolio through a multi-criterion and a cost-benefit analysis.

The model allows the extracting of the necessary elements for the definition of criteria and for the evaluation and selection of the proposed initiatives in terms of military equipment, modernization and operationalization of the forces system, to fill the gaps and their relevance. The relevance of the gap determines the value of the project according to the global importance of the gap that is intended to fill or mitigate. The degree of completion of the gap assesses how a project fills a gap. Once approved, the initiatives will be included in the PAF's portfolio. The model includes the following four modules.

Table 1. Modules of PAF's Model

Module	Description
Strategic	<p>Qualitative assessments of the PAF's structural documentation. Quantification to calculate the relative value of each type of mean for the fulfilment of FAP's missions.</p> <p>The main focus of this module is the attribution of numeric value (from 1 to 6).</p> <p>Assigning a score to each typology, considering the specificities and performance scenarios where the mean will work.</p>
Operational	<p>The translation into projects of the needs to build a sustainable system, based on a combination of the contribution that each project provides to fill the respective gap.</p> <p>Assess the impact or degradation that a given mean causes by its absence, and estimating the consequences. Proposals for projects and programs designed to fill identified shortcomings.</p>
Analysis	<p>Consists of a portfolio analysis aiming to adjust the initial evaluation of projects competing within the portfolio, considering the cost-benefit constraints, the initial assumptions, and selecting the right combination of projects that best serves the objectives.</p> <p>Prioritize and select those projects that will move on to the execution phase. The use of the portfolio analysis module available in the EPM (Microsoft Project Server), through which the multi-criteria analysis is performed, followed by a cost-benefit analysis of the projects.</p> <p>Allowing the selection of the ideal combination of the proposals of projects that maximizes the strategic value, whilst reducing the financial cost value (Best Value for Money).</p>
Portfolio Project Management	<p>Manage the set of approved projects, allowing an efficient adjustment of any changes, such as new projects or changes to cost restrictions that may occur in the initially-approved project selection. The projects are individually followed to anticipate deviations in terms of time and/or cost.</p> <p>Carrying out activities that are oriented to the maintenance of the strategic value and of the initial financial cost of the portfolio.</p> <p>Optimization, through making the best of the opportunities that may arise, especially financial reinforcements or new projects, or by the reduction/mitigation of the negative effects caused by budgetary or human resource reductions.</p>

### 3.3. Comparison

A comparison table (Table 2) was built to map the different contributions of the academic literature and the PAF's model.

Table 2. Mapping the PAF's Model with the different academic approaches

Approach	Method	Measure	PAF Model	Reference
Qualitative	Strategic Method	Balanced Scorecard; Bucket Approach		4, 39, 40, 41, 42, 43, 44
	Delphi Method			23, 45, 46, 47, 48
	Hybrid multiple-criteria decision-making method			49, 50
	Bubble Chart			4, 13
	Scoring models		Scoring models	4, 27, 51
	Fuzzy logic			27, 52, 53
Quantitative	Financial	ROI; TIR; VAL; Payback; Cost analysis	Best Value for Money	3, 9, 51, 54, 55, 56, 57, 58, 59, 60
Qualitative/ Quantitative	Decision tree			27, 61, 62
	Analytic hierarchy process		Multi-criteria analysis	27, 59, 63
	Analytic network process			45
Others	Risk		Risk analysis	3, 9, 24, 64, 65

## 4. Discussion

The PAF's missions are the starting point for our evaluation process, considering the specific pre-defined priorities and guidelines. These are aggregated according to their nature, and then subdivided into sub-scenarios, such as the specificity of the missions of security and defense of the national territory and its citizens. For the quantification process, a set of several attributes was considered. The metrics were decided by a group of experts from the Military Strategic Council (CMS), who evaluated them for each sub-scenario, and then contributions were made by the different Capacity Areas (which assign the level of importance that each mission merits).

The contributions of all Areas are converted into a numeric value and their average were calculated for each mission. The evaluation of the typology of means is carried out to quantify the degree of suitability of each one for the execution of the PAF's missions. The calculation of the relative strategic-military value of a typology takes into consideration the importance of the mission in question. The need to assess the gaps is simulated by assessing the impact that their absence or degradation would cause on the missions, thus enabling the estimation of the consequences of using the current means. The identification of the gaps and their characterization, including the determination of their weight, results from carrying out many analysis sessions, involving several specialists from various technical and operational areas.

The proposals of forces are the projects and programs that are designed to fill the identified gaps, the objective being to try and complete them to the maximum extent possible. The valuation of these proposals is calculated based on the percentage rate of completion of the gap that they were intended to fill, and on the value of the respective typologies of means. The value of each force proposal depends on how high is the percentage value of filling the corresponding gap, and on the value of the corresponding typology means. Thus, the greater the percentage value of gap-filling and the value of the typology, the higher is the value of the proposed force. After evaluating and prioritizing the set of gaps and projects, the portfolio analysis module, sourced from the EPM (Microsoft Project Server) is used.

Through a multi-criteria and cost analysis, projects are then selected for the portfolio. Initially, the strategic criteria are defined for selecting projects, as well as their weight, which is a critical activity, since it allows an evaluation which is aligned with the strategic objectives initially defined.

The defined criteria are the following: (1) Gap value; (2) Degree of completion; (3) Level of political ambition, and; (4) Political priority (Table 3).

Table 3. Prioritization criteria

Criteria	Description
Gap value	Evaluates the projects according to the value of the gap for which it was planned to fill.
Degree of completion	Evaluates the projects according to the degree of filling the gap
Level of political ambition	Evaluates the projects according to their contribution to the level of ambition established.
Political priority	Evaluates the projects according to the impact on the construction of the capacities that contribute to the priority scenarios

This method allows prioritizing all the projects that were defined and considered to fill in the identified gaps. After prioritizing projects for their strategic value, it is necessary to optimize the project list by carrying out a cost analysis, considering the annual budget. Therefore, it becomes possible to choose the projects that best attain a certain level of strategic value at the lowest possible cost, based on the concept of “The Best Value for Money”.

In terms of portfolio management, it is important to mention the actions that are carried out by the Portuguese Navy are the following: (1) Projects individually tracked, based on time and cost, to anticipate deviations and to enable the implementation of the necessary corrections to minimize their impact; (2) Portfolio management carried out through various activities that are aimed to maintain the strategic value and initial financial cost of the portfolio, and to optimizing it by introducing opportunities that may occur.

The PAF’s model uses several methods and all three types of approach. The fact that this model uses various approaches and several methods to select and prioritize projects, makes the model distinctive, whilst crossing and reinforcing the process of project selection and prioritization. The simultaneous use of approaches makes it possible to ascertain from different perspectives what are truly the relevant projects, and also those that require more attention in the context of the PAF’s missions. The PAF’s model uses a multi-criteria analysis (qualitative/quantitative approach) and a cost analysis (Quantitative approach) for the analysis module. A scoring model (qualitative approach) is also applied to the strategic module at the level of prioritization of PAF’s missions. In addition to these approaches, an approach to risk is made throughout the model. It is important to note that the PAF’s model has a well-developed strategic focus, as do those of some other authors <sup>3,15,16</sup>.

## 5. Conclusions

To achieve success in implementing their strategy, public or private organizations must know how to effectively manage their resources, whilst overcoming their current challenges. The scarcity of resources compels organizations to carry out a correct selection of their projects in the context of their portfolio, in alignment with their organization's strategy, to guarantee the accomplishment of objectives and the creation of value to their stakeholders. This value can be in the form of economic return, sustainability, market share, or even social visibility.

This study presents a pilot model of prioritization and selection which was implemented to fulfil the PAF’s missions. Given the very specific context in which it was developed, it was necessary to identify the attributes and factors of reliability and sustainability. The main virtue of this model lies with the reliability of the options and the standardization of the processes.

Other important contributions of the model are: (1) The metrics defined by experts referring to the characterization of PAF’s missions and the correlations established between capabilities, capacity areas and missions, ensuring the initial alignment with strategic orientations; (2) The numerical conversion of the qualitative evaluations and the use of an arithmetic algorithm to obtain the relative strategic-military value. Value from which the gaps assessments and respective proposals are indexed. Avoiding influence or personal interests in the decision process; (3) The algorithm construction for the calculation of the global relative value of the “means” that is based on the sum of all relative values and in the various PAF’s missions where it participates. Thus, the importance of each “mean” is associated with its transversality and versatility, considering also the weight or relevance of each PAF’s mission where its use is required.

Finally, the future development of a model conceptually more aligned with that used in NATO would allow its use at a level more operational and less strategic.

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