



BITS Pilani

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Module 9 Part 1

Management and Governance

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SSZG653 Software Architectures



Management and Governance

Outline



Planning

Organizing

Implementing

Measuring

Governance

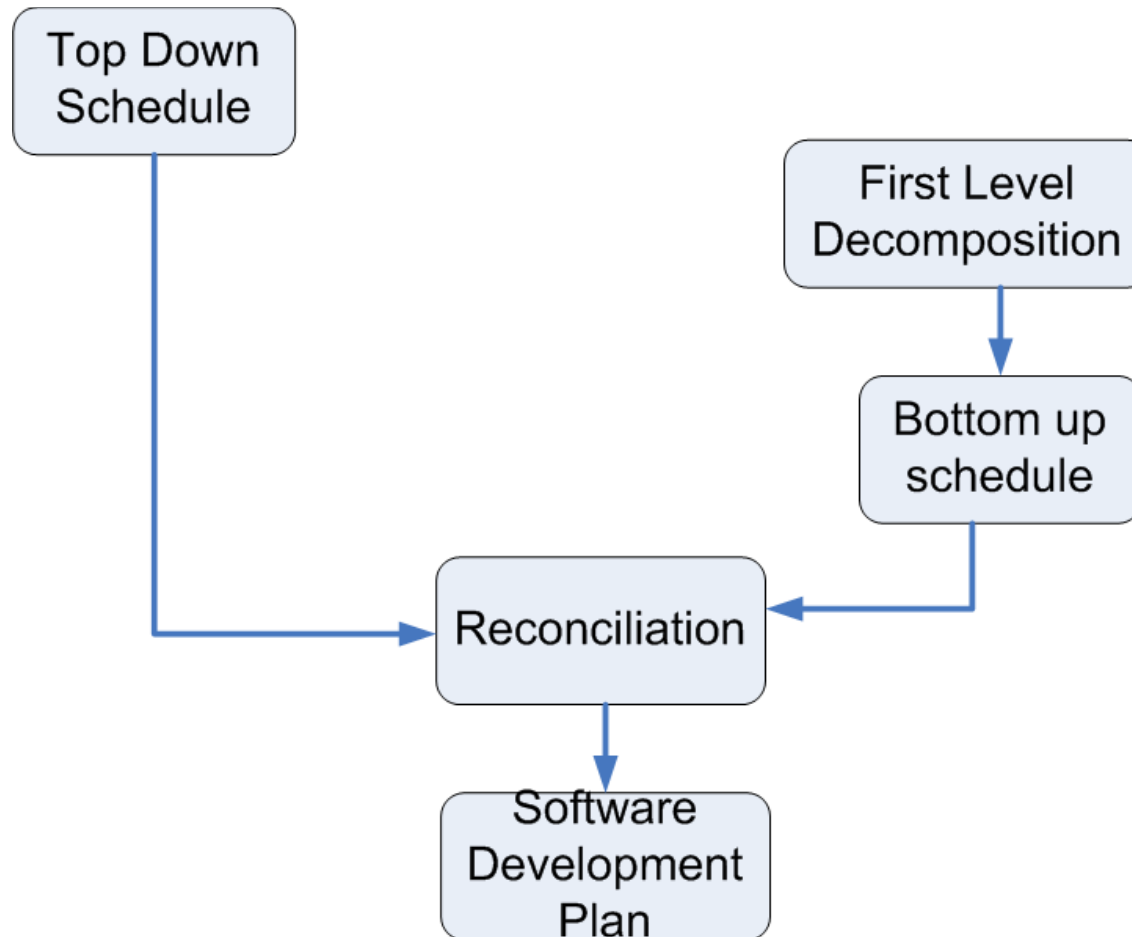
Summary

Planning



- The planning for a project proceeds over time.
- There is an initial plan that is necessarily top-down to convince upper management to build this system and give them some idea of the cost and schedule.
- This top-down schedule is inherently going to be incorrect, possibly by large amounts.
- Once the system has been given a go-ahead and a budget, the architecture team is formed and produces an initial architecture design.

The Planning Process



Top Down Schedule



- A top down schedule is needed to enable management to decide whether to do the project and to allocate resources.
Example: For a medium size project (~150K SLOC)
 - Number of components to be estimated: ~150
 - Paper design time per component: ~4 hours
 - Time between engineering releases: ~8 weeks
 - Overall project development allocation:
 - 40 percent design: 5 percent architectural, 35 percent detailed
 - 20 percent coding
 - 40 percent testing

Remaining Planning Steps

- An architecture team is created and they develop the first level decomposition of the architecture.
- Each member of the architecture team will be the lead architect for each major subsystem.
- A bottom up schedule is created by the architecture team
 - Typically more accurate than the top down schedule
 - The top down and the bottom up schedules must be reconciled to produce final (initial) schedule.
- Software development plan is written that specifies releases dates and features per release. This plan guides the initial activities of the project.

Organizing



- Division of responsibilities between project manager and software architect
- Global Software Development

Project Manager and Software Architect



- This is the most important working relationship on the team.
- The people in each role—PM and SA—must
 - Respect each other
 - Coordinate
 - Stick to their respective spheres.

Project Management Body of Knowledge (PMBOK)



Published by the Project Management Institute
ANSI and IEEE standard

Process groups

The five process groups are:

- Initiating.
- Planning.
- Executing.
- Monitoring and Controlling.
- Closing.

Initiating:



- processes performed to define a new project or a new phase of an existing project
- obtaining authorization to start the project or phase.

Planning:



- Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve.

Executing:



- Those processes performed to complete the work defined in the project management plan to satisfy the project specifications

Monitoring and Controlling:



- Those processes required to track, review, and regulate the progress and performance of the project;
- Identify any areas in which changes to the plan are required; and initiate the corresponding changes.

Closing:



- Those processes performed to finalize all activities across all Process Groups to formally close the project or phase.

Project Management Body of Knowledge (PMBOK)



Published by the Project Management Institute
ANSI and IEEE standard

Ten project management knowledge areas

1. Project Integration Management.
2. Project Scope management.
3. Project Schedule Management.
4. Project Cost Management.
5. Project Quality Management.
6. Project Resource Management.
7. Project Communications Management.
8. Project Risk Management.
9. Project Procurement Management.
10. Project Stakeholder Engagement.

Integration Management



- Ensuring that the various elements of the project are properly coordinated. The processes and activities needed to identify, define, combine, unify, and coordinate the various processes and project management activities within the project management process groups.
- Developing, overseeing, and updating the project plan. Managing change control process.
 - PM: Organizes project, manages resources, budgets and schedules. Defines metrics and metric collection strategy. Oversees change control process.
 - SA: Creates design and organizes team around design. Manages dependencies. Implements the capture of the metrics. Orchestrates requests for changes. Ensures that appropriate IT infrastructure exists.

Scope Management



- Ensuring that the project includes all of the work required and only the work required.
- Requirements
 - PM: Negotiates project scope with marketing and software architect.
 - SA: Elicits, negotiates, and reviews run time requirements and generate development requirements. Estimates cost, schedule, and risk of meeting requirements.

Schedule Management



- Ensuring that the project completes in a timely fashion.(Time Management in PMBOK6)
- Work breakdown structure and completion tracking. Project network diagram with dates.
 - PM: Oversees progress against schedule. Helps define work breakdown structure. Schedule coarse activities to meet deadlines.
 - SA: Helps define work breakdown structure. Defines tracking measures. Recommends assignment of resources to software development teams.

Cost Management



- Ensuring that the project is completed within the approved budget.
- Planning, estimating, budgeting, financing, funding, managing, and controlling costs.
 - PM: Calculates cost to completion at various stages, makes decisions regarding build/buy and allocation of resources.
 - SA: Gathers costs from individual teams, makes recommendations regarding build/buy and resource allocations.

Quality Management



- Determine quality policies, objectives, and responsibilities ensuring that the project will satisfy the needs for which it was undertaken.
- Quality & Metrics
 - PM: Defines productivity, size, and project-level quality measures.
 - SA: Designs for quality and tracks system against design. Defines code-level quality metrics.

Resource Management



- Organise, manage and lead ensuring that the project makes the most effective use of the people involved with the project.(Human Resource Management in PMBOK6)
- Managing people and their careers
 - PM: Maps skill sets of people against required skill sets. Ensures that appropriate training is provided. Monitors and mentors career paths of individuals. Authorizes recruitment.
 - SA: Defines required technical skill sets. Mentors developers about career paths. Recommends training. Interviews candidates.

Communications Management



- Ensuring timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.
- Communicating
 - PM: Manages communication between team and external entities. Reports to upper management.
 - SA: Ensures communication and coordination among developers. Solicits feedback as to progress, problems, and risks.

Risk Management

- conducting risk management planning, identification, analysis, response planning, and controlling risk on a project.
- Risk Management
 - PM: Prioritizes risks, reports risks to management, takes steps to mitigate risks.
 - SA: Identifies and quantifies risks, adjusts architecture and processes to mitigate risk.

Procurement Management

- Purchase or acquire products, services, or results needed from outside the project team. Processes in this area include Procurement Planning, Solicitation Planning, Solicitation, Source Selection, Contract Administration, and Contract Closeout.
- Technology
 - PM: Procures necessary resources. Introduces new technology.
 - SA: Determines technology requirements. Recommends technology, training, and tools.

Project Stakeholder Engagement



- The processes required to identify all people or organizations impacted by the project, analyzing stakeholder expectations and impact on the project, and developing appropriate management strategies for effectively engaging stakeholders in project decisions and execution.
- PM- Assess key participants and how the project affects their problems and needs.
- SA- Ensure the stakeholders' needs and concerns are dealt with appropriately.

Processes/Activities – Knowledge Areas.



- Each of the ten knowledge areas contains the processes that need to be accomplished within its discipline in order to achieve effective project management.
- Each of these processes also falls into one of the five process groups, creating a matrix structure such that every process can be related to one knowledge area and one process group.

Global Software Development

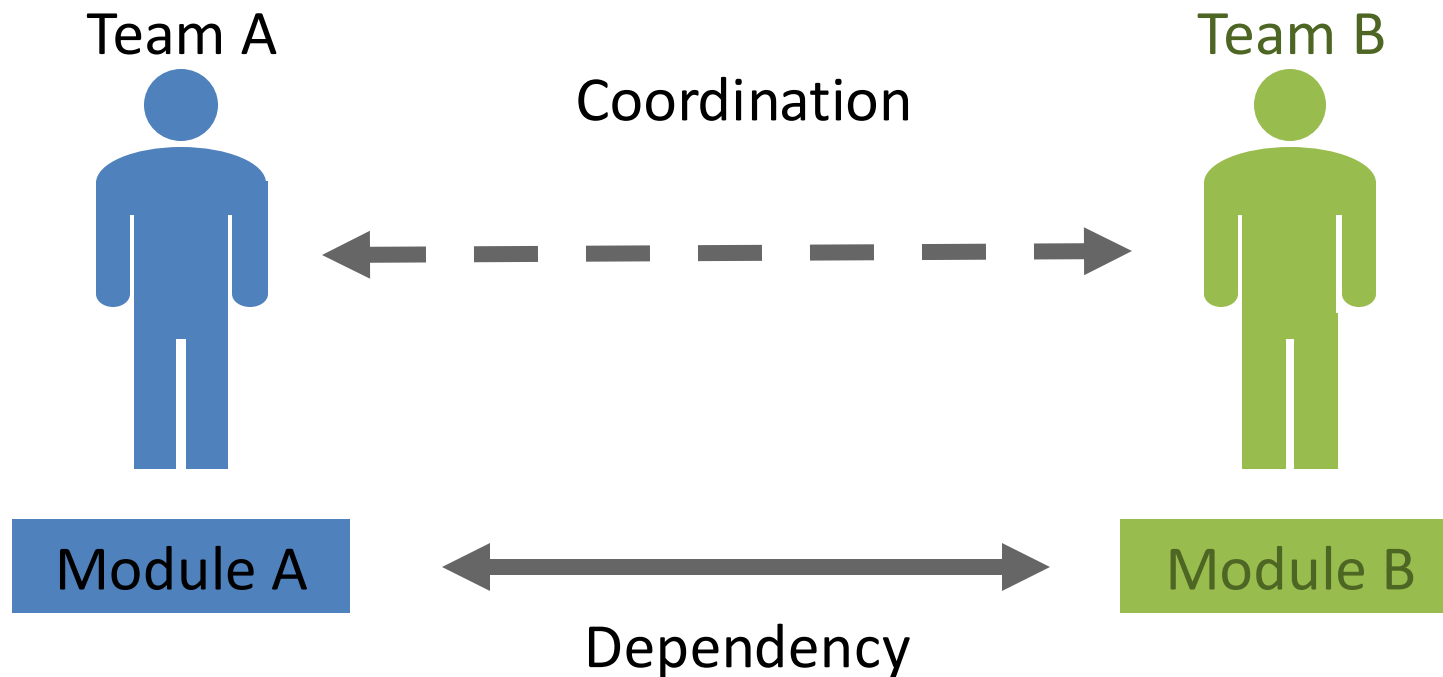


- A very common development context.
- Driven by
 - (Labor) costs
 - Skill sets and labor availability.
 - Local knowledge of markets.
- Global development means that coordination among teams is critical.

Team Coordination Induced by Module Interaction



If there is a dependency between two modules, the teams assigned to those modules must coordinate over the shared interfaces.



Coordination



- Local coordination can be informal and spontaneous.
- Remote coordination must be more structured.
- Coordination mechanisms:
 - Documentation
 - Meetings
 - Electronic media

Implementation Issues



- Trade-offs
- Incremental development
- Tracking progress

Trade-offs



- Software architect makes trade-offs among various quality attributes.
- Project manager makes trade-offs among
 - Features
 - Schedule
 - Quality
- Project manager should resist creeping functionality (scope creep)
 - Affects schedule
 - Can use a Change Control Board to manage (typically slow down) the pace of changes

Incremental Development



- A release may be in one of three states
 - Planning
 - Development
 - Test and repair
- All three states can be simultaneously active for different releases.

Tracking Progress



Progress can be tracked through

- Personal contact (doesn't scale)
- Meetings
- Metrics
- Risk management

Meetings

- Expensive use of time
- Either status or working – do not intermix
- One output of status meetings should be risks

Risks have

- Cost if they occur
- Likelihood of their occurrence

Project manager prioritizes risks

Measuring



- Metrics are an important tool for project managers. They enable the manager to have an objective basis both for their own decision making and for reporting to upper management on the progress of the project.
- Metrics can be global—pertaining to the whole project—or they may depend on a particular phase of the project.

Global Metrics



- Global metrics aid the project manager in obtaining an overall sense of the project and tracking its progress over time.
- Some example metrics, that any project should capture:
 - Size
 - Schedule deviation
 - Developer productivity
 - Defects
- Metrics should be tracked both historically for the organization and for the specific project.

Phase Metrics and Cost to Complete



Phase metrics

- Open issues
- Unmitigated risks

Cost to complete

- Bottom-up metric
 - Responsibility of lead architect for each subsystem team

Four responsibilities of a governing board

1. Implementing a system of controls over the creation and monitoring of all architectural components and activities, to ensure the effective introduction, implementation, and evolution of architectures within the organization.
2. Implementing a system to ensure compliance with internal and external standards and regulatory obligations.
3. Establishing processes that support effective management of the above processes within agreed parameters.
4. Developing practices that ensure accountability to a clearly identified stakeholder community, both inside and outside the organization.

Summary



- A project must be planned, organized, implemented, tracked, and governed.
 - Top-down schedule based on size
 - Bottom-up schedule based on top level decomposition.
 - Reconciliation of two schedules is the basis for the software development plan.
- Teams are created based on the software development plan.
- The software architect and the project manager must coordinate to oversee the implementation.
- Global development creates a need for an explicit coordination strategy.
- Management trade offs are between schedule, function, and cost.
- Progress must be tracked.
- Larger systems require formal governance mechanisms.