Module 8
Management and Governance

BITS Pilani

Pilani|Dubai|Goa|Hyderabad

Harvinder S Jabbal
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
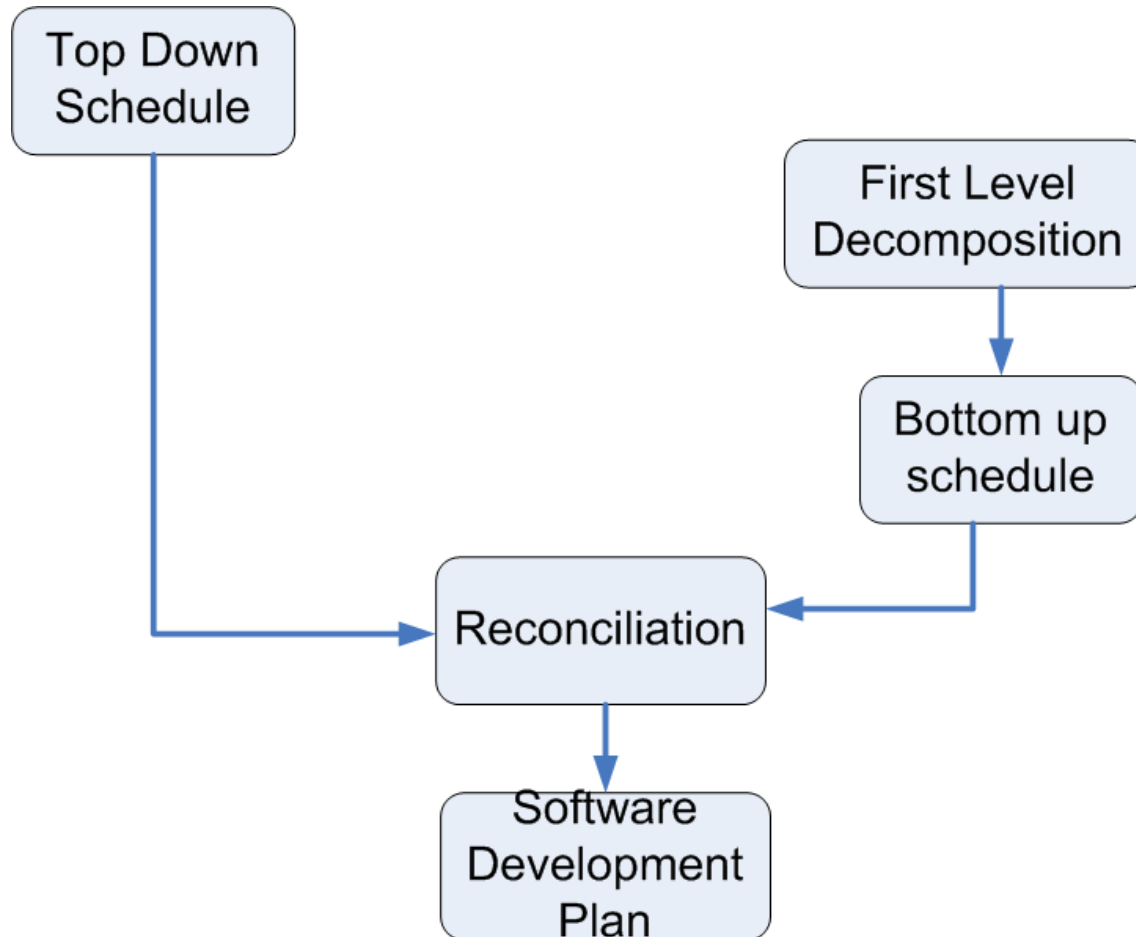
Top Down Schedule

- 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

Nine project management areas

1. Integration Management
2. Scope Management
3. Time Management
4. Cost Management
5. Quality Management
6. Human Resource Management
7. Communications Management
8. Risk Management
9. Procurement Management

Integration Management

- Ensuring that the various elements of the project are properly coordinated.

- 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.

Time Management

- Ensuring that the project completes in a timely fashion.

- 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 required budget.

- Resource planning, cost estimation, cost budgeting.

  – 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.

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Quality Management

- 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.

Human Resource Management

- Ensuring that the project makes the most effective use of the people involved with the project.

- 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 generation, collection, dissemination, storage, and 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

- Identify, analyze and respond to project risk.

- 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

- Acquire goods and services from outside organization.

- Technology

  - PM: Procures necessary resources. Introduces new technology.

  - SA: Determines technology requirements. Recommends technology, training, and tools.

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.

Team A

Team B

Coordination

Module A

Module B

Dependency
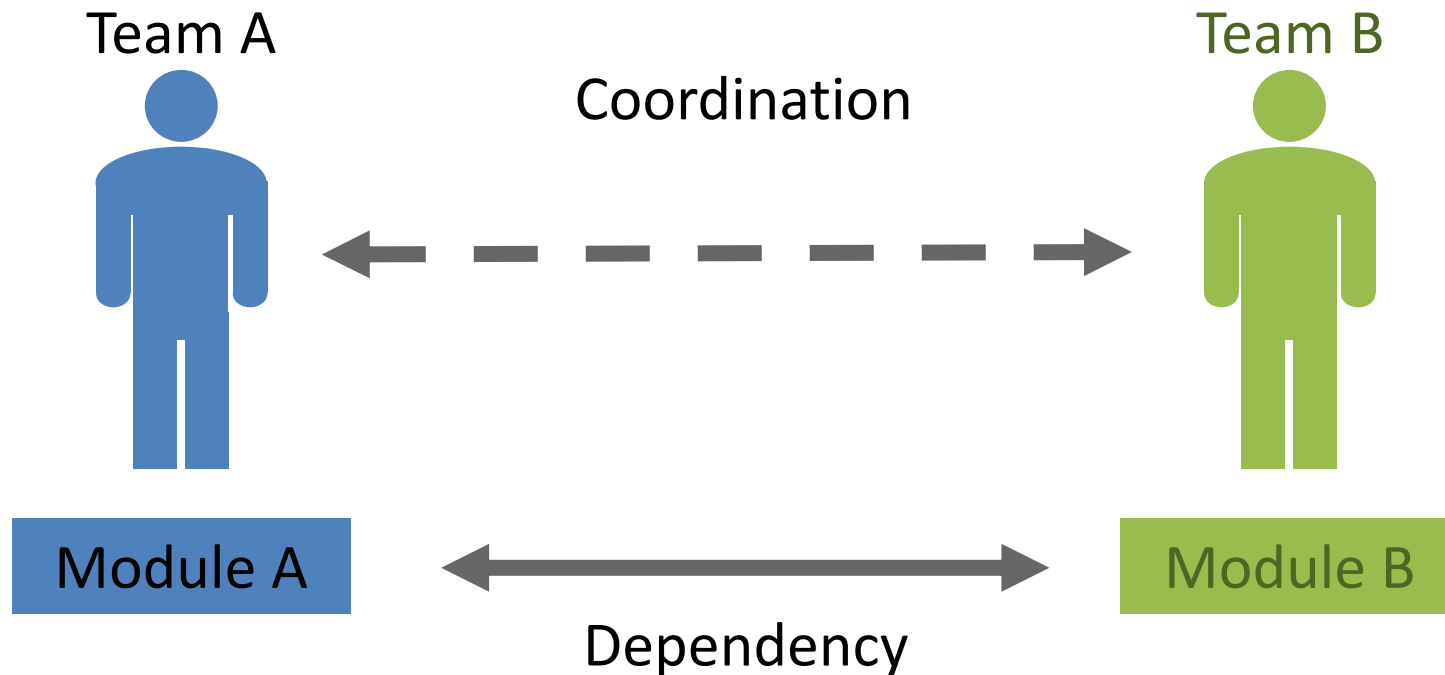
Coordination

- 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

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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

Governance

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 manage 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.