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| Project management document |
| **Project Office Mandate and Structure****Abstract**In this document we describe the mandate of the Project Office (PO) already provided in the framework of the ET-INFRADEV WP5. The main structure, and the concepts defining it, are given providing a first description of the work packages activities and of the operational Organization Breakdown Structure. |
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# List of Acronyms

|  |  |
| --- | --- |
| CDR | Conceptual Design Report |
| CERN | Conseil Européen pour la Recherche Nucléaire |
| CI | Configuration Items |
| ET | Einstein Telescope |
| ET-POET-PB | Einstein Telescope Project OfficeEinstein Telescope Project Board |
| ET-PP | Einstein Telescope Preparatory Phase |
| EVM | Earned Value Management |
| INFN | Istituto Italiano di Fisica Nucleare |
| IT | Information Technology |
| LHC | Large Hadron Collider |
| OBS | Organization Breakdown Structure |
| ORAMS | Operability, Reliability, Availability, Maintainability and Safety |
| PBS | Product Breakdown Structure |
| PM | Project Management |
| PMPRACI | Project Management PlanResponsible, Accountable, Consulted, Informed |
| RMP | Requirements Management Plan |
| RR | Requirements Register |
| SEP | System Engineering Plan |
| SMP | Schedule Management Plan |
| TDR | Technical Design report |
| TRL | Technical Readiness Level |
| WBS | Work Breakdown Structure |
| WG | Working Group |

# The Project Office mandate and framework

The Einstein Telescope Preparatory Phase (ET-PP) proposal provided the mandate framework for the Einstein Telescope Project Office (ET-PO). Its main goal has been identified as *guaranteeing that the as-built research infrastructure fully complies with ​the requirements, the parameters​ and the technical layouts detailed in the project baseline configuration included in the TDR*. This objective must be achieved *without making changes that were not endorsed by the stakeholders​ and adhering to the final schedule and the estimated budget*.

In this context, the first need is to choose *a System Engineering (SE) framework defining the project lifecycle and the associated deliverables.* This framework must indicate *all the procedures and the practices* aimed at providing a functioning facility complying with *the initial requirements;* these must be unambiguously identified, hierarchically structured and globally optimized by the collaboration. This will lead to the choice and the realization of the most ‘*elegant’* solution [1]. The Project Office selected the openSE framework, focused on the needs of scientific projects [2, 3, 4].

## Project Office main deliverable

The Project Management Plan (PMP) will be the main deliverable document of the Project Office [2, 5]. It will be released in the study phase, then revised and complemented at least at the beginning of every new phase of the project lifecycle, and whenever needed as the project progresses. It will illustrate the procedures for editing, informing, verifying, and validating all the processes ruling the project lifecycle. The objective of the Project Management Plan is twofold:

1. Giving the ET Project Board (ET-PB) the assurance that the project expectations are well understood and that everything is done to ensure the operational success of the project.
2. Ensure that the Project participants agree upon a common framework for organizing their project and commit to follow its prescriptions.

# The Project Office activities

As a matter of principle, to fulfill its duty, the Project Office must successfully manage, harmonize and coordinate the following activities:

1. *define, monitor and validate* *the processes* ruling the project execution, namely the management of the budget and the management of the schedule. This includes providing the WBS, the PBS, the PMP, the nomenclature, editing the quality plan, defining the change request process, and editing the risk register,
2. *lead* the harmonization of the procedures of the ET project bodies, of the best practices and of the project management tools,
3. *coordinate* the processes resulting in the availability of a baseline technical design and the consequent engineering specifications,
4. *provide* IT support for the configuration management, the project management, and the financial management tools (EVM),
5. *a*ssure training and support in the editing of the processes’ plans and ensure the availability of document templates,
6. *integrate* the documents lifecycle management framework; integrate the appropriate document verification and validation tools; verify and validate the different Project Management processes.
7. *organize* Safety, Quality, Configuration, Schedule and Budget Audits,
8. *report* the project schedule and budget to the shareholders and to the stakeholders’ boards.

The backbone of these Project Office activities is represented by the management processes. These are all anchored to a standard scheme composed of actors, objects, and actions to provide the deliverable, where:

* the *actors* are the Process Responsible and the Participants,
* the *objects* are the Documents or Deliverables,
* the *actions* are the process Verification and Validation.

This scheme provides the correct framework to develop the Project Office WBS [6, 7], that represents the different processes groups as specific Work Packages and the single processes as the Work Units. The WBS shall clearly designate actors, objects and actions for each Work Unit. Dedicated flowcharts will correlate them by following a input -> tool -> output logical scheme. These, for example should be represented by:

Input -> requirements, other WP outupts, norms and standards etc etc…

Tool -> Working groups, R&D, reviews etc etc

Output -> the intermediate and final deliverables

In fig.1 a WBS line is illustrated (corresponding to a process) of the WP1. The chosen format is assisting the identification of the associated flowchart.



Fig.1. WBS line describing the process of Stakeholders and Shareholders identification

This allows also to build the OBS and the RACI matrix for all the Project Office assignments. The first such assignment is the definition of the Project Office structure hereafter described.

# The Project Office structure

As previously mentioned, the ET-PO internal Organizational Structure is based on its Work Breakdown Structure (WBS) [7]. This allows to define a hierarchical organization based on different Working Packages and Work Units. To respect the WBS 100% golden rule, since the full PO activity is illustrated in the PMP the Work Packages have been identified by the different processes’ groups defining the document chapters. This results in a typical hierarchical Project Office structure, based on twelve ‘processes associated’ Working Packages. The Project Office will be assisted by a general support activity, including the IT, the administrative and the reviews organization aspects. The ET-PO OBS is illustrated in fig.2.

Fig.2. Project Office OBS structure.

To describe the PO full activities and responsibilities, the different WP contents are hereafter summarized to better identify the frame of the PO structure. At the end of the description the table with the WP processes and the associated deliverables is provided. It must be highlighted that, due to the specificity of the ET project, the conventional processes pertaining to scope management is divided in two different work packages, WP1 and WP4, named respectively ‘project’ and ‘scope’ management. At the end, also a description of the previously mentioned support activity is provided. I

## WP1. Project management

This group looks after all the processes aiming at the definition of the project. This includes the processes leading to the:

* identification of the stakeholders and the shareholders,
* definition of the scientific and technical requirements,
* delivery of the baseline proposed solution and the layout.

The first point is crucial for a perfect alignment of the actors’ expectations. The process shall provide, as main output, a stakeholder analysis matrix. In which for each stakeholder its influence, power and interest in the project are highlighted.

This will lead to the finalization of the project roadmap, the CDR and the definition of their modification procedures. It will include the editing of the Requirements Register (RR) and in the Requirements Management Plan (RMP). In the RR all the project requirements shall be listed inserted with an appropriate hierarchical structure and coding to track their interdependence. In the RMP the dynamical management of the requirements is described, including the change processes.

This will be followed by the finalization of the TDR and the definition of its modification procedures The engineering project baseline will be provided in the TDR. It will represent the principal reference for the work leading to the preparation of the calls for tender specifications.

The project organization, seen as a global quality process, will be illustrated in the PMP (Project Management Plan).

For both TDR and PMP the modifications procedures shall be established.

The project progress monitoring will be assessed by the different reviews and audits which will prepare the Project Progress Reports.

WP1 is responsible with WP2 in editing the close out report at the end of the project.

WP1 Responsible - Project Manager



Table 1. WP1 Deliverables

## WP2. Technical management.

Technical management is devoted to the organization of the processes governing the technical aspect of the collaboration. In this context the PO shall define the framework for:

* the preparation and the editing of the engineering specifications,
* the preparation and the editing of the verification plan and the verification reports,
* the preparation and the editing of technical change requests, non-conformity reports and notifications,
* the drafting of calls for tender,
* the preparation and editing of the to-build and as-built documentation,
* the preparation and editing of the maintenance plan,
* the potential editing of the remote operations and handling plan,
* the processes ruling the setting-up of working groups with the subsequent editing of the WG result reports,
* the analysis of the interfaces and the consequent drafting of the Utility Matrix
* the change requests procedures for all the different documents.

WP1 is responsible with WP2 in editing the close out report at the end of the project.

WP2 Responsible - Technical Coordinator



Table 2. WP2 Deliverables

## WP3. Safety management.

Safety management is one of the key elements in openSE framework, where the systems fundamental requirements are given by Operability, Reliability, Availability, Maintainability and Safety (ORAMS). This shall be set up from the beginning of the project definition and design. In this context safety management includes:

* the editing of the safety agreement and the relative process for validation by the ET Project Board,
* the editing of the general safety plan and the procedure for its submission to the authorities,
* the processes for the modification of the Safety Agreement and the Safety Plan.

Safety management also comprises the organization of the safety inspections, reviews and audits.

WP3 Responsible - Safety Manager



Table 3. WP3 Deliverables

## WP4. Scope management.

Scope management processes are devoted to the analysis of the project structure. This is considering all the procedures that gives the breakdown in systems, roles, actions and phases. It considers therefore, the drafting of the main project management tools like the project WBS, the PBS and the OBS. The process to modify these documents is also included.

It is straightforward that the PBS will be elaborated in collaboration with WP2 and the WBS with WP5. For this reason, the coordinator of the WP4 shall be the technical coordinator as for WP2.

WP4 must also define the Standards used across the collaboration.

WP4 Responsible – Technical Coordinator



Table 4. WP4 Deliverables

## WP5 Schedule management.

Schedule management is a procedure that requires the establishment of policies and documentation for maintaining, developing, managing, and controlling the schedules for time and resources for the completion of the project. The strategic benefit of the schedule management process is that it will monitor and manage the schedule throughout the project. This requires a separate, dedicated Work Package. This considers:

* the redaction of the master and detailed resource loaded schedule,
* the editing of the Schedule Management Plan (SMP),
* the setting of the process for change request of the documents.

SMP shall include:

* the description of the schedule management processes,
* the definition of the schedule methodology (especially for the resource loaded schedule) and the employed tools,
* the acceptable range and buffer for the activities,
* the standard units of measure,
* the schedule updating procedures,
* the control thresholds,
* the rules for % completion,
* the schedule variance and performance index,
* the schedule report format.
* EVM application procedures

EVM management responsibility will be shared with the Resource Manager, responsible for WP6. Budget and schedule review audits and reporting will be processes shared with the resource and financial management group activity.

WP5 Responsible - Schedule Manager



Table 5. WP5 Deliverables

## WP6. Resources and financial management.

Resource and financial management are one of the most critical aspects of the project management. The development of an integrated administrative and financial policy must be elaborated in the INFRADEV framework as a result of the ET preparatory phase. This will definitively establish the WP6-specific processes and deliverables. Nevertheless, it is possible to define immediately, as elementary activities, the Resources and the Procurements Plans draw up. Change request processes identification will also be considered.

As previously mentioned, the budget and schedule reviews are shared with the schedule management group (WP5)

WP6 Responsible – Financial Manager



Table 6. WP6 Deliverables

## WP7. Quality management.

The main deliverable of this group will be to set up the Quality Plan. In this context WP7 will also oversee the organization of the Quality Assurance reviews and audits.

The other core activity is to provide a change request process, in collaboration with WP9, supported by the appropriate informatic tools for its implementation.

The other processes included in WP7 are:

* the nomenclature editing,
* the nomenclature change request,
* the document lifecycle process definition and the choice and acquisition of the dedicated software,
* the establishment of the document repository database, in collaboration with WP9 to match the requirements of the Configuration Management,
* definition and implementation of project changes, both for modifications to the technical baseline (ECR, following prescriptions defined in WP9) and violation of requirements (NCRs).

 WP7 Responsible – Quality Manager



Table 7. WP7 Deliverables

## WP8. Risk management.

The basic processes for the risk management are:

* *risk identification*, namely the risk recognition and their source identification,
* *risk evaluation,* namely the determination of the occurring likelihood and the impact evaluation. This provides a risk order of priority,
* *risk handling,* namely the process that identifies, evaluates, selects, and implements various options to obtain an acceptable risk threshold compliant with the constraints and objectives of the project. It includes what must be done, when, who is responsible for it and the related cost and schedule,
* *risk controlling,* namely the continuous reporting and monitoring of both risks and their management processes.

All these aspects are considered and illustrated in the WP8 main deliverables, the Risk Register and the Risk Management Plan. WP8 shall provide the TRL classification for the systems and proposed R&D technology, following the EU standards [8].

WP8 Responsible – Risk Manager



Table 8. WP8 Deliverables

## WP9. Configuration and change management.

The project Configuration is supposed to provide time snapshots of the global parameters’ status, thus controlling the alignment of the project baseline definition with the implemented modifications. The main process shall provide the Configuration Management Plan where:

* The Configuration Management strategy is described,
* The Configuration Schedule is given with the milestones,
* The Configuration terminology is defined,
* The responsibilities are assigned
* The Configuration and Change Request procedures are illustrated. Different modifications category must be identified, and the modifications impact evaluated.
* The working tools are described.

After this process the first step is to set up the project baseline configuration by:

- choosing the appropriate physical and non-physical configuration items (CI) with the associated parameters,

- define the critical issues in respect to modifications,

- provide the Configuration Items interfaces.

This must be supported by the insertion of the configuration data into a relational database linked to a CAD tool.

Change process shall be integrated into the project lifecycle and. Periodically, the nth level configuration shall be reviewed. The project snapshots will be provided by the Physical and Functional Configuration audits, generating the Configuration Progress Reports.

WP9 responsible – Configuration Manager



Table 9. WP9 Deliverables

##  WP10. Site and installation management.

This processes group consists, first, in providing a procedure for the site characterization. For this reason, a ‘Standards for Sites Characterization’ plan must be provided, ruling the technical activity. This will give a common agreed framework for the different sites’ features analysis. The results of the sites measurements must be included in a dedicated technical report. This must be complemented by an integration environmental evaluation considering:

* the environmental Impact,
* the social impact,
* the economic impact.

A second phase will consider the editing of the Facility Integration Plan, consisting of documents dealing with different aspects of the facility integration as the hardware integration, the logistic requirements and the remote Handling.

Specific modification request procedures of these documents shall also be illustrated in the Facility Integration Plan.

WP10 Responsible – Site and Installation Manager



Table 10. WP10 Deliverables

## WP11. Commissioning and operation management.

The main activity of this group is the editing of the Validation Plan and its modification procedures. This document describes the strategy that is agreed to be followed, in different phases, to demonstrate to the ET Project Board and the other Authorities that the final deliverable is compliant with the requirements.

The Validation Plan is a fundamental document since it provides the collaboration agreed framework for the transition of two project lifecycle nodes:

a) Construction to Commissioning.

b) Commissioning to Operation.

In this framework the main contents of the Validation Plan are:

* Integrated hardware and sub-systems performances parameters to be measured to validate transition a),
* facility and systems performances, to be satisfied to validate transition b),

This must be complemented by the measurement’s description including the envisaged techniques, the tools, the standards and the expected results.

The results of the measurements in the different phases has to be illustrated in the Validation Reports.

The commissioning management processes must also generate the operation manuals for the operation team training and the operation management plan to organize this phase.

WP11 Responsible – Commissioning Manager



 Table 11. WP11 Deliverables

## WP12. Communication management.

The main communication management processes can be summarized in these four groups:

* Communications plan editing and modification requests procedure. The communication plan must start from a communication requirements analysis of the Stakeholders to develop the correct strategy. The final goal is to match the information acquisition and the communication to the project stakeholders needs. This document must be harmonized with the collaboration bylaws.
* Information distribution. These processes must make information available to project stakeholders in the correct timeframe.
* Performance reporting. This process considers the strategy for collecting and distributing the project performance. This is essential in almost all the project processes. It guarantees the alignment of different stakeholders with the project status and activities. The main goal is to engage the Project Board, the top management and the Shareholders in addressing project issues and risks in the right timeframe. The main deliverable is given by the progress reports to be provided in collaboration with WP1.
* Stakeholder management. This considers the organization and the methods (meetings, workshops, reviews, conferences...) to deploy for the effective communication. The goal is to satisfy the stakeholders requirements identified in the communication plan and resolve the related issues

WP12 Responsible – Communication Manager



Table 11. WP11 Deliverables

## Project Office support

 This activity is dedicated to the different activities assisting the project management methods application across the project office. Three main support classes have been individuated:

-IT support. This includes the identification, the acquisition, the configuration, the maintenance and the user support for all the IT tools employed in the different PO assets.

-PO Assistant. This resource must provide the daily practical, administrative and organizational assistance to the ET-PO components.

- Audit and Review Coordinator. In different WPs many verification processes will be represented by internal or external reviews and audits. This will require a considerable effort in the organization and the harmonization of these processes’ procedures.

Activities Responsibles– IT Manager, PO Assistant, Audit and Review Coordinator

# The Project Office establishment

To fulfil its duties the project office will be set up by professionals with different skills and professional profiles.

The Project Office, in its minimal configuration, should consist of the PO Coordinator, the person in charge of the technical coordination and the planning, the IT Support Manager, the Project Office assistant, the Audit Coordinator, the Risk manager, the Configuration Manager, the Commissioning Manager, the Quality Manager, the Communication Manager, the Schedule Manager and a System Engineer.

External profiles should coordinate WP3, WP6 and WP10 as far as the PO processes are concerned.

Other professional profiles can be added to the future organization, following the requirements and the constraints set by the work organization.

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