IEEE Standard for Software Project Management Plans

- Prescribes the format and content of SPMPs.
- Applicable to all types of software projects
  - Applicability is not limited to projects that develop source code for new products.
- Project size or type of software product does not limit application
  - But all components of the standard should be addressed by every software project.
- SPMP may be a separate component of a larger plan or it may be merged into a system-level or business-level project management plan.

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What is not

- Does not provide examples of SPMPs.
- Does not specify the exact techniques to be used in developing an SPMP.
  - Each organization using this standard should develop a set of practices and procedures to provide detailed guidance for preparing and updating of SPMPs
  - should take into account the environmental, organizational, and political factors that influence application of the standard.

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Terminology

- Follows the *IEEE Standards Style Manual*
- The word *shall* indicate mandatory requirements
  - no deviation is permitted.
- The word *should* indicate
  - among several possibilities one is recommended
  - a certain course of action is preferred, or
  - a certain course of action is not recommended.
- The word *may* indicate
  - a course of action permissible
- The word *can indicate*
  - possibility and capability
    - material, physical, or causal

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Compliance

- *format compliance*
  - the exact format and contents are followed in a project plan
- *content compliance*
  - the contents are rearranged in a project plan
  - a mapping should be provided to map the content-compliant project plan into the clauses

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Terms – Product related

- **work product:** any tangible item produced during the process of developing or modifying software.
- **baseline:** a work product that has been formally reviewed and accepted by the involved parties.
  - Should be changed only through formal configuration management procedures. May be project deliverables or the basis for further work.
- **project deliverable:** a work product to be delivered to the acquirer.
  - Quantities, delivery dates, and delivery locations are specified in a project agreement.
  - May include requirements, functional specifications, design documentation, source code …

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Terms – Process Related

- **work task: t**he smallest unit of work subject to management accountability.
  - must be small enough to allow adequate planning and control, but large enough to avoid micro-management.
- **work activity:** a collection of work tasks spanning a fixed duration within the schedule of a software project.
  - May contain other work activities
  - The lowest-level work activities in a hierarchy of activities are work tasks.
  - Typical work activities include project planning, requirements specification …

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Terms – Process Related

- **work package:** a specification of the work that must be accomplished to complete a work task.
  - A work package should have
    - a unique name and identifier
    - preconditions for initiating the work,
    - staffing requirements, other needed resources,
    - work products to be generated,
    - estimated duration,
    - risks factors,
    - predecessor and successor work tasks,
    - any special considerations for the work,
    - the completion criteria for the work package—including quality criteria for the work products to be generated.

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Terms – Process Related

- **supporting process:** a collection of work activities that span the entire duration of a software project
- **milestone:** a scheduled event used to measure progress.
  - examples may include an acquirer or managerial sign-off, baselining of a specification, …

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Elements of The SPMP

- Each version of an SPMP shall contain
  - a title page:
    - the date of issue, a unique identifier (draft number, baseline version number), and identification of the issuing organization.
  - a signature page:
    - the signatures of the persons responsible for approving the SPMP.
  - a change history
    - the project name, version number of the plan, date of release, a list of pages that have been changed in the current version of the plan, a brief statement describing the nature of changes incorporated into this version of the plan, and a list of version numbers and dates of release of all previous versions of the plan.
- Preface
  - shall describe the scope and context of the SPMP and identify the intended audience for the SPMP
- Table of Contents
- List of Figures
- List of Tables

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Outline

1. Overview
   1. Project summary
   2. Evolution of the plan
2. References
3. Definitions
4. Project context
5. Project planning
6. Project assessment and control
7. Product delivery
8. Supporting process plans
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Outline Level 2

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   1. Process model
   2. Process improvement plan
   3. Infrastructure plan
   4. Methods tools and techniques
   5. Product acceptance plan
   6. Project organization
      1. External interfaces
      2. Internal structure
      3. Roles and responsibilities

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Outline Level 2

5. Project planning
   1. Project initiation
      1. Estimation plan
      2. Staffing plan
      3. Resource acquisition plan
      4. Project staff training plan
   2. Project work plans
      1. Work activities
      2. Schedule allocation
      3. Resource allocation
      4. Budget allocation
      5. Procurement plan

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Outline Level 2

6. Project assessment and control
   1. Requirements management plan
   2. Scope change control plan
   3. Schedule control plan
   4. Budget control plan
   5. Quality assurance plan
   6. Subcontractor management plan
   7. Project closeout plan

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Outline Level 2

7. Product delivery
8. Supporting process plans
   1. Project supervision and work environment
   2. Decision management
   3. Risk management
   4. Configuration management
   5. Information management
      1. Documentation
      2. Communication and publicity
   6. Quality assurance
   7. Measurement
   8. Reviews and audits
   9. Verification and validation

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Overview

1. Overview
    1. Project summary
        1. Purpose Scope and objectives
        2. Assumptions and constraints
        3. Project deliverables
        4. Schedule and budget summary
    2. Evolution of the plan

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Purpose, scope, and objectives (Subclause 1.1.1 of the SPMP)

The project statement of purpose shall describe

- the relationship of this project to other projects,
- how this project will be integrated with other projects or ongoing operations.

- Shall also provide a brief statement of the business or system needs to be satisfied by the project,
    - a concise summary of the project objectives,
    - the products to be delivered to satisfy those objectives,
    - *the methods by which satisfaction will be determined.*
- A reference to the official statement of product requirements shall be provided
- Should also describe any considerations of scope or objectives to be excluded from the project or the resulting product.

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Assumptions and constraints (Subclause 1.1.2 of the SPMP)

- Shall describe
  - the assumptions on which the project is based
  - imposed constraints on project factors such as the schedule, budget, resources, ...

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Project deliverables (Subclause 1.1.3 of the SPMP)

- Shall
  - list the work products that will be delivered to the acquirer, the delivery dates, delivery locations, and quantities required to satisfy the terms of the project agreement.
  - specify the delivery media and any special instructions for packaging and handling.
- May be incorporated into the SPMP directly or by reference to an external document.

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Schedule and budget summary (Subclause 1.1.4 of the SPMP)

- Shall
  - provide a summary of the schedule and budget for the software project.
  - The level of detail should be restricted to an itemization of the major work activities and supporting processes

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Evolution of the SPMP (Subclause 1.2 of the SPMP)

- Shall
  - specify the plans for producing both scheduled and unscheduled updates to the SPMP.
  - specify methods of disseminating the updates.
  - specify the mechanisms used to place the initial version of the SPMP under configuration management and to control subsequent changes to the SPMP.

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References (Clause 2 of the SPMP)

- Shall
  - provide a complete list of all documents and other sources of information referenced in the SPMP.
- Each document should be identified by title, report number, date, author, path/name for electronic access, and publishing organization.
- Other sources of information, such as electronic files, shall be identified using unique identifiers such as date and version number.
- Any deviations from referenced standards or policies shall be identified and justifications shall be provided.

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Definitions (Clause 3 of the SPMP)

- Shall
  - define, or provide references to, documents containing the definition of all terms and acronyms required to properly understand the SPMP.

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Project context
(Clause 4 of the SPMP)

Project Context

1. Process model
2. Process improvement plan
3. Infrastructure plan
4. Methods tools and techniques
5. Product acceptance plan
6. Project organization
    1. External interfaces
    2. Internal structure
    3. Roles and responsibilities

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Process model
(Subclause 4.1 of the SPMP)

- Shall
    - define the relationships among major project work activities and supporting processes by specifying
        - the flow of information and work products among activities and functions,
        - the timing of work products to be generated,
        - reviews to be conducted,
        - major milestones to be achieved,
        - baselines to be established,
        - project deliverables to be completed,
        - required approvals that span the duration of the project.
    - include project initiation and project termination activities.
    - indicate tailoring of standard process models
- A combination of graphical and textual notations may be used.

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Process improvement plan (Subclause 4.2 of the SPMP)

- shall
  - either reference the life cycle model management process or include plans for periodically assessing the project, determining areas for improvement, and implementing improvement plans.
  - The process improvement plan should be closely related to the problem resolution plan;
  - Implementation of improvement plans should be examined to identify those processes that can be improved without serious disruptions to an ongoing project and to identify those processes that can best be improved by process improvement initiatives at the organizational level.

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Infrastructure plan (Subclause 4.3 of the SPMP)

- Shall specify
  - the plan for establishing and maintaining the development environment(hardware, operating system, network, and software), and the policies, procedures, standards, and facilities required to conduct the software project.
- may include
  - workstations,
  - local area networks,
  - software tools for analysis, design, implementation, testing, and project management,
  - desks, office space, and provisions for physical security, administrative personnel, and janitorial services

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Methods, tools, and techniques (Subclause 4.4 of the SPMP)

- Shall specify
  - the development methodologies,
  - programming languages and other notations,
  - the tools and techniques to be used to specify, design, build, test, integrate, document, deliver, modify and maintain the project deliverable and non deliverable work products
  - the technical standards, policies
  - procedures governing development and/or modification of the work products

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Product acceptance plan (Subclause 4.5 of the SPMP)

- Shall specify
  - the plan for acquirer acceptance of the deliverable work products generated by the software project
  - objective criteria for determining acceptability of the deliverable work products
  - any technical processes, methods, or tools required for product acceptance
  - methods such as testing, demonstration, analysis and inspection
- A formal agreement of the acceptance criteria shall be signed by representatives of the development organization and the acquiring organization.

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Project Organization

6. Project organization
   1. External interfaces
   2. Internal structure
   3. Roles and responsibilities

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External interfaces (Subclause 4.6.1 of the SPMP)

- Shall
  - Describe the organizational boundaries between the project and external entities.
- Should include:
  - the parent organization,
  - the acquiring organization,
  - subcontracted organizations, and
  - other organizational entities that interact with the project.
- Organizational charts and diagrams may be used to depict the project's external interfaces

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Internal structure (Subclause 4.6.2 of the SPMP)

- Shall
  - describe the internal structure of the project organization to include the interfaces among the units of the software development team.
  - specify the organizational interfaces between the project and organizational entities that provide supporting processes,
- Organizational charts or diagrams should be used to depict the lines of authority, responsibility, and communication within the project.

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Authorities and responsibilities (Subclause 4.3 of the SPMP)

- Shall
  - identify and state the nature of each major work activity and supporting process
  - identify the organizational units that are responsible for those processes and activities
- A matrix of work activities and supporting processes vs. organizational units may be used to depict project roles and responsibilities.

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Project Planning

5. Project planning
    1. Project initiation
        1. Estimation plan
        2. Staffing plan
        3. Resource acquisition plan
        4. Project staff training plan
    2. Project work plans
        1. Work activities
        2. Schedule allocation
        3. Resource allocation
        4. Budget allocation
        5. Procurement plan

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Project Planning

1. Project initiation
    1. Estimation plan
    2. Staffing plan
    3. Resource acquisition plan
    4. Project staff training plan

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Estimation plan (Subclause 5.1.1 of the SPMP)

- Shall
  - specify the cost and schedule for conducting the project
  - specify methods, tools, and techniques used to estimate project cost, schedule, resource requirements,
  - specify associated confidence levels
  - specify the basis of estimation to include techniques and the sources of data
  - specify the methods, tools, and techniques that will be used to periodically re-estimate the cost, schedule, and resources needed to complete the project

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Staffing plan (Subclause 5.1.2 of the SPMP)

- Shall specify
  - the number of staff required by skill level,
  - the project phases in which the numbers of personnel and types of skills are needed,
  - the duration of need
  - the sources of staff personnel
- Tools and Techniques:
  - Resource Gantt charts, resource histograms, spreadsheets, and tables …
  - Depict the staffing plan by skill level, by project phase, and by aggregations of skill levels and project phases.

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Resource acquisition plan (Subclause 5.1.3 of the SPMP)

- Shall
  - specify the plan for acquiring the resources in addition to personnel needed to successfully complete the project
  - specify the constraint on acquiring necessary resources.
- Should
  - include a description of the resource acquisition process, including assignment of responsibility for all aspects of resource acquisition
  - include acquisition plans for equipment, computer hardware and software, training, service contracts, transportation, facilities, and administrative and janitorial services.
  - specify the points in the project schedule when the various acquisition activities will be required.

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Project staff training plan (Subclause 5.1.4 of the SPMP)

- Shall
  - specify the training needed to ensure that necessary skill levels in sufficient numbers are available to successfully conduct the software project.
  - specify training schedule which shall include:
    - the types of training to be provided,
    - numbers of personnel to be trained,
    - entry and exit criteria for training,
    - the training method;

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Project planning

1. Project work plans
   1. Work activities
   2. Schedule allocation
   3. Resource allocation
   4. Budget allocation
   5. Procurement plan

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Work activities (Subclause 5.2.1 of the SPMP)

- Shall
  - specify the various work activities to be performed
  - use a work breakdown structure to depict the work activities and the relationships among work activities.
- Should
  - decompose work activities to a level that exposes all project risk factors and *allows accurate estimate of resource requirements* and schedule duration for each work activity.
  - use work packages to specify, for each work activity, the necessary resources, estimated duration, work products to be produced, acceptance criteria for the work products, and predecessor and successor work activities.
- The level of decomposition for different work activities in the work breakdown structure may be different …

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Schedule allocation (Subclause 5.2.2 of the SPMP)

- Shall
  - provide scheduling relationships among work activities in a manner that depicts the time-sequencing constraints and illustrates opportunities for concurrent work activities.
  - Indicate any constraints on scheduling of particular work activities caused by factors external to the project.
- Should
  - Include frequent milestones that can be assessed for achievement using objective indicators to assess the scope and quality of work products completed at those milestones.
- Techniques
  - milestone charts, activity lists, activity Gantt charts, activity networks, critical path networks, and PERT.

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Resource allocation (Subclause 5.2.3 of the SPMP)

- Shall
  - include the numbers and required skill levels of personnel for each work activity
  - provide a detailed itemization of the resources allocated to each major work activity in the project work breakdown structure
  - may include:
    - personnel by skill level
    - computing resources,
    - software tools,
    - special testing and simulation facilities,
    - administrative support.
- A separate line item should be provided for each type of resource for each work activity
- A summary of resource requirements for the various work activities should be presented in tabular form

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Budget allocation (Subclause 5.2.4 of the SPMP)

- Shall
  - provide a detailed breakdown of necessary resource budgets for each of the major work activities in the work breakdown structure.
  - The activity budget shall include the estimated cost for activity personnel
  - May include costs for factors
    - travel,
    - meetings,
    - computing resources,
    - software tools,
    - special testing and simulation facilities,
    - administrative support.
- A separate line item shall be provided for each type of resource in each activity budget.

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Procurement plan (Subclause 5.2.5 of the SPMP)

- Shall
  - List the goods and services that will be purchased for the project
  - How they will be obtained.
  - It shall specify the types of contracts to be used, who will conduct the procurement, sources of standard procurement documents, the deadline for obtaining each good and service and the lead times needed to conduct the procurement process.

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Managerial Process Plans

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Project assessment and control

6. Project assessment and control
    1. Requirements management plan
    2. Scope change control plan
    3. Schedule control plan
    4. Budget control plan
    5. Quality assurance plan
    6. Subcontractor management plan
    7. Project closeout plan

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Requirements management plan (Subclause 6.1 of the SPMP)

- Shall
  - specify the control mechanisms for measuring, reporting, and controlling changes to the product requirements.
  - specify the mechanisms to be used in assessing the impact of requirements changes on product scope and quality, and on project schedule, budget, resources, and risk factors.
  - specify change control procedures and roles
- Techniques
  - traceability, prototyping and modeling, impact analysis, and reviews

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Scope change control plan (Subclause 6.2 of the SPMP)

- Shall
  - describe how to detect activities out of the project's scope and the actions that are to be taken if such activities are found or requested.

48

Schedule control plan (Subclause 6.3 of the SPMP)

- Shall specify the control mechanisms methods and tools to be used
  - to measure the progress of work completed at the major and minor project milestones,
  - to compare actual progress to planned progress,
  - to implement corrective action when actual progress does not conform to planned progress
- Achievement of schedule milestones should be assessed using objective criteria to measure *the scope and quality* of work products completed at each milestone.

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Budget control plan (Subclause 6.4 of the SPMP)

- Shall specify the control mechanisms to be used
  - to measure the cost of work completed,
  - compare planned cost to budgeted cost,
  - implement corrective action when actual cost does not conform to budgeted cost.
- Shall specify
  - the intervals at which cost reporting will be done
  - the methods and tools that will be used to manage the budget
- The budget plan should include frequent milestones that can be assessed for achievement using objective indicators to assess the scope and quality of work products completed at those milestones.
- Techniques
  - Earned value tracking should be used to report the budget and schedule plan, schedule progress, and the cost of work completed.

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Quality control plan (Subclause 5.3.4 of the SPMP)

- Shall specify the mechanisms to be used to measure and control
  - the quality of the work processes and the resulting work products
- Quality control mechanisms may include
  - quality assurance of work processes, verification and validation, joint reviews, audits, and process assessment.

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Subcontrat management plan (Subclause 6.6 of the SPMP)

- Shall
  - contain plans for selecting and managing any subcontractors that may contribute work products to the project
  - The criteria for selecting subcontractors shall be specified
  - The management plan for each subcontract shall be generated using a tailored version of this standard.
  - Plans should in particular include,
    - requirements management, monitoring of technical progress, schedule and budget control, product acceptance criteria, quality assurance, and measurement and risk management processes shall be included
  - A reference to the official subcontract and prime contractor/subcontractor points of contact shall be specified.

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Project closeout plan (Subclause 6.7 of the SPMP)

- Shall contain
  - the plans necessary to ensure orderly closeout of the software project.
  - Should include
    - a staff reassignment plan,
    - a plan for archiving project materials,
    - a plan for postmortem debriefings of project personnel,
    - preparation of a final report to include lessons learned and analysis of project objectives achieved.

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Product delivery (Clause 7 of the SPMP)

- shall
  - contain plans for delivery of the project's product(s), and
  - specify the product delivery approach:
    - the required information flow both internal to the project and to all external organizations required to support the delivery,
    - the packaging and physical delivery plans,
    - all associated customer documentation such as operation manuals, maintenance manuals and training materials.

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Supporting Process Plans

7. Supporting process plans
    1. Project supervision and work environment
    2. Decision management
    3. Risk management
    4. Configuration management
    5. Information management
        1. Documentation
        2. Communication and publicity
    6. Quality assurance
    7. Measurement
    8. Reviews and audits
    9. Verification and validation

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Risk management plan (Subclause 7.3 of the SPMP)

- Shall specify
    - the risk management plan for identifying, analyzing, and prioritizing project risk factors.
    - describe the procedures for contingency planning,
    - methods to be used in tracking the various risk factors, evaluating changes in the levels of risk factors, and the responses to those changes
    - plans for assessing initial risk factors and the ongoing identification, assessment, and mitigation of risk factors throughout the life cycle of the project.
- Should describe
    - risk management work activities,
    - procedures and schedules for performing those activities,
    - documentation and reporting requirements,
    - organizations and personnel responsible for performing specific activities,
    - procedures for communicating risks and risk status among the various acquirer, supplier, and subcontractor organizations.

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Risk management plan (Subclause 7.3 of the SPMP) …

- Risk factors include
  - risks in the acquirer-supplier relationship,
  - contractual risks,
  - technological risks,
  - risks caused by the size and complexity of the product,
  - risks in the development and target environments,
  - risks in personnel acquisition,
  - skill levels and retention,
  - risks to schedule and budget,
  - risks in achieving acquirer acceptance of the product.

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Measurement plan (Subclause 7.7 of the SPMP)

- Shall specify
  - the methods, tools, and techniques to be used in collecting and retaining project metrics.
  - the metrics to be collected, the frequency of collection, and the methods to be used in validating, analyzing, and reporting the metrics.

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