Proposed project management methodology for military public domain projects - implementation of laser weapon technology

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Abstract—This thesis intends to make a comparison between the project management carried out in the private domain and the public domain, with special focus on the military application. The work begins identifying the differences between the public and private domain. Then, are identified other nations / organizations where they have already elaborated doctrine on the subject. In a second phase, based on the Portuguese Navy project manager organization, it’s design a model that pretend fully adapt the private project manager routines to the public project manager for military application. The designed model is based on the PMBok methodology, however it was necessary made some adaptation in order to: the organization, life cycle and the ten areas of knowledge suit the military publics projects. The proposed model was validated using semi-structured interviews to experts with have extensive experience in project management nationally and internationally in this area. Finally is made an application of the model to a case study, which aim implement of the defence capability against laser weapons in the Portuguese Navy.

Keywords—Project Manager, public domain, private domain, knowledge areas, organization, life cycle

I. INTRODUCTION

In order to optimize it is own resources management process, the Portuguese Navy has implemented a Project Management strategy since 2007, based on the Enterprise Project Management (EPM) support tool, which is based on the Balanced Scorecard methodology, (BSC). The implementation of this capacity has been achieved based on the good practices set out by the two reference institutes in the Project Management area, namely the Project Management Institute (PMI) and the International Project Management Association (IPMA) ([1], [2]). However, the good practices stated by these institutes were mostly developed for the private sector [3] [4]. Thus, it turns out There are profound differences between the public and private sector at the organization level, the number of stakeholders, and Human Resource management methodologies. Therefore it becomes apparent that it is impracticable to apply directly the practices developed for the private sector to the public sector, as evidenced in [10], [11], [7] and [8].

PMI in 2003 identified these differences and has since released three editions of the Government Extension to the PMBok. This publication tailors PMBok’s procedures to the public sector as referred to in [7]: “This update expands the scope of the previous edition to include all forms of government”. In the light of these conclusions drawn by the US and reiterated in three editions, it is now considered appropriate to check whether the Government Extension to the PMBok project management procedures need to be readjusted to the national context and case. Navy. In this sense, the investigation was initiated by NATO, where it was found that it had already felt the need to adapt good project management practices to the public domain, taking into account the particularities of the characteristics of the military environment [9] [10].

Concerning of allied / friendly nations, the pioneer nation in project management was the United States of America (USA), because through the Project Management Institute, it has its own publication for project management (US Department of Defence Extension to: A Guide to the Project Management Body of Knowledge [12]).

They have taken all necessary steps to conduct project management in the public domain for military purposes. The fact that the nation that invests more in the defence sector, considers it imperative to adapt project management procedures to the reality of the public sector in particular to the military sector, Thus, this paper aims to identify the differences between the two domains (public and private) and propose a project management solution, optimized for the Portuguese public domain, focus in the military component. As a case study, it will be use a project within a ministerial program to improve one or more capabilities of the Portuguese Navy that will be the establishment of laser detection capability. This case study objective is to exemplify the engineering challenges (systems integration at the logical and physical level) needed to install equipment on board of a warship, thus bridging the need for a project management system suitable for this domain.

II. ANALYSIS

As mentioned, PMI, aware about the differences between the public and private sector, “Government Extension to the PMBOK” [7]. This publication follow the basic organization of PMBoK, but highlights the differences between the application of good practice between the public and private domain, indicating differences in “Inputs”, “Tool & Technique” and “Outputs”. 
Likewise, in England, it was also identified the need to create a model that would bridge the differences between the two domains. PRINCE 2 was the solution found.

In the US, since the early days of project management, the Department of Defence (DoD) has felt the need to bridge the gap between public domain projects themselves and military projects. Thus, with PMI collaboration, DoD developed “U.S. Department of Defence Extension to: A Guide to Project Management Body of Knowledge (PMBok Guide)”. As regards the NATO institution, it was found that it also has its own project management documentation, namely three documents: the “AAP-20 NATO Program Management Framework (NATO Life Cycle Model)” [10], “ARAMP-1 NATO risk management guide for acquisition programs [11]” AAP-48 NATO System Life Cycle Processes [9]”.

Once, all the models developed are not applicable in Portugal, due it’s national characteristic, it was decided move on to create a new model, based on the previous but that include all the national specificities.

Thus, the ten knowledge areas and organization and life cycle will of PMI good practice be addressed, in order to explain the identified differences and will be made a proposal of new Inputs, Tools & techniques and Outputs to adapt PMBok fifth edition to Portuguese Navy needs.

A. Organization

Conceptually, the terms and principles used in project management are the same in both areas [7], [12] i.e. the basic concepts of good practice identified by the two major institutes (IPMA and PMI) in their NCB base publications and PMBok ([3], [4]) are applicable in both domains. This means that the ten knowledge areas identified by PMI are applicable in both domains, however there are specificities of each domain that require adaptations to enable their full implementation [13], [14], [15]. In this account, in the public domain, elected governments establish laws, statutes, regulations, and policies. These serve to guide the projects that governments use as a source of progress. This is how the limits, duties and responsibilities of the project team are established in the public domain. This whole process is based on building consensus with stakeholders. However, this consensus may be called into question during election cycles, as projects demonstrate the success / failure of policies pursued by a particular government.

So, it is suggested that there is a multidisciplinary team (covering the various sectors of the Navy at the strategic level, called the strategic management team, which will play four key roles for project success. The role of this team will be manage the strategic stakeholder unreachable by the project manager, at same time perform communication management with this stakeholder and play the CCB (change Control Board) role. The intention is this team pick up the business case and develop short project charter call it mini-charter, where will explain the scope, stakeholders, assumptions and cost of the project. After concluded this step, the team will be made one mini-charter for each area covered by the project.

In the next phase of the project, the project manager will be appointed and the team will perform the above functions.

In the project organization, it is also found that in the public domain, the documents approval are it significantly, because unlike the private sector that approval is only dependent on the sponsor, in the public sector the project will need to gather consensus across the various stakeholders. So at this point, the strategic management team, has an important role to play in order to enable the approval of the documents.

B. Life cycle

Compared to what is described in [7], [10] and [12], the characteristics are applicable in both areas. However, in the public domain is important to take in account the law - Public Procurement Code [28] or by the approval processes.

Thus a new life cycle has been developed which is based on PMBok but with appropriate adjustments to the public domain requirements. Thus the life cycle is divided into five phases and the objective of the first phase - Initiation, macro scope definition, assumptions / risks, Stakeholders and macro budget of the project and subproject. The final product of this phase will be the elaboration of the project and subproject mini-charters. The achievement of the proposed objectives and the elaboration of the Outputs will be the responsibility of the strategic management team.

The second phase of the project life cycle, which will start after the approval of the mini-charters. In this phase one of the major differences of the developed model materializes against the PMBoK, since the planning phase is divided in two moments: strategic planning and operational planning. In the first, the team that developed the “Mini-charters” - the strategic management team - takes on the role of “Change Control Board” (CCB), appoints the project manager, and in turn each sector appoints the manager of your subproject. Thus, the project management team will be led, as usual, by the project manager and its members will be the subproject managers. This team, in the strategic planning phase, will have as its mission the production of the Project Management Plan (PMP). When completed, and approved by the CCB, operational planning begins, which aims for each subproject manager to bring together his project team and develop his own PMP.

Upon completion of the subproject PMPs, all subproject managers develop their requirements program (PoR), which is eventually assembled into a single document and approved by the CCB.

The third, fourth and fifth phase - Execution, monitoring and control and closing do not Significant changes compared to PMBok fifth edition, however, the fact that the project is conducted in the public domain, subject to the Public Procurement Code (CCP), either due to the number of stakeholders entails readjustment to the level of processes used in the knowledge areas.

C. Integration

If we focus on this aspect of defence, project integration is developed as described. However, the difference lies in the formulation of the need, as according to [2], [10], [1] defence projects are born from the following sources: Requirements imposed by international organizations (NATO, European Union (EU)), New national requirements and Need to replace the system by obsolescence
Thus, it is considered necessary to make adjustments to the
“Develop project charter” process, the “Inputs”, “Agreements”
and “Enterprise environmental factors” will play a very active
role in project development. This increase in importance is due
to the alliances (eg NATO, EU, UN) in which the military is
inserted, having a major influence on project implementation.

D. Scope

In this area of expertise, the major differences focus on scope
planning in the face of legal constraints in the public sector and
the definition of scope, requiring it to be as clear as possible so
that stakeholder with the greatest influence, identify the
conversion of their needs into project-specific requirements[7].

This step is achieved through a much more complex work
breakdown structure than normally used in the private sector. It
is suggested that the Create WBS process be modified by
introducing the input stakeholder analysis.

Although project communication is mainly handled in the
communication plan, scope verification can generate an
unplanned flow of information, mostly external to the project.
Government, parliamentary or public inquiries, audits and
reviews (eg complaint-based) and inspections by external
funding organizations (eg NATO, international agencies such as
FROTEX, allied countries such as the USA, etc.) require the
creation of a variety of project reports, public communications,
media interviews, and other communication artefacts that are not
normally created during a private sector project. In view of the
foregoing paragraph, it was considered necessary to identify
“Outputs” “Communication Artefacts” in the “Validate Scope”
process.

In the public domain there is often scope control by entities
outside the project. External Requirements translate into
requirements imposed by external entities to the project. Entities
such as the Court of Auditors, NATO, or the EU (if they are
sponsors) often make positive checks on the scope of the project.
Therefore, it was considered appropriate to insert the “Input”
External Requirements into the scope control process.

E. Time

As mentioned in the previous subchapter, one of the
characteristics of the public domain is the dependence on entities
outside the project. Thus, in order to be able to draw up a solid
schedule, it will be necessary to know in detail the approval
deadlines of the various stakeholders involved, and to be able to
fit them with the needs of the project. Thus, the “Input” Activity
attributes of the Estimate Activity Duration process were
changed.

Another limitation of the domain is the obligation to
synchronize the funding cycle with the schedule, a mitigation
strategy is the use of bonds, which despite being frequently
used is not yet reflected in PMBOK fifth edition.

Another technique used in defence is the use of Initial
Operational capability (IOC) and Full Operational capability
(FOC). These two elements make time management easier as
they define the scope taking into account operational needs and
financial constraints to add these two Tools & Techniques to the
“Develop Schedule” process

F. Cost

In general, projects in the public domain can be funded by
various budgets (NATO, European Union (EU), among others),
and given the legal deadlines and captivations of the
government, it is necessary to have organizational agility to
ensure /stability.

Therefore, it is considered necessary to make changes to the
“Determine Budget” process, including the “Input” “Annual
Budget Cycle” and the “Tool & Technique” “split funding”,
“Maching Found” and “Obligation”

G. Quality

All requirements (operational and technical) are built on
NATO quality standards, European and national standards.
Thus, the “Enterprise environmental factors” “Input” of the “Plan
Quality Management” process seems more challenging than in
the private sector,

Taking into account the case study presented, the
implementation of a capacity aims to establish something new
in an institution, and it may be that there may not be technical
competence to carry out adequate quality control. Thus, the
“Input” “Training of personnel in quality practices” was inserted
into the “Perform Quality Assurance” process.

H. Human Resources

In the face of major human resource constraints and
functional organization a characteristic of the military
environment is that the “Enterprise” “Enterprise Enviromental
Facts” of the “Plan Human Resource Management” process is
of particular importance in military-related public domain
projects.

In the face of military organization, it is difficult to award
rewards to human resources working in matrix organizations.
Thus, it is considered that the “Tool & Techniques”
“Recognition and rewards” of the “Develop Project Team”
process becomes more out of tune in the domain under analysis.

I. Communication

Projects in the military environment have an extremely
complex communication plan, as there is a whole hierarchy to
respect.

Thus, the importance of projects being developed at a
strategic level becomes apparent, because only with the
involvement and interest of stakeholder with power, the project
will be able to succeed within the organization. Thus, in the Plan
Communication Management process, the “Input” “Enterprise
environmental factors” and “Organizational process assets”
have special relevance in the public domain and are thus
indicated as points of special interest.

Likewise it is necessary to enter the “Tools & Techniques”
“communication at same strategic level”.

On the other hand, given the high degree of turnover
characteristic of military positions, it is important to have a
review routine in order to adjust communication to possible
internal surrender. This review should also take into account the
bosses’ surrender moments in order to prevent the approval
process from falling into these periods.
Finally, the Tool & Technique Communication Methods of the Communications Management process is considered to be of particular relevance in the public domain, as it is customary to use methods such as press releases, official announcements, and public decision-making, among others.

J. Risk

Risk management in public domain projects is considered to follow the same good practices as those used by the private sector. However, in public projects it is essential to identify social, environmental and political risks.

The financing risk is constantly present in the project, since from the choice of the project until the payment of the last instalment, there is always the possibility of captivation by government agencies. Likewise, challenges to procurement processes can make financial execution unfeasible, jeopardizing the project as a whole.

Political risks are related to the ever-changing political cycles, and these risks have a high impact on the project selection/award phase, as when the project is being implemented it is more difficult to influence than never impossible. The insertion of the “Laws and regulation” input into the “Plan Risk Management” process aims to oblige to take into account the CCP and technical laws that regulate the operation of the public domain (the armed forces and each branch organic law) where the other competences are identified.

The insertion of the “Tool & Technique” “Stakeholder Analysis” into the “Identify Risks” process is intended to verify the internal strategic alignment in order to identify possible stakeholder-related risks against the project. On the other hand, this “Tool & Technique” aims to analyse the external policy component of the project, identifying risks arising from top leadership change.

K. Procurement

Public procurement is extremely time consuming and difficult to plan against the various uncontrollable variables.

Thus, when analysing in detail the process “Plan Procurement”, it is considered important that this process has the following changes in the “Input”: “Enterprise environmental facts”, which despite being in the process of PMBok fifth edition, in public domain is of particular importance.

Similarly the Input “Enterprise environmental facts” due to certain market conditions may differ from those of the private sector.

Input Organizational process assets provide the policies, procedures, guidelines and systems of governance related to formal and informal procurement that are considered in the development of the procurement plan. These restrictions previously listed translate into limitations/requirement, usually materialize with incremental formalisms depending on the value of the project.

With regard to Tools & Techniques, as explained in the previous paragraph, public procurement requires very different procedures from those used in the private domain. Thus, it appears that the three publications used as a basis ([7], [12], [9]) indicate the need to be able to delineate those entities which may be awarded a particular contract, as this method shows that the entities that will be present in the tender have the technical expertise and dimension that allow the fulfilment of the contract.

At the national level, this procedure is reflected in the Public Procurement Code. Thus, it was considered important to introduce “degree of qualification” as “Tools & Techniques”.

Based on the amount to be contracted, the CCP permits procedures directed at various levels of tendering entities, as it ranges from direct awarding (only one entity) to tendering by prior qualification (limited to entities that prove their expertise to fulfil a particular contract), national contest and finally international contest. Thus, it is considered that the “Plan Procurement Management” Process should have the “Tool & Technique” “Degrees of competition”.

The state as a social entity, unlike the private domain, when developing its projects has national and local development obligations. Thus, it is considered important that the procurement knowledge area has “Tools & Techniques” that allow these factors to be taken into account. Thus the “Tool & Technique” “Award and preference laws” which allows to take into account geographic factors of interest, social groups (such as hiring people with disabilities) and areas of national interest. These stand out for being vectors that the state seeks to develop/maintain in order to foster economic growth, or the maintenance of strategic skills (like an example shipbuilding).

The “Tool & Technique” “Protest and grievance procedure” seeks to introduce in this of knowledge area a concept that does not exist in PMBok Fifth Edition, as in the private domain there are not usual complaints about the award of a contract to a particular company. In the public domain, as stated in the CCP, any procedure executed may be the subject of a complaint within the deadlines established by that regulation, and these deadlines are taken into account in the “Plan Procurement management” process in the “Input” “Organizational process assets”.

L. Stakeholders

Stakeholder is one of the most difficult knowledge areas to manage when the project is being carried out in the public domain. In the military environment, this task becomes more arduous, since it is difficult to achieve relationships with the most varied stakeholders because the entire hierarchical chain, whose support is fundamental to the success of the project, must be respected.

Thus, in the “Identify Stakeholders” process, the differences were identified: “Enterprise environmental inputs” and “Organizational process assets” inputs gain particular importance in public domain projects as presented in the first two paragraphs of this subchapter. Similarly, these two Inputs will also be used for the same purpose in the following two processes.

“Tool & Technique” “POC Identification” seeks to introduce the concept of contact points between entities, as mentioned, the relationship between entities is usually made through previously identified contact points.
In the “Plan Stakeholder Management” process, the “Input” “enterprise environmental factors” and “Organizational process assets” also acquire special importance.

“Tool & Technique” “Communication methods” enables the project manager to use the specific communication methods that exist between the various institutions (portals, institution-specific communication applications such as AcinGov) as well as public communication through from the media and social networks.

Finally, the Manage Stakeholder Engagement process reflects stakeholder management through the project and strategic management team, as it introduces the “Tool & Technique” “Management by position”, it provides the ability to manage stakeholders according to their position / position within the institution. The presented Tool & Technique works in partnership with the Tool & Technique POC Identification of the Identify Stakeholders process as it is considered that there should be an equity in the relationship between the position held by the team member / POC of the institution with which it relates to.

The “Manage Stakeholder Engagement” process is considered as “Inputs”, “Organizational process assets” acquiring even more importance in the military public domain context.

The Enterprise Environmental Factors Input is considered to be a factor that will clearly condition the type of communication, as the mere fact of working in a military environment conditions the management method of the interested parties.

### III. VALIDATION

The validation of the developed model was performed by an expert interview. Thus, a sample of 15 people was identified and 7 semi-structured interviews were performed.

The interviews were conducted on a script that is divided into four parts. The first part, entitled General Characterization of the sample, aimed to present the basic characterization of the sample, which identifies that 6 of the 7 respondents are male military personnel and 1 is a former military officer.

The second phase of the script aimed to collect the respondent’s profile regarding the degree of knowledge and experience in project management, thus aiming to demonstrate that the identified sample had accumulated knowledge / experience in the project management area so that their answers could validate / enrich the developed model.

Having found that all respondents have extensive experience in project management as the entire sample has participated in more than 3 projects, 6 of the 7 respondents have specific training in project management, all respondents have in-depth knowledge of public project projects. Military nature and the entire sample has solid knowledge of the Navy organization for project management.

Thus, it is concluded that the sample has the ideal characteristics to perform the validation of the developed model.

The third phase aimed to introduce the main theme, project management in the public domain of military nature, in order to identify the level of knowledge of the sample in relation to the subject and to verify the relevance of the theme. Thus, this phase aimed to obtain the opinion of the sample regarding the literature review performed. It was found that the sample had difficulties in identifying the areas of project management that most differentiate between the two domains, and the answer was more associated with the area of project management in which each respondent most experienced difficulties. However when asking the same question, but directed to the Navy, it appears that the sample recognizes the areas identified in the literature review. This factor is considered to be related to the maturity of the project management organization, and the difficulties experienced throughout its professional life, as they identify the organization of the Navy for project management as the most deficient area, and associate this with The remaining justifications lead to the conclusion that the organization lacks maturity for project management, leading to certain areas that should be closer to the public domain becoming complex and divergent.

Regarding the fourth phase, acceptance of the developed model, consideration that the model was fully accepted by the sample.

### IV. APPLICATION

To apply the developed model it was choose a case of study about the implementation of the defence capacity against laser weapons. This case of study, it was choose once, it explain necessity to have project manager to implement a capacity. It possible to say the necessity starts at the engineering level, because the big challenge is the complexity of a warship. As described in [16], any system to be installed on board today will belong to a system of systems, so that any equipment installed on board a ship must be able to integrate with the various systems of existing command and control.

Similarly, integration will not only be at the logical level, since from the physical positioning of the equipment it should allow its maximum operational operation without compromising the remaining equipment already installed as well as its own safety. [17]

Overcoming the difficulties of physical installation of the equipment, before being able to logically interconnect with the others, it must have interfaces with the other “auxiliary” support systems of the ship, that is, it must have electrical supply, cooling system and waterproofing (compressed air). Thus, only after engineering to interconnect to all these systems will it be able to logically interconnect with the command and control system.

Today, it is expected that any system will be able to connect to various command and control systems, distributing to each other the information they want [16], [17]. In view of the above, it becomes apparent that what is needed to successfully carry out projects becomes central to the existence of a project management model that allows a broad view of the needs to be achieved in time / cost / scope / quality meet operational needs.

#### 4. Initiation phase

In the initiation phase it will be necessary to develop two processes: Develop “Project Charter” / “mini-charter” and “Identify Stakeholders”. The major differences between public and private sector projects relate to stakeholder management,
and it was considered necessary to focus more on two inputs to the Develop Project charter process. Thus, the implementation of the agreements and Enterprise Environmental Factors will be achieved by the members of the strategic management team as they will play a key role in explaining the project within their respective sectors, so as to align the various interested parts. By way of example, shows the development organization of the mini-charters. After mini-charters have been developed, they are submitted to the internal approval. During this period of internal approval of the mini-charter, it is considered that there may be a need to make adjustments to the documents initially developed to address needs identified by stakeholders.

During this sector alignment period, in compliance with the “POC identification” tool & technique “Identify Stakeholders” process, when presenting the project inside and outside the sector, the strategic management team try to identify contact points (POCs) within the various institutions / entities that have been identified as a stakeholder of the project. By way of example, as the Minister of Defence is a stakeholder of the project, it is necessary to identify POCs that facilitate communication with this entity.

During this phase the initial classification of stakeholders is made, which is reversed in the mini-charters and specified in the stakeholder register. The major difference that this table brings is the identification of the POC to be able to influence a particular stakeholder rating, using the stakeholder analysis. Based on this table, using the power / interest column, stakeholder classification is performed. Together with Stakeholder analysis and good PMBOK practices will be used as a basis for the management of stakeholder. Thus, it is verified that in order to obtain elements that enable the correct filling and updating of the presented tables, it is necessary to identify POCs, which guarantee a close relationship with the interested parties capable of having an advance notice.

This process becomes critical in public domain projects because the number of stakeholders and their social characteristics make POCs the only viable way of managing stakeholders.

The approval of the mini-charters by an internal department will be formally. During this phase, the GP and the subproject managers will be formally appointed.

B. Planning fase

In the proposed model, the planning phase was divided into Strategic Planning and Operational Planning. In strategic planning the project PMP is developed by the management team under the supervision of the strategic management team. The GPI is created and tasks are assigned to management tasks.

- **Scope**

Performing the analysis by knowledge areas, based on the suggested changes, it is verified that the “Create WBS” process was added with the “Input” “Stakeholders analyses”. This process is to be performed both in the Strategic Planning phase, when developing the project PMP, and also in the operational planning phase when developing the subproject PMPs. The realization of this input involves verifying the degree of satisfaction of the interested parties when given a certain work package. To carry out this analysis, we use the POCs identified in the stakeholder analysis process, using the analysis of stakeholders.

- **Time**

Concerning the knowledge area “Time”, it appears that in the planning phase the process “Estimate Activity Duration” takes place, this process happens in the two phases of planning, but it is in the strategic planning. While maintaining the same configuration as “Inputs” / “Tools & Techniques” / “Outputs”, the “Input” “Activity attributes” gets special prominence. In the case of study under study, it appears that the three work packages “documentation for contract” are where “Input” under analysis will have the most consequences. This is considered to be mitigated through the identified POCs as they will be able to give a continuous report of the progress of the documents being approved. Similarly, a risk of delaying the documentation under review is required.

The second process that changes with the proposed model is the develop the Schedule, although this process occurs throughout the planning phase, the proposed changes will impact the strategic planning phase as the two new Tools & Techniques “IOC and FOC definition” and “Obligation” will be used to define the project's PMP in order to be able to reconcile the operational requirements, budget availability, annual budget ceilings and production capacities of the companies to be hired. In the case of the study under consideration, it was considered that the IOC should take place in 2020 in order to comply with the international requirements imposed and the FOC in 2025 allowing for a breakdown of spending over five years.

Considering the above, and now analysing the knowledge area “Cost”, it appears that the process “Determine the budget” brings the “Tools & Techniques“, “split funds” and “Match foundings”, and the “Annual Budget cycle” input needed to make the proposed IOCs and FOCs viable, as it allows the financial agility to transfer money between budgets, so what is approved is the financing needs, framed with the planned total funding For the project, it is then up to the project and subproject managers to make the necessary adjustments in order to have the money on time.

- **Quality**

The Enterprise Environmental factors “Input” of the “Plan Quality Management” process is performed during operational planning, with NATO and national requirements being introduced throughout the PoR but with a particular focus on the quality and testing chapter.

- **Human Resources**

The military reward system differs significantly from the public domain system. This problem is considered to be resolved with the project management organization prepared as identified in that chapter.

- **Communication**

The model adds the “tool & Technique” “communication at the same strategic level” to the “Plan Communication Management” process, this change introduces communication sharing between the project management team and GPI, thereby.

- **Procurement**
The elaborated model introduces the “Tools & Techniques” “degree of qualification”, which aims to ensure that companies applying for work have qualifications. In the case of study in question, this “Tools & Techniques” is applied during operational planning, in the elaboration of the PoR, either in the development of precise requirements that require discouraging non-specialist companies, or by the following sentence: “The bidder should be shown to have a large experience in developing laser military equipment, made to prove that by at least tree it has successfully executed 3 project of implementing military laser defence capability complying NATO standards.” With regard to “Tools & Techniques” “degree of competition”, given the monetary values in question and the need to use bonds, this “Tools & Techniques” “degree of competition” led to the need for a tender via NSPA.

- **Risk**

The "Laws and regulation" Input is intended to oblige the GP to take into account the CCP and technical laws governing the operation of the public domain. In this sense in the project PMP, during the strategic planning a competency map is made.

- **Cost**

In the process “determine the Budget” was inserted the “Input” “Annual Budget Cycle”, Thus, from the annual expenditure ceiling, the project manager can apply the “Tool & Technique” “split funding” and “Matching Founds” to obtain funding according to the project's need. The “Tool & Technique” “Obligation” is used after hiring from NSPA, where the present value in each item (Material, Personnel, and Operational) will be transferred to NSPA annually. But the actual expense of money is only made by meeting the milestones identified in the contract (s).

- **Stakeholder**

In the “Plan Stakeholder Management” process The “Tool & Technique” “Communication methods” is used to establish specific lines of communication, which in the case of the study refers to the use of specific portals of communication with public institutions (purchase management application of the national defence (SIG-DN) and AcinGov, and the creation of press releases to try to reduce media influence in the process.

C. **Execution fase**

In the execution fase it was introduced the follows amendments to the Quality Assurance, Develop Project Team, Manage the Communication, Conduct the Procurement and Manage Stakeholder Engagement processes have been introduced in the implementation phase, reflecting mainly the specific procurement needs of the project. Public domain.

- **Quality**

In the capacity implementation it is normal that there is no technical capacity to correctly identify the requirements and later quality. In the case study in question, it is considered that the Navy does not yet have these skills, so WBS Staff Work Package 4.5, developed in operational planning, includes a work package to plan staff training for project teams during the implementation phase.

- **Human Resources**

To the “develop Project Team” process has been added to “Toll & Technique” “Recognition and rewards”, the designed organization allows project and subproject managers to have disciplinary skills to award the usual military rewards (praises and medals) or punishments. Likewise, the project / subproject manager is also responsible for evaluating the military personnel working on his project team, thus providing another means of encouragement.

- **Procurement**

To the conduct the procurement process was added the "Tool & Technique" "Award and preference laws" and "Protest and grievance procedures". In this case study, the “Tool & Technique” “Award and preference laws” was not used, as no national manufacturer working in this business area was identified, so the decision was made to go to the international public tender. Regarding the "Tool & Technique" "Protest and grievance procedures", in the case of this study, with the hiring of the NSPA to purchase the goods and services, the Navy is safeguarded as any lawsuit will be against that same. Institution, in this project a risk was inserted to contemplate possible delays in the supply of goods by lawsuits.

- **Stakeholder**

All changes made to the “Manage Stakeholder Engagement” process are intended to continue the process identified in the planning phase. It is intended that the management team meetings should systematically review the position of the various stakeholders in order to determine if the change of interlocutor (GP / GPI), POC or type of information is required. This process is vital in the military environment as it provides for a staff turnover cycle every three years, so continuous monitoring of stakeholders and above all POCs is required.

D. **Monitoring and Control fase**

At this stage the changes were minimal, as only the processes: “Validate the Scope” by inserting “Output” Communication Artefacts”,” ”Control the Scope "by inserting" Input “ external requirements ”and the "Control "process the procurement "by reinforcing the importance of the“ Tool & Techniques ""," Inspections & Audits ”and “ Claims Administration ”. All modifications presented relate solely to the external control factor by regulatory or sponsoring parties. In the case of this study, financing is assumed to be obtained from the LPM. Thus, the external supervisory entity will be considered the DGRDN and in view of the project values, the court of auditors will also supervise the project. Thus, it was considered that for the DGRDN there must be a direct communication line. For the Court of Auditors, the submission of information will be sent on request always taking into account the accumulated experience of other projects and the use of POC information.

V. **Conclusions**

It was verified that in Portugal there is no specific doctrine for this purpose, in the particular case of the Portuguese Navy, a project management methodology based on good PMI practices has been developed.
In this way, the work developed seeks to develop a model that can adapt PMBok 5th edition good practices in order to address the identified differences between the private domain and the military public domain.

Thus, this work begins by making a contextualization of the theme and motivation for its realization. It then proceeds to the literature review that focuses on comparing PMBok fifth edition and three publications that seek to adapt PMBok’s own procedures to the public domain of a military nature.

Given the review, it was found that the management of public domain projects of military nature have their own characteristics, verifying that the organization, project life cycle and the knowledge areas stakeholder management, purchasing and communication are the substantiating the differences between the two domains. Similarly, it was concluded that the methodologies developed in the publications under analysis are not directly applicable to our national reality. Thus is born the motivation for accomplishment to develop a project management model for this same reality.

Thus, based on the PMI organization (PMBok fifth edition [20]), and the extensions to PMBok for its adaptation to the public domain, always using English versions in order to facilitate comparison between the various publications, an analysis the project organization and life cycle as well as its ten knowledge areas. Noting that in order to adapt good practice from the private domain to the military public domain, it is necessary to change 45% of the cases, with the areas of communication, purchasing and stakeholder having the most changed, with 67%, 75 respectively. % and 75% of changes.

Afterwards, the developed model was validated. For this, a sample that had experience in the execution of large projects in the Portuguese Navy was identified. After inviting the entire sample, seven semi-structured interviews were obtained. This interview first intended to demonstrate that the identified sample had solid knowledge / experience in project management and would be able to validate the elaborated model. Secondly validate developed model and gather feedback from improvements. There was acceptance of the developed model, and all suggestions for improvement were served to elaborate the final version of it.

Finally, the last chapter of the work applied the model to the case study of the implementation of the defense capability against laser weapons. Having demonstrated here the importance of project management for the implementation of a capacity. Virtually all inputs, Tools & Techniques and Outputs have been found to be used and of great importance to make the project easier to manage

REFERENCES

[17] [The secretary of the navy, “Acquisition and Capabilities Guidebook Published,” 2012.