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| nscl.PNG | National Superconducting Cyclotron Laboratory | msu.png |

Project Management Plan

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| --- | --- |
|  |  |
| Project Name | Formal Software Engineering Processes |
| Project Code | FSEP |
| Account |  |
| Department | EE |
| Project Manager | Vasu V |
|  |  |

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| Reviewed By |  |  |  |
| Approved By | John V |  |  |

Revision History

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# Project Overview

## Introduction

National Superconducting Cyclotron Laboratory (NSCL) is a world leader in rare isotope research and nuclear science education. NSCL scientists and researchers conduct advanced research in fundamental nuclear science, nuclear astrophysics, and accelerator physics. To facilitate the research, NSCL operates two superconducting cyclotrons.

Software tools are used extensively in every aspect of workings at NSCL: operation and control of the cyclotrons, data acquisition from experiments, visualization of the results etc. The goal of this project is to develop processes that will bring formal software engineering methodologies to Software Development Lifecycle (SDLC) using industry standards like CMMI and ISO-90003. It will enable improvement in quality, productivity, and transparency of software development.

## Business Need

At NSCL, software is being developed without the required Software Engineering rigor. The applications are developed without adequate documentation, be it requirements, design, test, or deployment, resulting in systems that are impossible to maintain after the developers have left the organization. A myriad of technologies and architectures are used in software applications; it makes their operation, sustenance, and interoperability very expensive and difficult. This culture of software development will not be sustainable or cost-effective with the envisioned growth at NSCL.

However, NSCL is a R&D laboratory where people are encouraged to innovate, dabble, and experiment. Hence the software processes should not be so stringent as to stifle the spirit of creativity. An approach that strikes the balance between ad-hoc development and extreme formalization is essential. At the same time the processes should be easy to adopt and understand.

Streamlined organization-wide development processes will reduce defects and costs of software applications. This project will bring the required discipline and transparency to the software development lifecycle. It will allow the software development to scale with NSCL’s growth, and not become a technical or financial hindrance.

# Scope

The objective of this project is to develop processes that are sufficient to earn CMMI –DEV Level 3 rating or equivalent, such as ISO 90003 certification, for the software development activities at the Electronics department at NSCL. The business requirements of the project are described in [5].

## Deliverables

1. Gap Analysis Document: it describes the difference between the current processes and the goal
2. Software Process Infrastructure (SPI): Policies, Procedures, Guidelines, Checklists, Template and any other artifacts that define and describe the processes. It also includes the tools, standards, and databases that support the processes.
3. Tool Recommendations: A report on tools that will help in automating the processes
4. Training Material: Documents used in training

## Out of Scope

1. Tools that help with the process work-flows will not be developed as part of this project
2. The processes and the implementation will be limited to software development at the Electronics Department

## Scope Baseline

The WBS for this project is described in [4].

## Roles and Responsibilities

|  |  |
| --- | --- |
| **Role** | **Responsibility** |
| Sponsor | * Approve, deny, or defer escalated scope change requests |
| PM | * Approve, deny, or defer escalated scope change requests, as appropriate * Facilitate impact assessment of scope change requests * Evaluate need for scope change requests * Organize and facilitate scheduled change control meetings with stakeholders * Coordinate incorporation of approved scope change requests into schedules * Perform overall management of the Change Control process, including the change control documentation and forms * Communicate outcomes of scope change requests to Team Leads |
| Architect | * Identify, manage, and escalate issues * Validate scope change requests * Participate in impact assessment of scope change requests as needed * Organize and facilitate ad-hoc meetings as needed to resolve issues with scope change requests, complete Change Request Analysis form(s), and determine outcomes of scope change requests * Organize and facilitate scheduled change control meetings with stakeholders |
| Analyst | * Proactively identify and raise issues * Participate in defining potential resolution(s) * Evaluate need for scope changes and inform the Team Lead of possible need for a scope change request |

# Overall Strategy

The strategy is:

1. Identify the gap between current practices and those needed to achieve the goal (CMMI-DEV Level 3 or equivalent). This activity results in the first milestone: Gap Analysis Document.
2. Develop the process infrastructure i.e. policies, procedure, guidelines, templates, checklists, and other documents. Keep the stakeholders involved by conducting periodic meetings where the processes are presented and discussed. The phase ends with a milestone: Version 0.5 of the Software Process Infrastructure (SPI V0.5).
3. Refine the processes, and come up with SPI V1.0
4. Implement the processes. Impart training; identify tools needed for process automation. Tune the processes if needed, to generate SPI V1.1
5. Evaluate the processes. Perform internal audit, evaluate the results, and then embark on external audit.
6. Address any Non-Conformance Reports issued during the external audit. Once the certification is awarder, close the project.

## Critical Success Factors

The success of the project depends on:

* Support from Management
* Product characteristics: flexible, lightweight, un-bureaucratic
* Training

## Product Lifecycle Model

The Software Process Infrastructure (SPI) is the main deliverable of this project. As shown in Figure 1, SPI goes through the following phases:

* Definition: The components of SPI are described and documented
* Refinement: All the components are looked at as a whole, and refined
* Implementation: The users are trained in the processes, and the processes are used in software development
* Analysis: Software projects are analyzed qualitatively and quantitatively for quality and productivity
* Evaluation: The processes are audited by internal or external agencies
* Improvement: The SPI components are made more efficient resulting in higher quality and productivity

After the first Evaluation Phase, SPI will go through the cycle of continuous improvement throughout its life.

Figure 1 Process Lifecycle

# Project Organization

## Organization

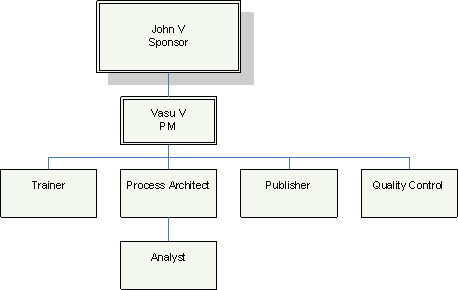


Figure 2 Organization

## Responsibility Assignment Matrix

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **PM** | **Analyst** | **Process Architect** | **Quality Control** | **Publisher** | **Trainer** |
| **Gap Analysis 1.1** | C | R | A |  |  |  |
| **Initiation 1.2.1** | A | C | R | C | I | I |
| **Planning 1.2.2** | A | C | R | C | I | I |
| **Execution 1.2.3** | A | C | R | C | I | I |
| **Monitor 1.2.4** | A | C | R | C | I | I |
| **Closure 1.2.5** | A | C | R | C | I | I |
| **Templates 1.2.6** | A | C | C | I | R | C |
| **Training 1.3.1** | A | C | C | A | C | R |
| **TR 1.3.2** | C | C | R | C | I | I |
| **Migration 1.3.3** | C | A | R | C |  |  |
| **Refinement 1.4** | C | C | A | R | I | I |
| **Evaluation 1.5** | A | C | C | R |  | I |
| R = Responsible, A = Accountable, C = Consult, I = Inform | | | | | | |

# Project Management and Controls

## Configuration Management

The artifacts used and generated during the course of the project will be controlled through NSCL’s CVS system. The sponsor will approve the baselines for the artifacts. The project manager will tag them with Release Identifier, and announce the changes to the stakeholders.

The format of the Release Identifier is as follows: ‘R’ + Major Number + Minor Number (Example R1.2).

The following items will form the configuration:

* Deliverables
  + Software Process Infrastructure (SPI)
  + Gap Analysis Document
  + Tool Recommendations Document
  + Training Material
* Project Management Artifacts
  + Requirements Documentation
  + Work Breakdown Structure
  + Project Management Plan
  + Change Requests

Potential changes to the configuration items will be first notified to the project manager. The project manager will perform the impact analysis, and present the results. The potential changes will be discussed in the weekly meeting. Once approved, they will be incorporated into the configuration.

The CVS parameters for this project are:

* CVS Repository Folder: /projects/cvsroots/electronics/eecvs
* CVS Module: FSEP

## Risk Management

The initial classification, identification, and analysis of the risks[[1]](#footnote-1) will be done during the planning phase. The Risk Register will be updated as and when new risks are realized, during the life of the project. All updates to the Risk Register must be communicated to the stakeholders, as described in the Communications Management section.

### Risk Breakdown Structure

The various risk categories are:

* Internal
* External
* Technological

### Risk Register

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ID** | **Risk** | **Category** | **Root Cause** | **Probability** | **Impact** | **Response** |
| R01 | Lack of Mgmt Support | Internal | Cost, Need | Low | High | Cost/benefit analysis |
| R02 | Attrition | Internal | Varied | Low | Medium | Knowledge transfer, artifact repository |
| R03 | Resistance to adaptation | Internal | Culture | Medium | High | Management support |
| R04 | Lack of tools | Technology | Cost, availability | Medium | Medium | Develop tools |
| R05 | Lack of funding | External |  | Low | High | Iterative development |

## Quality Management

The goal for the project itself assures a high level of quality. Still, SPI will be evaluated qualitatively in terms of flexibility and complexity. Feedback from stakeholders collected during the weekly meetings (see Section 5.11) will be used for quality assurance, quality control, and process improvement.

Quantitative analysis based on percentage overhead, percentage defect reduction etc may be performed during the implementation phase. In such case, the quality management plan will be updated accordingly.

## Cost Management

There are two cost components associated with this project:

* Intangible: The time spent by the team in developing and implementing the SPI
* Tangible: The cost for external audit, and possibly internal audit

## Schedule Management

The schedule for the project is embedded below[[2]](#footnote-2):



## Human Resources

The project will be executed by just one person impersonating different roles: PM, Architect, Analyst, Publisher, and Trainer. This person will spend only 50% of her time (20hrs/week) on the project; any changes to this commitment must be approved by the sponsor. Quality-related responsibilities will be performed by the stakeholders.

## Communications Management

The stakeholders will meet every week to discuss the developments in the SPI. The (partial) deliverables will be presented to the stakeholders. The feedback from the stakeholders will be incorporated into improving the SPI.

The status of the project will be communicated to the stakeholders in two ways:

* Informally during the Electronics Department Engineer’s weekly meeting
* Formally on a monthly basis via emails

All the project related artifacts will be kept online in the project area [\\intranet\projects\SEPG\FSEP](file:///\\intranet\projects\SEPG\FSEP). The contents of this area will be described through a ‘Readme’ file, in each folder.

## Procurement Management

The following services are candidates for procurement:

* The external audit will be performed by an authorized certification agency.
* The internal audit may be outsourced to an external agency; the Make-or-Buy analysis for this service will be performed in future once SPI V0.5 is complete.

# References

1. Formal Software Engineering Processes, Project Charter, NSCL
2. CMMI for Development, Version 1.2, Software Engineering Institute, Carnegie Mellon University, http://www.sei.cmu.edu
3. ISO 90003:2004 Software Standard
4. Formal Software Engineering Processes, Work Breakdown Structure, NSCL
5. Formal Software Engineering Processes, Requirements Documentation, NSCL
6. Formal Software Engineering Processes, Glossary, NSCL

# Glossary

The glossary of terms and acronyms is given in [6].

1. Risk is related to uncertain events. It may have negative or positive impact on the project. [↑](#footnote-ref-1)
2. Microsoft Project must be installed on your PC to view the embedded schedule [↑](#footnote-ref-2)