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PROJECT MANAGEMENT FOR ITM

ITM 471/571

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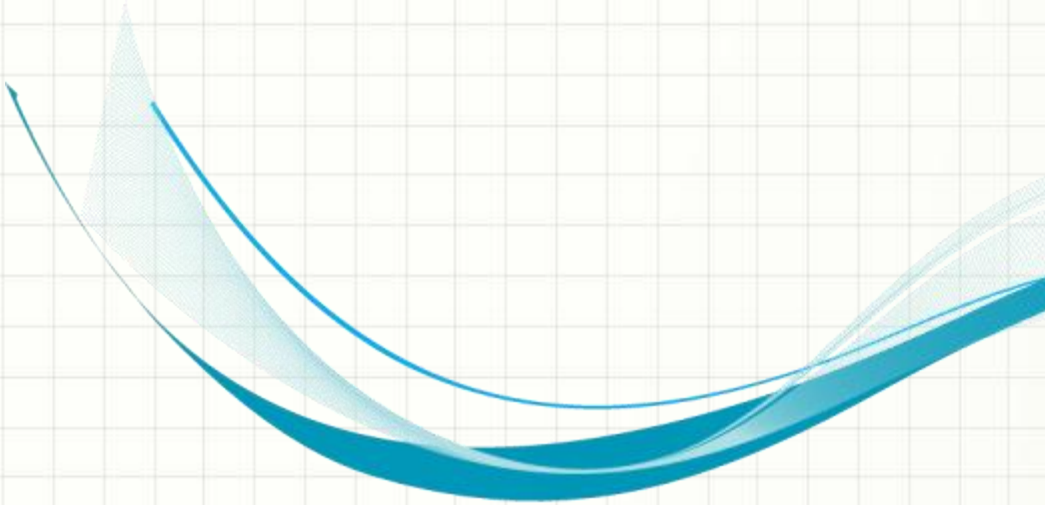
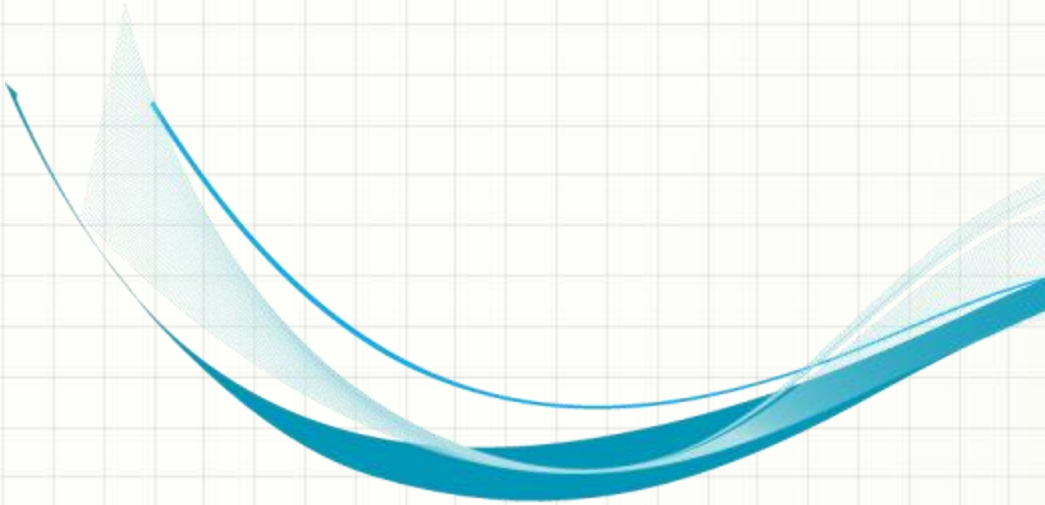
School of Applied Technology

Fall ‘14



Week 1
Introduction and Motivation



Instructor

Dennis Hood

- Background
  - Teaching
  - Industry
  - Education
- Contact
  - dhood@iit.edu
  - Office Hours
    - TR 12:45pm – 1:45pm
    - Or by appointment

Objectives

Course Objectives

- Learn fundamental project management concepts
- Explore techniques and methods designed to improve the likelihood of successfully delivering projects
- Analyze case studies and simulations to experience project management

Textbook

Textbook

- *Effective Project Management: Traditional, Agile, Extreme*, 7th Edition
  - Wiley, 2014
  - ISBN# 978-1-118-72916-8
- We will also reference
  - *Guide to the Project Management Body of Knowledge (PMBOK)*, Project Management Institute (PMI)
  - This is NOT a required text

Grading

Grading

- Homework Assignments
- Simulation Project
- Individual Research Paper
- Exam
- Participation

Motivation

Be Prepared

- Risk-based decision making
  - How likely is it to happen?
  - How much will it cost us?

Motivation for Project Management

- Projects fail at a ridiculous rate
  - Significant direct expense is wasted
  - Opportunity is lost
  - Time and frustration may be “costliest”
- Management can save the day
  - Planning and monitoring help to minimize the impact of risks
  - Change will happen and must be anticipated and embraced
  - Management must be lean and effective

Project Management Described

- Added value
  - Planning and monitoring help to minimize the impact of risks
  - PM anticipates and manages inevitable change
  - PM formalizes the process, a critical component for improving it over time
  - The result is an increased likelihood that the current project will be successful and future projects even more so
- Cost
  - Management is overhead and therefore must strive to be lean and effective

Project Management for IT Managers

- Involves many diverse departments
- Information Technology is a relatively immature discipline
- The domains and technologies are extremely dynamic
- They are also fairly expensive and somewhat resistant to change
- Software development contains little standardization and almost no regulation
- When a project is successful, the “how” is rarely documented for public consumption

What is a Project?

- General definition
  - A project is a sequence of unique, complex, and connected activities having one goal or purpose and that must be completed by a specific time, within budget, and according to specification
- Business focus
  - A project is a sequence of finite dependent activities whose successful completion results in the delivery of the expected business value that validated doing the project (the business case)

Project Definition Implications

- A project is the application of resources (people, tools, etc.) to produce a product or deliver a service
- Each project is temporary and unique
  - It has a definite beginning and ending
  - It has aspects that have never been done before
- A project begins when the involved parties (stakeholders) agree to the objectives
- A project ends when the objective (or an agreed upon modified objective) is met or is determined unattainable

Examples

- We manage projects in our daily lives
  - “What should I have for breakfast?”
  - “What do I want out of life?”
- Ex: Attending class
  - Objective: Arrive prepared, in the right place, and on time
- Ex: Trip to a distant land
  - Objective: See the sights and experience the culture (safety? budget?)
- Ex: Build a building
  - Objective: Meet the stated requirements including cost, schedule, and regulatory constraints

Programs and Portfolios

- Program
  - A collection of logically related projects that share a common goal or purpose
  - Managed in a coordinated way to obtain benefits and control not available if managed individually
  - May include elements of related work outside of the scope of the discrete projects in the program
- Portfolio
  - A collection of projects or programs and other work that address strategic business objectives
  - Grouped to facilitate effective management
  - Not necessarily interdependent or directly related

Inter-related Project Parameters

- What we can accomplish (*scope*) and how good it is (*quality*) are factors of:
  - How much we invest (*cost*)
  - How long we take (*time*)
  - And how hard we work (*effort*)
- A change to any of these 5 factors forces a change to at least 1 of the other 4

Death, Taxes and Change

- Change is inevitable, don't fight it
- Technology will continue to change at a frightening speed
  - Stay away from the bleeding edge
- Next comes domain
  - At a high-level of abstraction, the domain is fairly stable
- Process will change the least
  - That is where you should focus your efforts

21st-Century Challenges

- Life-Cycle Compression
- Globalization
- Information Overload
- Downsizing, outsourcing, off-shoring, etc.
- Customer focus
- More smaller projects

Growth is Good, Creep is Bad

- Scope creep
  - Unmanaged and unaccounted for expansion of scope, typically driven by the customer
- Feature creep
  - Similar to scope creep, but typically driven by the project team (e.g., gold plating)
- Hope creep
  - Wishful thinking
- Effort creep
  - Working harder, not smarter

Project Classifications

- Each project is unique and therefore may require a unique management approach
- However unique approaches are problematic
- Better would be to develop a finite set of tailored approaches, each appropriate for a class of projects

Classification by Characteristic

- Projects can be classified by:
  - The degree of risk
  - The amount of business value
  - Estimated duration
  - Complexity
  - Technologies to be applied
  - Number of organizational units involved
  - Estimated cost

Classification by Project Type

- Examples of project types:
  - Application development
  - System installation
  - Recruiting and hiring
  - Infrastructure implementation
  - Vendor selection
  - Policy development/establishment
  - Research

Week 2
The Project Management Process

Lesson Overview

- The PM Process
- Reading: Ch. 2-3
- Objectives
  - Establish a process for managing projects
  - Examine the life cycle of projects
  - Analysis the role of stakeholders and other organizational elements in projects
  - Discuss the PMBOK's PM Processes and Knowledge Areas

Definitions

What Exactly Is Project Management?

- What business situation is being addressed by this project?
- What do we need to accomplish?
- What will we commit to?
- How will we do it?
- How will we know that we did it?
- When it’s over, how will we assess our performance?

Definition of a Project

- Ex.: Your car won't start. You ask the mechanic to find out what's wrong and fix it.
  - Is this a project? Is it more than one project?
- Ex: Your group is responsible for maintaining the XYZ system
  - Is this a project?

PM and Project Requirements

- PM is an organized common-sense approach that utilizes appropriate client involvement in order to deliver client requirements that meet expected incremental business value
- A requirement is a desired end-state whose successful integration into the solution delivers specific, measurable, and incremental business value to the organization

Objectives and Constraints

- Objectives are desired results and form the basis of project planning
  - The project plan is designed to achieve the project's objectives
  - The project is done when the objectives have been met (generally speaking)
- Constraints
  - Restrictions on the structure of the project primarily associated with the parameters of the scope triangle

Stakeholders

- A stakeholder is anyone impacted by the project and/or its outcome
  - Customer
  - Sponsor
  - Management
  - Project team
  - Partners, etc.
- Proactive communication is critical to the stakeholders' satisfaction

Organizational Structure

- Functional
  - Organized by areas of specialization
  - “Silos”
- Projectized
  - Organized by project teams
- Matrix
  - A combination of both
  - Everyone has both a functional manager and a project manager

Process

PM Life Cycle Models

- Linear
  - Clearly defined and stable
- Incremental
  - Deliver business value early and often
- Iterative
  - Incomplete requirements
  - Approach must facilitate discovery
- Adaptive
  - Big-picture goal understood, but not solution
- Extreme
  - Even the goal is not yet understood

Project Management Processes

- Process groups
  - Initiating or Scoping
  - Planning
  - Executing or Launching
  - Monitoring and Controlling
  - Closing
- The PM process can be instantiated several times during a project life cycle

Knowledge Areas

- Integration management
- Scope management
- Time management
- Cost management
- Quality management
- Human resources management
- Communications management
- Risk management
- Procurement management
- Stakeholder management

Week 3
Strategy, Scope and Initiation

Lesson Overview

- Strategy, Scope and Project Initiation
- Reading: Chapter 4
- Objectives
  - Discuss the impact of business strategy on project management
  - Explore methods for selecting the “right” projects given business objectives and resource availability
  - Examine the process of pulling together the management elements crucial for project success
  - Analyze organizational structure alternatives
  - Examine the Initiation process group and the Integration Management knowledge area

Strategy

Organizational Mission

- Strategic Management
  - "You Are Here"; Destination and Plan
  - How the organization plans to compete with available resources in current and anticipated environments
- Steps for accomplishing the mission
  1. Define (or redefine) organizational mission
  2. Set long-range goals and objectives
  3. Analyze and formulate strategies
  4. Implement strategies through projects
  5. Go back to step 1 and repeat

SMART Objectives

- ***S***pecific
  - Be unambiguous
- ***M***easurable
  - Establish objective metrics
- ***A***ssignable
  - Identify accountability
- ***R***ealistic
  - Be sure it’s feasible
- ***T***ime-bound
  - Identify the finish line

Strategic Projects

- Projects are how strategies are realized
- Implementation Issues
  - Multiple dimensions of shared resources
  - Prioritization
  - Formal and informal coordination
  - Authority and accountability
  - Communication
  - System support

Governance

- Project Classification
  - "Must Do" vs. Operational vs. Strategic
- Selection Criteria
  - Alignment with strategic objectives
  - Return on investment (over time)
  - Resource availability
  - Risk
- Formal Proposal Process

Project Proposals

- Proposals capture relevant information
  - Brief description (incl. category and timing)
  - Risks
  - Selection criteria ratings
- Initial assessment screening
  - Criteria weighting gives objective score
- Formal Approval Process
  - Signing authority based on total cost
- Approved projects are prioritized

Project Scope

The Need for Project Definition

- By “definition” we mean establishing the purpose and parameters of the project
  - What will this project achieve?
  - When will it complete?
  - How many people?, having which skills?
  - How much will it cost?
- Consensus among stakeholders is critical to success
- Definition must precede planning

Scope of Work to be Performed

- Scope defines the objectives and the work to be produced
  - Begins as a client request and is negotiated into a contract of deliverables
  - Must also define what won't be done
  - Establishes key milestones and environmental requirements
  - Also agree to conditions of satisfaction
  - Project scope vs. product scope

Requirements

- A requirement is something the product should do or a quality that it must have
- The project's scope is largely comprised of the product's requirements
- Requirements are gathered by analyzing customer needs, market trends, competitor's products, etc.

Testing Requirements

- Completeness
  - Have all requirements been captured?
- Clarity
  - Are they clearly stated?
- Validity
  - Do they accurately reflect customer needs?
- Measurability
  - Can each be measured?
- Testability
  - Can the implementation of each be tested for correctness?

Testing Requirements (cont.)

- Maintainability
  - Will the implementation be maintainable?
- Reliability
  - Will the system be reliable/available?
- Look and feel
  - Will the system be adequately usable?
- Feasibility
  - Can the requirements be implemented?
- Precedent
  - Have we previously implemented something similar?

Testing Requirements (cont.)

- Scale
  - Are the requirements large and/or complex?
- Stability
  - Are the requirements likely to change?
- Performance
  - Can performance requirements be met?
- Safety
  - Are safety issues adequately addressed?
- Specifications
  - Is documentation adequate?

Organizational Structure

The Need for Structure

- Administration
  - HR, budget, career development, etc.
- Communication
  - Command and control
- Authority and Responsibility
  - Accountability is essential
- Functional Cohesion
  - Skill and competency development
  - Economies of scale

Project Team Differences

- Projects are temporary
  - Project teams are only needed for a relatively short period of time
  - They are expected to gel quickly and display a burst of productivity
- Projects are cross-functional
  - Membership is based primarily on value to the project (not historical ties, etc.)
  - Understanding of roles is critical
- Projects have a small set of well-defined objectives

Option 1 – Functional

- Surface Project from Functional Org
  - Organize by function, Manage by project
- Pros:
  - Structural integrity
  - Supports career paths
- Cons:
  - Focus is not on projects
  - Project manager has limited authority
  - Communication is strained

Option 2 – Projectized

- Organize the staff as project teams
  - PMs have dedicated staff (senior managers)
  - Some functional presence for operations
- Pros:
  - PM has direct authority
  - Team is diverse, focused and unified
- Cons:
  - Difficult to optimize utilization (bench?)
  - Consistent skill development is impeded

Option 3 – Matrix Organization

- Hybrid of 1 and 2
  - PM's "horizontal" authority overlays "vertical" functional hierarchy
  - Weak vs. Balanced vs. Strong
- Pros:
  - More project-focused than hierarchy
  - More efficient than project organization
- Cons:
  - Everyone has two bosses

Project Initiation

Project Initiation

- Develop Project Charter (Integration Management)
  - Purpose
  - Business value
  - High-level requirements
- Identify Stakeholders (Communications Management)
  - Highest level of roles and responsibilities
  - Establish communication channels

Integration Management

Integration Management

- Defines the overlap and interfacing among the activities of managing a project
  - The PM's reason for being
- Most PM activities involve more than one knowledge area
  - Cost estimates are dependent on time
  - Risk management involves understanding the capabilities of the project resources, etc.
- The IM knowledge area ensures that all PM processes are addressed
  - Even if it is determined that a given process is not needed on a given project (tailoring)

Integration Management Processes

- Develop Project Charter
- Develop Project Management Plan
- Direct and Manage Project Execution
- Monitor and Control Project Work
- Perform Integration Change Control
- Close Project or Phase

Develop Project Charter

- Formally authorizes the project and gives the authority to the project manager to allocate resources
  - Statement of work
  - Business case
  - Measurable project objectives
  - First-cut risk analysis
- Approved by the project sponsor

Develop Project Management Plan

- Defines how the project will be executed, monitored and controlled, and closed
- Encompasses plans for all of the other knowledge areas and plans for
  - Change and configuration management
  - Scope management
  - Process improvement
- Represents the result of tailoring the general project management process
- Must be formally approved by stakeholders

Direct and Manage Execution

- Captures the integration piece of executing the project
  - Basically making sure the project goes smoothly, especially at points of interaction
  - Ensuring common understanding of project elements (e.g., responsibilities, etc.)
  - Being of service (e.g., offer assistance, etc.)

Monitor and Control Project Work

- Tracking, reviewing, and regulating progress
- Monitoring
  - Collecting, assessing, analyzing, etc.
  - Communicating status
- Controlling
  - Determining correcting or preventive actions
  - Replanning if necessary

Perform Integration Change Control

- Change is a significant threat, but also a fact of life
- Requests must be evaluated
  - Impact/risk
  - Time and effort required
  - Cost
- The implementation of formally approved changes must be managed
  - Change Control Board (CCB)

Close Project or Phase

- The project doesn’t end with the completion of the technical work
  - Formal acceptance of completion
  - Final documentation
  - Lessons learned analysis
  - Capture of metrics and analysis
  - Deliver final product and transfer responsibility
  - Release project resources

Week 4
Planning and WBS

Lesson Overview

- Planning Documents and Work Breakdown Structures
- Reading: Chapter 5
- Objectives
  - Examine the planning process and associated documentation
  - Analyze the process of defining scope
  - Examine the Work Breakdown Structure (WBS) as a tool for establishing scope
  - Analyze requirements verification and control

The Planning Process Group

- Develop Project Management Plan
- Scope Management Planning
  - Collect Requirements
  - Define Scope
  - Create WBS
- Schedule and Budget Planning
- Plan Quality and Develop HR Plan
- Plan Communications
- Risk Management Planning
- Plan Procurements

The Scope Management Processes

- During Planning
  - Collect Requirements
  - Define Scope
  - Create Work Breakdown Structure (WBS)
- During Monitoring and Controlling
  - Verify Scope
  - Control Scope

The Scope Statement

- Describes the project's deliverables and the work required to create them
- Consists of:
  - Product scope description
  - Product acceptance criteria
  - Project deliverables
  - Project exclusions
  - Project constraints
  - Project assumptions

Inter-related Project Parameters

- What we can accomplish (*scope*) and how well we do it (*quality*) are factors of:
  - How much we invest (*cost*)
  - How long we take (calendar *time*)
  - And how hard we work (resource *effort*)
- A change to any of these 5 factors forces a change to at least 1 of the other 4

Managing Project Priorities

- Priorities determine which factors are:
  - Constrained / Fixed – cannot be altered
  - Enhance – should be optimized
  - Accept / Tolerate – can be slackened
- Factors must be negotiated to meet the objectives of the project while still maintaining the equilibrium of the scope triangle

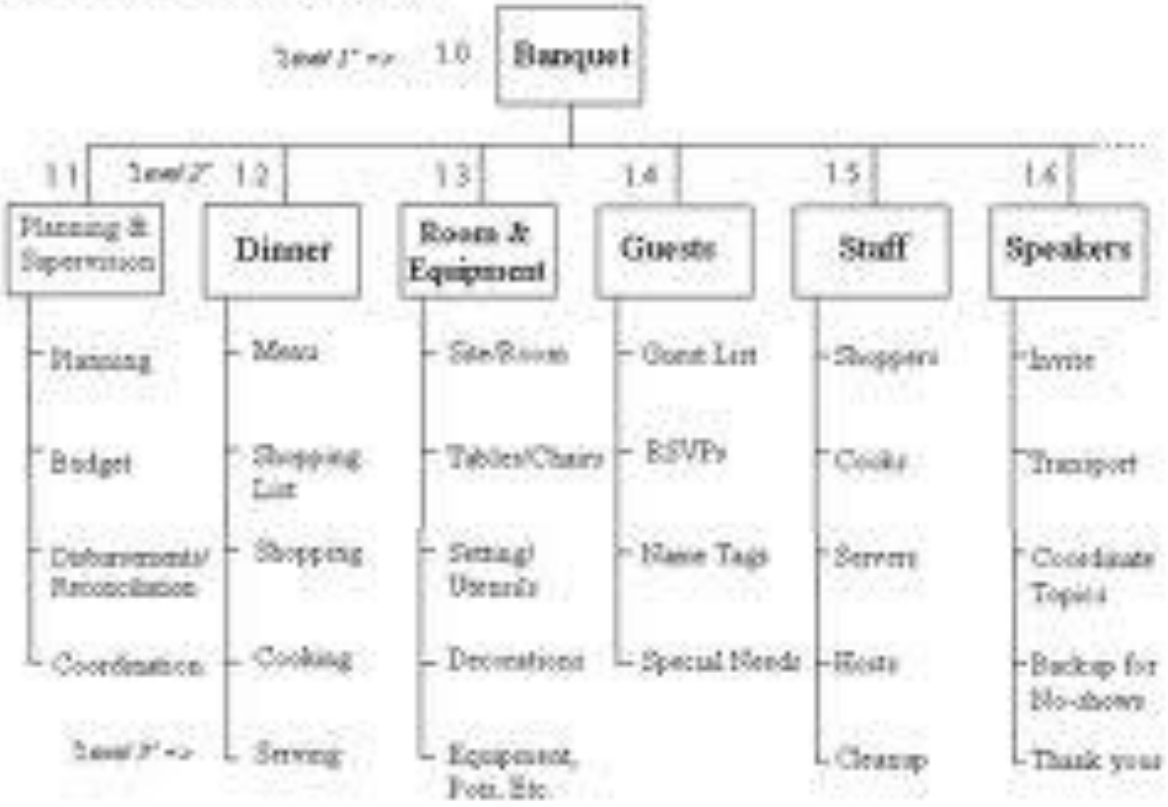
Work Decomposition

- Breaking the goal into manageable pieces
- Decomposition techniques
  - Top-down vs. bottom-up
  - Activities vs. deliverables
- Stopping Rules
  - Progress and completion can be measured
  - Start and end events are clearly defined
  - Each activity has a deliverable
  - Effort can be estimated with confidence
  - Required skills are well understood

Work Breakdown Structures

- A representation of the hierarchy of decomposed activities
  - The top level represents the project's goal
  - The leaves represent the assignable work
  - Intermediary levels represent "roll-ups" of related activities (phases, components, etc.)
- Roll-ups
  - Provide cost and effort summaries for logically-related activities

WBS Example - Banquet



Uses for the WBS

- Helps analyze the project's activities and deliverables
- Helps frame the system architecture
- Helps organize the project team
- Helps analyze costs and establish budget
- Provides a baseline for reporting status
- Helps communicate work assignments and inter-dependencies

Looking Ahead: Controlling Scope

- Scope change may be the most significant threat to project success
  - The initial effort to establish a clear understanding of scope is invaluable
  - Disciplined change management must be employed to maintain control of the project
- Progress will be measured in terms of activity completion
  - Independent verification of completion
  - Milestones

Week 5
Risk Management

Lesson Overview

- Risk Management
- Reading: Ch. 6
- Objectives
  - Explore the sources of risk and approaches for managing it
  - Define risk in terms of likelihood and impact
  - Analyze mitigation and contingency planning as part of project management

Homework Assignment 1

- You are the PM of a project which must complete on time to avoid a $500k fine
- You have identified the following threats to on-time completion and estimated the likelihood of each:
  1) Not enough time (30%)
  2) Insufficient funding (20%)
  3) Insufficient effort (25%)

Homework Assignment 1 (cont.)

- Document your risk management plan
  - Provide the exposure for each risk
  - Provide a response plan for each risk
    - Mitigation / transfer action(s)
    - Estimated response cost and revised exposure
    - Statement of cost vs. benefit
  - Describe a plan to monitor each risk
    - Metrics collection
    - Contingency plan
- Submit to Blackboard by 10/4/14

The Risk Management Process

Risk Management

- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitative Risk Analysis
- Plan Risk Response
- Monitor and Control Risks

The Nature of Risks

- Risk and opportunity go hand-in-hand
  - Strategically taking risks and succeeding puts you ahead of the competition
  - Risk-taking is energizing and unifying
- Risk-taking expands knowledge
  - Discovery comes from plunging into the unknown
- Cost-Benefit is based on utility and exposure
  - (Perceived) Benefit = Intrinsic Value + Actual Gain – Cost
  - (Perceived) Loss = Intrinsic Impact + Actual Loss + Cost
  - Expected Utility = $P_{success}$•Benefit - (1-$P_{success}$)•Loss
  - Risk Exposure = Likelihood • Impact

Planning

- Inputs
  - Scope and quality requirements
  - Constraints
    - Time, cost, resources, etc.
  - Past history
- Planning meetings and analysis
- Risk management plan
  - Framework for dealing with threats
  - Responsibilities, general sense of impact, etc.

Identify Risks: Tools and Techniques

- Reflect on past projects to determine causes of past failures and near failures
- Ask those being asked to commit
  - Commitment leads to anxiety
  - Anxiety reflects risk
- Talk to the experts
- SWOT analysis
  - Strengths and weaknesses
  - Opportunities and threats

Identify Risks: Sources of Risk

- Activity scheduling
  - Activity dependencies and critical paths
  - Time pressure
- Organization and resource management
  - Structure - Command, control and communication
  - Human issues – team play, skills, experience, etc.
- Funding
- Scope creep and related changes
- Ambiguous constraints, especially quality
- Lack of process
- New technology

Risk Analysis

- Qualitative
  - Relatively quick initial assessment
  - Fuzzy assessments of likelihood and impact at first (e.g., low, medium, high)
- Quantitative
  - Get to financial measure of exposure
  - Likelihood is a probability
  - Impact is a financial assessment
- Prioritize by exposure ratings
- Set aside “acceptable” risks

Plan Risk Responses

- Avoid
  - Consider a different, risk-free approach
- Transfer
  - Transfer ownership to a 3rd-party
- Mitigate
  - Reducing the likelihood and/or impact
  - May result in either transfer or avoidance
- Accept
  - Create a monitoring process
  - Establish corrective actions

Plans for Common Risks

- Activity scheduling
  - Insert buffers such as reviews
  - Attend to the critical path
- Organization and resource management
  - Close communication gaps and look for cross-impacts
  - Skills, experience and a good night's sleep all matter
  - Engage and involve the team
- Funding
  - Proactively manage the flow of cash
- Scope creep
  - Thoroughly analyze requirements then lock them down
  - Make the users part of the process
  - Establish and enforce change management procedures
- Develop formal processes

Dealing with Technology Risks

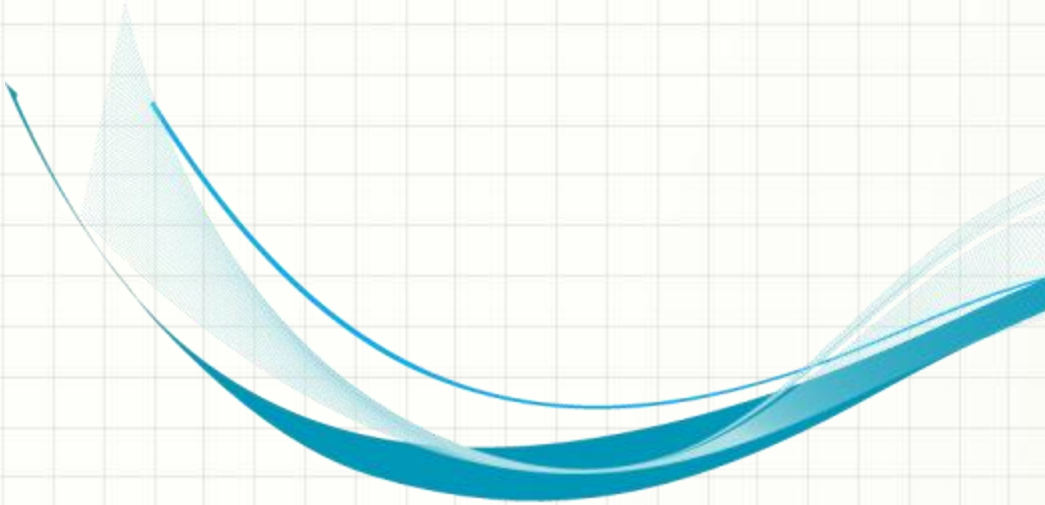
- Technology changes frequently
  - Keep projects short
  - Anticipate upcoming advancements
- Change leads to growth
  - Establish a culture of R&D
  - Reward prudent risk taking
- Manage new technology insertion
  - Provide adequate training
  - Test drive before you commit
  - Import expertise
  - Participate in lessons-learned forums

Cost-Benefit Analysis

- Compare the cost of mitigation with the benefit (the reduced exposure)
  - Exposure is a financial value
  - Mitigation always costs something
  - Benefit = ΔExposure
- Analyze completely
  - Exposure changes with time
  - Account for transferred risks

Monitoring and Controlling Risks

- Monitor the prioritized list of risks
- Establish metrics and the associated measurement process for each risk
- Determine triggers that will initiate action
- Document the contingency plan for each
- Recognize that monitoring is intrusive
- Reassess risks frequently



Week 6
Estimation and Control

Lesson Overview

- Estimation
- Sequencing Activities (Precedence Diagrams)
- Reading: Ch. 7
- Objectives
  - Develop methods for sequencing project activities
  - Discuss techniques for optimizing networks
  - Explore critical path management and other advanced sequencing topics
  - Evolve project planning from WBS analysis to calendar scheduling

Where is the Storm Going to Hit?

End → date t, $ → budegt

- Pressure to provide an early answer can lead to errors and certainly lowers certainty
- Change is inevitable (shorten to avoid this)
- Variability due to risk is difficult to factor in
- Political pressure to provide the *right* answer breeds cynicism
- Fear of punishment breeds padding

The Benefits of Good Estimating

- Estimate Defined
  - A credible approximation of the effort, time and cost required to successfully complete the project determined through careful analysis
- Risk Reduction
  - Enables more accurate resource planning
  - Reduces the likelihood of running short or running out of critical resources
  - Sets realistic stakeholder expectations
- Motivates Early Analysis
- Facilitates Communication
- Improves Plan Credibility

Estimation Challenges

- Uniqueness
  - History is the best predictor of future results
  - Discovery will provide answers that lead to more accurate estimates, but we need an estimate now!
- Complexity
  - Many variables to consider
  - May need to view multiple perspectives
- Is the project team doing the estimating?

Is Estimating Part of the Project?

- Estimation takes time and resources
- More such investment leads to more accurate estimates
- Is this effort part of the project?
  - Generally, initial estimates (macro) associated with project selection are not (Project Office and experienced personnel)
  - More detailed estimates (micro) necessary to build the plan are (PM and key team members)
  - This is largely semantics and accounting

Estimating Activity Attributes

- Finalize your definition of each activity
  - Resources
    - Skills required, desired level of experience, etc.
    - Match with available (or attainable) resources
    - Systems, tools, etc.
    - Compile a resource calendar
  - Duration
    - How much time is required to complete the activity?
    - Highly dependent on the capabilities of the resources
  - Cost
    - (labor rate X duration) plus materials
    - Systems, tools, etc.

Estimating Guidelines

- Get estimates from those responsible
- Get multiple opinions / perspectives
  - Delphi
- Estimate based on “normal” conditions
  - 8-hour days, 80% availability, etc.
- Use consistent units
- Estimate independent tasks independently
- Analyze the possible impact of risks

Estimating Durations

- Past experience is the best predictor
  - Expert opinion
  - Analogous estimating
    - Look to previous, similar projects
  - Parametric estimating
    - Statistical basis based on significant parameters such as square footage, number of requirements, etc.
  - Three-point estimates
    - Expected = {[Opt. + (4 X Most Likely) + Pess.] / 6}
    - Standard Deviation = (Pess. – Opt.) / 6
    - Variance = $(SD)^2$
- Contingency reserves are OK, but don't pad

Refining and Finalizing Estimates

- Account for “passing the baton”
- Adjust for known “abnormalities”
- Build in rework loops if necessary
- Account for change (insurance contract?)
- Schedule in refinement milestones
- Establish contingency funds and time buffers where necessary for survival
  - Use with extreme caution!
- Track and store actuals for future analysis

Getting into the Flow

- Purpose of the Precedence Diagram
  - Establish the relationships and dependencies among the project's activities
  - Optimize sequencing and analyze risks
  - Begin planning resource allocation and scheduling
- Inputs
  - Work packages from the WBS decomposition
    - The lowest level of decomposition
  - Knowledge of activity relationships
- Outputs
  - Precedence diagram
  - "Best Case" schedule
  - Resource requirements

Sequencing Activities

- Define activities from the WBS work packages
  - Activities consume time, money and effort to produce deliverables
- Identify inter-activity dependencies
- Graphically represent the sequence
- Identify possible areas of improvement
  - Parallel activity execution
  - Minimize idle time
  - Smooth resource utilization
- Identify possible areas of risk
  - Fan-in (merge) and fan-out (burst)
  - Not enough room for error (slack)
  - Inadequate resource pool
- Refine the WBS as necessary

Benefits

- Validate estimates
- Analyze interdependencies
- Effective in developing the plan and helps set the stage for controlling the project
- Communication vehicle
- Risk management
- Resource planning
- Identify compression and other optimization opportunities
- Helps to determine the viability of the project given available time, money, and resources

Constraints

- Constraints usually come from the following dependencies:
  - Mandatory (hard logic)
    - Work flow - one activity requires output from another
  - Discretionary (preferred, soft logic)
    - Best-practices dictate task ordering
  - External
    - Imposed from above (e.g., drop-dead dates)
    - Availability of shared resources / unique skill set requirements
    - Government regulations
    - Supplier constraints

Diagramming Basics

- Arrows and Nodes
  - Precedence diagramming method (PDM) depicts activity dependency relationships (preferred)
    - Also known as activity-on-node (AON)
  - Activity-on-arrow depicts state transitions
- All WBS work packages must be represented
- All activities must be exist on a path between the start and end nodes
- Project networks
  - Are acyclic
  - Flow from left (project start) to right (project end)
  - Have no conditional logic

Types of Relationships

- Finish-to-start (FS)
  - Activity completion gives successor the green light
  - By far the most common representation
- Start-to-start (SS)
  - Activity B cannot begin until activity A has started
  - You must begin plowing before you can start sowing
- Finish-to-finish (FF)
  - B cannot finish until A has finished
  - You must complete building before you can finish testing
- Start-to-finish (SF)
  - B cannot finish until A has started
  - Don’t order the inventory until you’ve started preparing the warehouse
- Most relationships can be converted to FS
  - For example, subdividing tasks to achieve greater parallelism (known as laddering)

Leads and Lags

- Lead time
  - Time removed from the schedule to bring an activity closer to the beginning of the project
  - Example
    - Painting is planned to begin once priming is complete
    - The PM puts 1 day of lead in to begin the painting activity 1 day before the priming activity is finished
- Lag time
  - Slack built into the schedule to intentionally delay the start of downstream activities
  - Example
    - Putting in the carpeting can begin once the painting is done
    - The PM puts in 1 day of lag to make sure the paint is dry

Computing Duration

- Forward Pass – Earliest Times (optimistic)
  - Starts at 0 and computes ES and EF
  - $ES_{act} + Duration_{act} = EF_{act}$
  - An activity's ES is its predecessor's EF
- Backward Pass – Latest Times (risk averse)
  - Starts at EF and computes LS and LF
  - $LF_{act} - Duration_{act} = LS_{act}$
  - An activity's LF is its successor's LS
- Slack is the cushion between early and late
  - SL = LS – ES as well as LF – EF
  - 0 slack indicates a critical path activity

Critical Path Analysis

- Critical Path Characteristics
  - Start to finish connection of activities with no float
  - The path of longest duration
  - Determines the project duration
  - Any delay in a CP task slips the project end date
- Critical Path Planning
  - Manage CP tasks aggressively
  - Watch for migration of the CP
- Critical Chain Project Management
  - Focuses on the CP as a significant project constraint

Identifying Milestones

- Choose points of significant accomplishment
  - Successfully achieving a milestone should be reason to celebrate for the entire team
  - Milestones should be focal points for the team
- Choose points of transition
  - Analogous to reaching a plateau when climbing a mountain
  - A place to catch your breathe, reflect on what's been accomplished, and re-evaluate the plan before moving on
- Milestones must be clearly defined and attainable
- Not too many, not too few

Making It Real

- Apply the network diagram to a calendar
  - Real-time means account for holidays, weekends, meetings, downtime, etc.
- Assign resources to the activities
  - Match by skill set first,
  - then look at availability
  - Account for vacations, possible sick time, etc.
- This is usually done with a GANTT Chart

WBS to Schedule

- Evolution of analysis
  - All activities from the WBS analysis must be accounted for
  - All dependency relationships from the Precedence Diagram must be respected
  - Schedules are typically depicted in Gantt chart form
- Resource Allocation
  - Each activity must have a logical resource allocated to it (in terms of skills and experience)
  - Resources must not be over-allocated

Homework Assignment 2

- Project overview
  - Develop a new software product
  - Finish as soon as possible
    - You must finish in 42 weeks or less to avoid a $1 million fine
    - You will receive a $200k bonus for each week sooner than 42
  - It would be nice if your budget was under $2.5 million
  - You may need to make compromises to achieve “success”
- Please see the activity details
  - Durations are in weeks; Costs are in thousands of dollars
  - Both the expected (“normal”) and the maximally compressed (“crash”) values are provided for each activity
  - Activity dependencies are also provided with the listing of each activity’s predecessor(s)
  - In addition to the given activity costs, your project will incur a $2k per week administrative overhead fee

Homework 2 – Activity Details

		Immediate	Normal		Crash	
ID	**Activity**	**Predecessor(s)**	**Duration**	**Cost**	**Duration**	**Cost**
A	Initiate Project	-	2	30	2	30
B	Research Market	A	8	40	7	45
C	Research Competing Products	A	8	80	6	200
D	Capture Requirements	B,C	4	50	4	50
E	Design User Interface	D	10	200	8	300
F	Design Database	D	12	400	10	600
G	Develop Test Cases	D	8	100	6	140
H	Evaluate Prototype	E,F,G	4	100	3	125
I	Finalize System	H	12	500	10	1000
J	Develop Marketing Plan	H	12	300	8	420
K	Release Product	I,J	4	200	3	400

Homework 2 - Deliverable

- Define “success” for this project
- Draw a precedence diagram for the "normal" schedule
  - show the critical path(s)
  - expected project costs (indirect, direct and total)
  - expected project duration
  - justify any assumptions
- Advise the team of their situation
  - Use our compression algorithm to identify options
  - Draw a project cost-duration graph showing *all* solutions
  - Choose the “best” plan and use cost-benefit analysis to justify your selection
  - SHOW ALL WORK and JUSTIFY ALL ASSUMPTIONS!
- Due 10/18/14

Week 7
Schedule Management

Lesson Overview

- Schedule Management
- Reading: Ch. 9
- Objectives
  - Explore scheduling issues and approaches to effective schedule development
  - Analyze scheduling and resource allocation techniques
  - Revisit risk management with regard to scheduling decisions
  - Define “Traditional Project Management”

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WBS to Network to Schedule

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  - All dependency relationships from the Network Diagram must be respected
  - Schedules are typically depicted in Gantt chart form
- Resource Allocation
  - Each activity must have a logical resource allocated to it (in terms of skills and experience)
  - Resources must not be over-allocated

Know Your Critical Path

- The critical path dictates the project's duration
  - All other paths contain float
- Delays to critical activities delay the project
  - Manage risk along the CP aggressively
    - Dependable resources
    - Milestones and quality reviews
    - Strategic buffers
- Compression is only possible along the CP
  - Compressing a CP activity will compress the project by the same amount as long as enough float exists in the non-critical paths

Critical Chain Method

- Goldratt, *The Goal* and *Critical Chain*
  - Theory of Constraints
  - Respects both resource and technical constraints
- Observations
  - People pad estimates
  - But people tend to use the padding
  - Early completion is often not reported so the opportunity is lost
  - Multitasking overhead is under estimated
  - A few key resources truly drive the project and therefore bottlenecks are created around people
  - People procrastinate

Pressure to Compress

- Reasonable sources of pressure
  - Time is money
    - Though not completely correlated: if the project completes sooner it will cost less
  - Market windows and competition
  - We all know you padded the schedule!
- Unreasonable sources of pressure
  - Management is trying to appease
  - We have to fit the budget cycle
  - We're late!

Getting it Done Sooner (or Cheaper)

- Respect the scope triangle
  - Reducing time usually increases cost
  - Unless scope and/or quality is sacrificed
- Focus on critical path activities
  - You can only reduce total project duration by reducing critical path activity durations
  - Remember – compression creates new CPs
- Reassess risk
  - Schedule compression is inherently risky
  - Beware the *Mythical Man Month* (Brooks)

Compression Options

- Feasible
  - Reduce scope
  - Phased-delivery, throwaways and prototypes (extreme programming)
  - Outsource
  - Dedicated project teams
  - Fast-track and crashing
- Risky
  - Add resources
  - Schedule overtime
  - Compromise quality
- Wishful thinking

Compression Cost-Benefit Analysis

- Assuming compression is feasible (safe, respects scope triangle, etc.) we still need to assess its value
  - Is the benefit of the compression worth the cost?
  - Remember, crashing has its limits and is inherently risky
- Project indirect costs
  - Overhead that varies directly with time
  - Administration, supervision, rent, etc.
  - The shorter the project, the lower the indirect cost
- Project direct costs
  - Driven directly from activities
  - Labor, equipment, subcontractors, etc.
  - Can the activity be done faster? At less cost?

Compression Analysis Graphs

- Project Cost-Duration Graphs
  - Graph the total project direct, indirect, and sum costs by time for each feasible project duration
  - Identifies the optimum cost-duration point
- Activity Graphs
  - Examines the cost per unit time of an activity
  - Activity costs assume “normal” time
  - Activities can be “crashed” at a cost (scope triangle)
  - Goal: crash CP activities with the smallest increase in cost per unit time

Compression Algorithm

1) Calculate the cost to compress each activity by one unit of time (slope)
2) Identify the CP activities
3) Compress the project by one unit of time by compressing the activity (or combination of activities) with the lowest cost (smallest slope)
   - It may be necessary to compress more than one activity if there are multiple CPs
   - Compress each activity by only one unit of time per iteration
4) Recalculate the CP
5) Iterate steps 2-4 until “done” compressing

Resource Allocation

- Resources extend from human to materials, equipment and working capital
- Utilization
  - Both over *and* under-utilization can cause problems
  - Keep people engaged but leave breathing room
  - Projects are more marathon than sprint
- Smoothing
  - Take advantage of available float
  - Switch assignments if feasible
  - Adjust dependencies if necessary

Multiproject Scheduling

- Benefits
  - Improved global utilization
  - Key resources provide skills and experiences to more than one project
  - Increased employee engagement
- Risks
  - Multiple-boss problem at the project level
  - Schedule changes in one project can create conflicts with another
  - Project switching overhead can decrease effectiveness

Managing Risk in Scheduling

- Things requiring risk management
  - Merges and bursts
  - Critical path activities
  - Heavily utilized resources
- Variability is risk
  - Risk accumulates with each activity
  - Seems like we’re late more often than early

Measuring and Reporting Status

- Measure progress vs. plan
  - Has the milestone been achieved?
  - Has the deliverable been produced? To satisfaction?
  - To what degree has the activity been completed? To satisfaction?
- Document and communicate progress
  - Status reports should report on activity completion
  - Reporting should be sequenced to allow for effective review
  - Deviations from plan must follow risk and change management plans

Scheduling for Success

- Allocate resources to match required skills and experience levels
- Mitigate schedule risks with strategic buffers
- Make the most of your milestones
  - Measurable
  - Attainable
  - Useful
- Build a schedule you can manage
  - Measure and document progress
  - Manage change effectively

Traditional Project Management

- Linear PM Life Cycle (PMLC) Model
  - Dependent phases executed sequentially
  - Best if
    - Scope is well defined and not likely to change
    - Activities are fairly routine (predictable)
    - Established templates can be utilized
- Incremental PMLC Model
  - Dependent phases repeated in sequential order (still no feedback)
  - Best if
    - Interim deliverables (partial solutions) are desirable
    - “Final” deliverable is not completely understood
    - Some scope change is expected due to “on-the-fly” clarification
    - Resources are scarce and must be allocated more dynamically

Week 8
Cost Management and EVM

Lesson Overview

- Cost Management and Maintaining Control
- Reading: Chapter 9
- Objectives
  - Discuss the activities required to manage project costs
  - Examine methods for establishing and managing project budgets
  - Discuss monitoring as a process for keeping projects on target
  - Identify metrics that facilitate effective monitoring as well as methods for collecting and using them effectively
  - Examine the earned value approach to monitoring projects

Cost Management

- Estimate costs
  - Direct costs
    - Labor effort over time
    - Systems, tools, materials, etc.
  - Indirect costs (administration, etc.)
- Establish budget
  - Expenditures over time
  - Justification of costs
- Control costs
  - Establish baseline
  - Measure actual and compare to plan

The Cost Management Plan

- Overrunning the budget is a significant project risk that must be managed aggressively
- The Cost Management Plan is part of the overall Project Management Plan
  - States how costs will be estimated and planned, and
  - how actual expenses will be managed with respect to the plan
- The following should be considered during planning:
  - The required level of accuracy for cost estimates
  - The units of measure for each cost driver (e.g., “per week”)
  - Control Account codes to link costs to organizational units
  - Control or variance thresholds for triggering contingencies
  - The rules for measuring performance (e.g., EVA)
  - Reporting formats and frequency – different stakeholders may have different needs/requirements
  - The inclusion of indirect costs (e.g., administrative overhead)

Estimating Costs

- Let past experience help predict the future
  - The same methods used to estimate time
- Time is money – so look to duration estimates
  - Estimate how much it will cost to *successfully* complete each activity
  - The schedule usually drives the budget, but consider altering the schedule to get a better budget (e.g., materials may be cheaper if purchased sooner or later than originally scheduled)
- Non-labor resources (e.g., systems, tools, etc.) cost money too
- Don’t forget to pay yourself (PM activities)
- Strategically allocate reserves, but don’t pad!

Estimation Accuracy

- Generally speaking, increasing the accuracy of an estimate will take more time and effort
  - Rough Order of Magnitude (ROM) Estimate
    - Usually made during project initiation
    - Typically a range of +/- 50% from the actual cost
  - Budget Estimate
    - Usually made during project planning
    - -10 to +25% from actual
  - Definitive Estimate
    - Refinements made during the project
- Generally speaking, the more accurate an estimate is, the more valuable it will be

Determining the Budget

- The process of aggregating estimated costs to establish an authorized cost baseline
  - How much money should the organization prepare to expend in total?
- This includes contingency/reserve funds that should be set aside to recover from risks
  - Contingency funds are associated with known risks
  - Management reserves can be added to the budget to cover “unknown” risks such as unplanned scope changes
- Cash flow analysis is necessary to ensure that required funds are available when needed

Controlling Costs

- Actual project performance must be monitored and controlled to ensure adherence to the plan and, if necessary, to trigger contingencies to recover from deviations
- Controlling the project from a cost perspective
  - Collect expenditure data
  - Compare with planned cash flow (limited value)
  - Incorporate “true” project progress (earned value)
  - Trigger contingency if variance exceeds threshold
  - Report budget status
- Increases in the budget must be formally approved

Monitoring Progress

- Goals
  - Keep the project on target (“You Are Here”)
    - Implies the presence of a baseline
  - Feed data to risk and change control
  - Provide visibility for stakeholders
  - Collect data for the knowledge base
- Monitoring is inherently intrusive
  - Take what is readily available
  - Extract the rest carefully
  - Keep the process objective and positive
- Are people more productive when they are being watched?

What to Measure

- Progress
  - How far along is the project?
  - Are we hitting our milestones?
  - How much is left?
- Stability
  - How frequently is the direction changing?
  - Are we in control? Is control attainable?
- Quality
  - How “acceptable” are the work products?
  - Do we need to “rework” anything?

Earned Value Management

- Combines time, cost, and work completed
  - Used to determine project status
  - How much value has been created to date?
  - Implies the existence of a phased budget and the ability to collect actual cost and progress over time
- Base metrics
  - Planned Value (PV)
    - estimated value of work planned to date
    - PV at the target completion date equals the budget (BAC)
  - Earned Value (EV)
    - estimated value of work actually completed
  - Actual Cost (AC)
    - actual cost of the work actually completed

EV Derived Metrics

- Variance – difference from plan
  - Cost Variance (CV) = EV - AC
  - Schedule Variance (SV) = EV - PV
  - Cost Performance Index (CPI) = EV / AC
  - Schedule Performance Index (SPI) = EV / PV
- Forecasting completion
  - Estimate at Completion (EAC)
    - As of now, how much do we expect the project to cost?
    - At planned rate of spending vs. at actual rate of spending
  - Estimate to Complete (ETC)
    - Estimated remaining cost
  - Variance at Completion (VAC)
  - To-Complete Performance Index (TCPI)
    - Rate to meet in order to stay within budget

Using Earned Value Analysis

- Variance analysis
  - Compute the schedule and cost variances
  - Positive is good, negative indicates lag relative to plan
- Efficiency analysis
  - Compute CPI and SPI
  - <1 indicates inefficient relative to expectations

Using Metrics to Improve the Process

- Capability Maturity Model (CMM)
  - Each level is characterized by increasing proficiency at monitoring
  - Achieving a CMM level requires quantitative proof of capability
- Feedback Loops
  - Educate the team on what did and didn't work
  - Metrics make it objective
  - Gets the team focused on areas in need of improvement and the size of the gap
- Historical Data
  - Along with experience, the project manager's best friend

Week 9 Stakeholder and Quality Management

Lesson Overview

- Stakeholder and Quality Management
- Reading: Chapter 16
- Objectives
  - Examine the process of quality management and its relationship to project management
  - Analyze methods for assuring acceptable levels of quality
  - Discuss the role of stakeholder management in projects
  - Analyze leadership and conflict management

Stakeholder Management

People: Your Most Valuable Asset

- Success or failure will primarily be driven by the performance of your team
  - Attitude, motivation, etc.
- Their development on your project is critical to the success of the organization
  - Maturity, professionalism, team attitude, etc.
- People management is very dynamic
  - Shared resources, outside influences, etc.

Roles and Responsibilities

- The team
  - Work as a team to complete project activities
- The sponsor
  - Provides funding, resources, guidance, etc.
- Functional managers
  - “Own” the resources and provides technical direction
- The project manager
  - Leads, manages and controls

PM Responsibilities

- Determine required resources
- Work with functional managers
- Establish and maintain team cohesion
- Manage the team
- Communicate responsibilities
- Manage stakeholder relationships
- Provide tools and training
- Evaluate performance

The Human Resource Plan

- Enterprise environmental factors
  - Culture, policies, availability of assistance, etc.
- RACI chart
  - Responsible, accountable, consult, inform
- Staffing management plan
- Recognition and rewards systems

Project Leader Contradictions

- Be involved but not *too* involved
  - Think holistically, attend to detail
  - Communicate broadly and proactively
- Innovate *while* maintaining stability
- See the big picture *while* executing tasks
  - Rely on intuition
  - Understand the business and politics
- Be decisive *and* flexible
  - Maintain composure and be unwavering
  - Act with (measured) urgency, justice and integrity
  - Motivate (by example) and be optimistic
- Champion individuals *but* stress teams
  - Partner with others and value teams
  - Unite and protect the team *while* respecting the organization

The Power of Teams

- Diversity of thought
  - Comprehensive exploration of the solution space
  - Complex problems have many possible solutions
  - Teams are more likely to identify and analyze a richer set of possible solutions
- Inertia
  - The momentum of a team is more sustainable than that of individuals
- Learning through sharing
  - Training of individuals is expensive and often inefficient
  - Shared experiences provide more efficient and longer lasting training

Leading Teams

- Communicating vision and purpose
- Acting with integrity and justice
  - Evaluating team and individual performance
  - Recruiting and evolving
- Maintaining high performance levels over long periods of time
  - Motivation and inspiration
  - Downtime and change
  - Leading by example

Group Decisions and Conflict

- (Managed) conflict is good
- Consensus on a team is better than individual opinions
  - Establish a culture of respect for opinions
  - Establish effective forums for idea sharing
  - Encourage and manage productive conflict
- Consensus is easier said than achieved
  - Group think is like a big individual opinion
  - What if there's no clear winner?
  - Unresolved conflict can fester

Quality Management

Quality Defined

- Quality
  - The degree to which the project fulfills requirements
  - A degree of excellence
  - A critical yet understated requirement
- Quality Management
  - Creating policies and procedures
  - Enforcing them to ensure compliance with project requirements

QA vs. QC

- Quality Assurance
  - Prevent defects
  - Improve the level of quality through an efficient set of activities performed throughout the life cycle
- Quality Control
  - Eliminate defective products
  - Improve the rate of acceptable product delivery through an efficient set of defect detection activities, primarily late in the life cycle

Quality Goals

- Prevent, discover and eliminate defects
- Deliver customer satisfaction by representing the user in design and development
- Enforce standards and process
- Mind the gate
- Improve processes
- Review, audit, monitor, verify, validate and inspect

The Value of Quality

- Quality increases customer satisfaction
  - Credibility lasts and attracts new business
- Lack of quality leads to rework
  - Unscheduled work means unplanned expense and slipping schedules
  - Work under duress increases the likelihood of more mistakes
- Uptime and performance are largely determined by quality
  - Lack of quality drives the need to change

The QA Environment

- Contractual conditions
  - Scope, time, budget, etc.
- Customer-supplier relationship
  - Change management, acceptance, etc.
- Teamwork
  - Variety of skills, parallel activities, etc.
- Multiple project support
- HCI / usability concerns
- Turnover management
- Maintenance
  - Enhancement and release management, troubleshooting, etc.

Defect Classification

- Incorrect specification of requirements
- Misunderstanding of client's needs
- Deviation from requirements
  - Gold-plating, short-cutting, etc.
- Design errors
- Implementation errors
- Violation of standards
- Poor test coverage
- User interface / usability errors
- Documentation errors

Planning for Quality

- Checkpoints supporting milestones
- Independent verification
- Build-test-fix-retest
- Make it measurable/testable
- Inspire the delivery of high-quality deliverables
  - Establish quality goals
  - Obtain commitment
  - Motivate performance
- Collect the data/information required to improve over time

Analysis Tools

- Control Charts
  - Maintain stability within upper and lower limits
- Benchmarking
  - Actual vs. past performances
- Design of Experiments
  - Identify factors influencing specific variables,
  - so that they can be managed
- Statistical Sampling
  - When evaluating all or most is impractical
- Flowcharting / process analysis
  - Anticipation of troublesome steps

Perform Quality Control

- Feedback loops
  - Measure the output of a process
  - As compared to expected
  - Understand the results (both good and bad)
  - Use that knowledge to improve the process
- Root-cause analysis
  - Ask yourself what caused a problem to occur,
  - then ask what caused that cause, and so on
- Histograms and Pareto Charts
  - Frequency of problems by problem category
  - 80% of the problems are due to 20% of the causes
  - Invest in eliminating the most problematic causes

Case Assignment #3

- Scenario
  - Last year your company committed to a very challenging project because your best engineers “guaranteed” they could handle the challenges and deliver the final product on time – you are the project manager
- 5-month status report
  - The engineers report that all is going well
  - Accounting reports that the project is on budget
- 10-month status report
  - The customer is on the phone asking for the finished product
  - Accounting reports the entire budget has been spent
  - The engineers report they are not ready and will need 5 more months (accounting reports this will cost an extra $500k)
  - They again guarantee success stating that the problems were due to using unfamiliar, complex technologies

Case Assignment #3 (cont.)

- Analyze the state of the project
  1. Draw an EVM graph
     a) Plot the PV, EV and AC lines
     b) Plot points for 0, 5, and 10 months
     c) Estimate EV and AC for 100% completion (show on the graph)
  2. Recommend and justify next steps
     a) Calculate SV, CV, SPI and CPI at 5 and 10 months
     b) Recommend changes to complete the project by month 13
- Analyze the state of the company
  1. Who should be fired (and why)?
  2. Document a process improvement plan stating specific changes to make future projects more likely to succeed
- Due 11/15/14 (Blackboard)

Week 10
Closing Phases

Lesson Overview

- Auditing and Closing Projects
- Reading: Chapter 8
- Objectives
  - Discuss activities associated with closing things – contracts, phases, projects, etc. – such as audits, lessons learned analysis, etc.
  - Discuss the role of contracting and purchasing
  - Examine different types on contracts and strategies for entering into them
  - Analyze buy vs. build-type decision making

Closing Phases

Achieving Milestones

- Closure
  - Managing phase closure is critical to future success
  - This applies to interim phases as well as the project as a whole
- Analysis
  - Capture metrics
  - Assess state
- Stakeholder management
  - Record and report
  - Obtain approval and move on
- Keys to success
  - Start with the end in mind
  - Be disciplined (no cutting corners!)
  - Celebrate success
  - Learn

Are We There Yet?

- The project is done when:
  - You deliver the deliverable and the customer accepts it
  - The stakeholders agree to end it
  - Never, it will go on forever!
  - It fails (and everyone admits it)
  - It's cancelled (due to outside influences)
- The ability to accurately assess the state of the project is key

A Time of Reflection

- Audit goals
  - Identify the successes and failures
  - Gain an understanding of why (root causes)
  - Learn and record the knowledge
- The process
  - Start with objective actual vs. planned data, then supplement with testimonials
  - Identify significant goods and bads
  - Do the detective work to determine the true sources
  - Record the lessons learned for future improvement

Keys to an Effective Audit

- It's not about blame
  - Chances are it was more process than person anyway
- Focus on the big items
  - Chances are solving them will probably correct the little ones anyway
- Try to balance positives and negatives
  - No project is all good or all bad
  - You can learn as much from your successes
- Get a good scribe

Questions to Address

- Did the team follow the plan?
- Was the schedule appropriate? budget?
- Did the PM lead effectively? manage?
- Was the team cohesive and effective?
- Did we have the right people? tools? training?, etc.
- Was risk managed well? change?
- Was communication proactive?
- Were we able to do it right?

Evaluating Performance

- Start with teams, then look at individuals
- Gather feedback from multiple sources
- Be objective, fact-based, honest and just
- Keep true to the accountabilities established during planning
- Emphasize successes *and* areas in need of improvement
- Reward those who made it happen

Where Do We Go From Here?

- Celebrate success, or at least the accomplishment of completion
- Respect the team's momentum and comfort with each other
- Look for opportunities to advance individuals
- Relax, reflect and refresh
- Do it again - only this time do it better!

Procurement Management Process

- Obtaining the supplies, resources, services, etc. required by the project
  - Buying from a seller
- Issues
  - Rules and regulations
  - Negotiation and relationships
  - Buy vs. build
  - Useful life
- Steps
  - Plan - identify needs, evaluate sellers, etc.
  - Conduct - negotiate and select sellers
  - Administer – manage relationships, change, etc.
  - Close

Procurement Contracts

- Contracts are binding and must therefore be respected
  - It can be both shield and sword – either for or against you!
  - Change management discipline is key
  - The project manager should be involved in developing the contract

Procurement Decisions

- Determine need
- Buy vs. build vs. borrow
  - Risk is a *cost*
  - Time has *value*
- Seller selection
  - The pros and cons of “preferred” vendors
  - Capability, including relevant experience
  - Motivation
- Post-engagement responsibilities
  - Ownership
  - Maintenance

Paperwork

- Statements of work (SOWs)
- Requests for proposal (RFPs)
  - Also requests for bids or quotes
- Purchase orders (POs)
- Contracts
  - Fixed price vs. Time and material vs. Cost reimbursable
  - Delineation of responsibilities
  - Acceptance
- Nondisclosure agreements

Administer Procurements

- Disciplined change management
- Quality assurance
- Verifiable completion of scheduled work
- Proactive communication
- Risk monitoring supported by EVM

Project Maturity Model

- Organizational Project Maturity Model
  - Developed by the PMI
  - Modeled after SEI's CMM
- Levels of maturity
  - Ad hoc – Lacks predictability
  - Formal – PM standards are applied
  - Institutionalization – Organization-wide
  - Management – system support for portfolio management
  - Optimization – Continuous improvement

Week 11 Process Improvement and PM Models

Lesson Overview

- Process Improvement and PM Models
- Reading: Chapter 12
- Objectives
  - Examine the topic of process improvement as it pertains to the project management process
  - Discuss approaches for improving the PM process
  - Analyze the role of metrics in improving the PM process
  - Compare and contrast different PM models

Process Improvement

Improving a Process

- Processes are inherently improvable
  - The more you examine a process the more imperfections you'll spot
  - Just when you think you've squeezed out all of the inefficiencies, along comes a technology innovation!
- Improvements should be strategic
  - Make decisions based on benefits and costs
- Change is hard so be gentle

Motivation

- Change is a constant threat
  - IT managers rely on the unreliable – people and tools
  - People use tools *in the context* of a process to (hopefully) create value
  - Processes are often more manageable and stable
- Knowledge is power
  - Understanding the “as-is” allows us to move methodically (and strategically) toward the “to-be”
  - Decreasing inefficiency and increasing productivity results in greater profit

The Physics of Process Flow

- Bottlenecks
  - Where is the flow most restricted?
- Friction
  - Is the flow inhibited? (bureaucracy, etc.)
- Inertia and momentum
  - A process at rest tends to stay at rest
- Conductivity and insulation
  - Do motivators exist to encourage positive flow?
  - Is the process isolated from “distractions” and “noise”?

Variability of Process

- Variety
  - The spice of life
  - Death to a production line
- Managing variability requires knowledge of
  - The desired output
  - The degree of tolerance
- Reducing variability (increasing predictability) takes effort ($)
- Side benefits can be significant

Goal-based Improvement

- Focus on improvement
  - A focal point is essential to achieving significant, sustainable improvement
- Don’t try to get it all in one swing
  - If the end of the tunnel is so far away that we can’t see the light, then we need interim goals
  - Success is a journey – just keep heading in the right direction

The Role of Feedback

- Get connected
- Timing is everything
- Be SMART
- Thresholds are necessary to prevent overreaction
- Proactivity vs. reactivity
  - Is it process improvement or quality control?

Quality Focus Thru the Years

- The assembly line
- TQM
- ISO 9000
- Deming
- Baldridge
- CMM
- Six Sigma

Six Sigma: Methodology or Religion

- Process change, Six Sigma style
  - Management
  - Improvement
  - Redesign
- Zen and the art of process improvement
  - If you look closely enough, you will see variation
  - If you focus on it, will it improve?

Six Sigma Mechanics

- No more than 3.4 defects per million opportunities (DPMO)
- Implies that
  - We know (exactly) what a defect is
  - We know (exactly) what an opportunity is
  - We have a measurement process that
    - Accurately detects any defect
    - Is unobtrusive enough so as not to significantly impede productivity

Statistically Speaking

- Six Sigma assumes a normal distribution (bell curve) of event outcomes
- 99.99966% of outcomes will be within six standard deviations of the mean
  - In other words, only 3.4 of every million outcomes will be outside the six standard deviation range
- It only works if
  - You really have a normal distribution
  - You target the mean and
  - You bound your acceptable range of outcomes at -/+ six standard deviations

Six Sigma Projects

- Define requirements
  - Suppliers, Inputs, Process, Outputs, Customers (SIPOC)
  - Critical-to-Quality (CTQ)
- Measure existing vs. desired
  - Focus on the “important” outputs that can be improved
- Analyze data to identify causes
- Improve the process
- Control the results and maintain

The Capability Maturity Model

- Developed to address software project failure rates
  - US Defense Department (DoD) and the Software Engineering Institute (SEI)
  - Lack of maturity of process in engineering software was believed to be the leading cause of an alarming failure rate
- A framework for improvement
  - Five distinct levels of process maturity
  - Key process areas that must be satisfied

CMM's Levels

- Initial (aka ad hoc, chaotic, disorderly)
- Repeatable
  - Disciplined enough to repeat successes
- Defined
  - Defined and documented process, tailored
- Managed
  - Quantitatively understood and controlled
- Optimizing
  - Continuously improving

PM Life Cycle Models

PM Life Cycle Models

- Linear
- Incremental
- Iterative
- Adaptive
- Extreme

The Linear Model

- Waterfall approach
  - Scope
  - Plan
  - Launch
  - Monitor & Control
  - Close
- Phase relationships are finish-to-start
- Very well understood goal and solution
  - “We’ve done this many times before”
- Intolerant of learning / change

The Incremental Model

- Piecemeal version of the waterfall approach
- Phased deliverables provide earlier, lesser value in increments
- Learn as you go – change as necessary

The Iterative Model

- Iteration is used to explore, discover and learn while moving toward an acceptable level of completion
- Iterations produce increasingly complete prototypes to facilitate discovery of the complete solution
- Scope can be “refined” between each iteration

The Adaptive Model

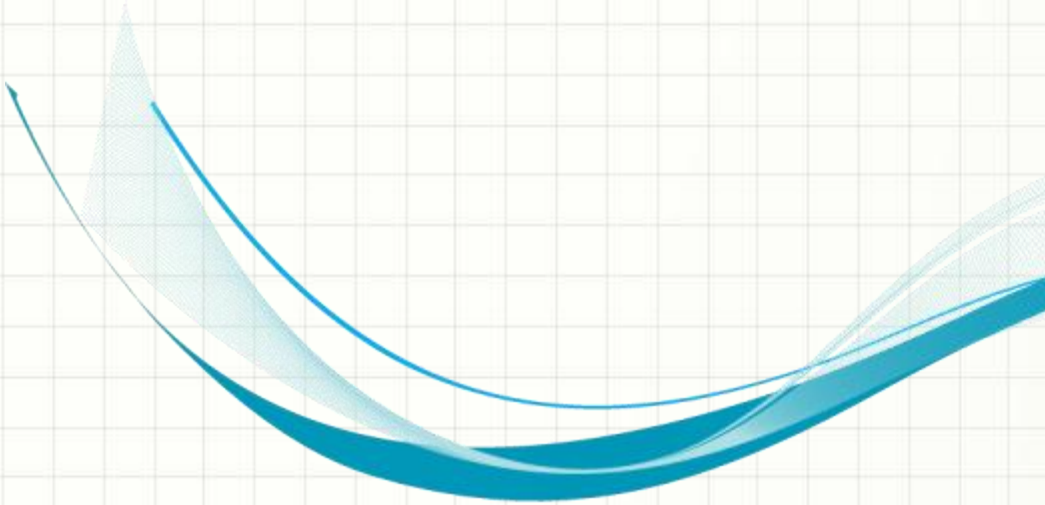
- The future is less certain
- Knowledge gained in one iteration will be used to direct the next iteration
  - Just-in-time planning
- The goal is convergence toward an acceptable solution
  - High-risk, high-reward?
- Partial solutions may be released at the discretion of the client

Extreme Project Management

- Rapid and very visible progress toward a yet to be determined solution to a vague and evolving problem
- Capability and desire in search of a solution which in turn will search for a problem
- Change is a given since the next iteration is at best loosely defined until the current iteration is assessed
- Success must be thought of in different terms – knowledge gained

Extreme PM Evaluated

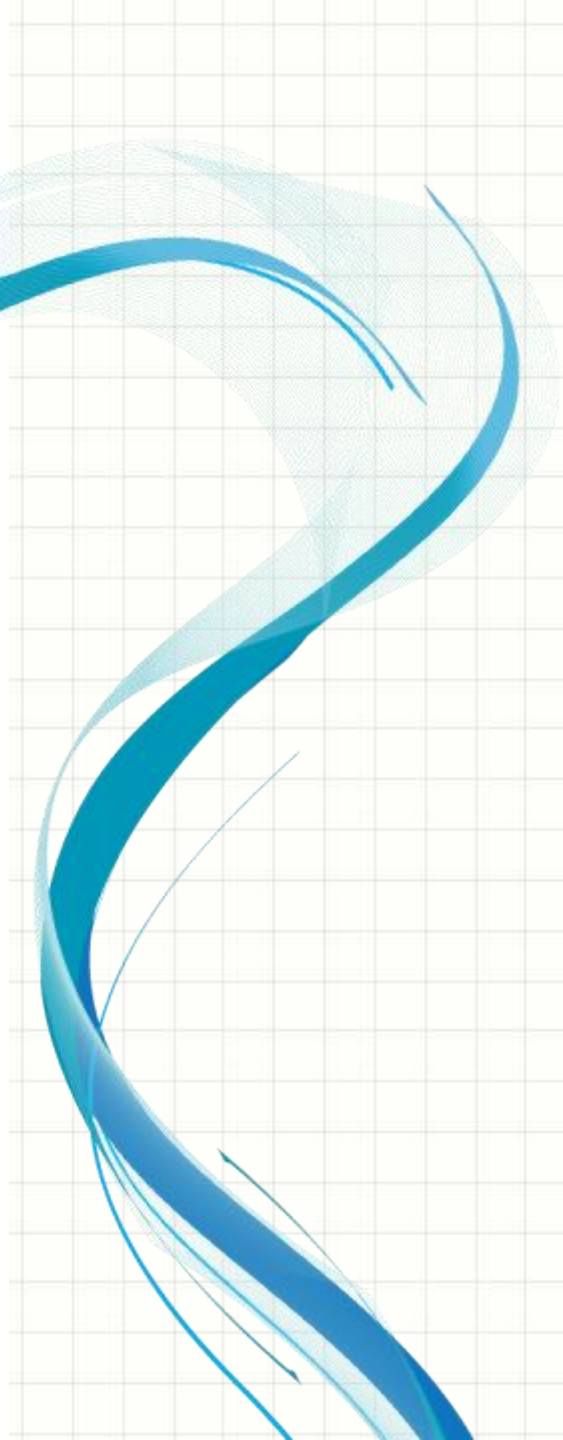
- Strengths
  - Extremely engaging (creative problem solving)
  - Extremely flexible
  - Rapid breezing over of many possible solutions
  - Facilitates getting “out of the box”
- Weaknesses
  - Commitment to anything but exploration is futile
  - Encourages play, not work
  - Drives sales and marketing crazy
  - Who’s paying for this?



Week 12 Challenging Projects

Lesson Overview

- Distressed and Multi-team Projects
- Reading: Chapters 13 and 14
- Objectives
  - Examine especially challenging project management situations
  - Analyze the root causes of distress and discuss approaches for preventing such situations
  - Discuss challenges associated with multi-team projects and approaches for managing them



Challenging Projects

Distressed Projects

- The project seems headed for failure
  - EVM variance metrics
    - Trending toward failure over a significant duration
    - Recent metrics indicate a high risk of failure
  - A recent significant change threatens project success
    - Key personnel quit or become unavailable
    - Dramatic change in scope
    - Project de-prioritized by management
    - An “uh-oh”-moment (e.g., tool limitations)
    - Money troubles
    - A “fire” breaks out with in production

Root Causes

- Inadequate requirements capture
- Lack of sponsorship
- Lack of planning, risk analysis, etc.
- Poor management of change
- Lack of oversight (monitoring)
- Over commitment / wishful thinking
- Poor communication / lack of visibility
- Inadequate training and/or technology evaluation

Don’t Let This Happen to You

- Learn from the past
  - Or else, history will likely repeat itself
- Take the time to manage risk
- Line up sponsorship
- Plan with detail (WBS, budget, etc.)
- Manage the critical path
- Manage change with discipline
- Respect the dynamics of people and teams
- EVM-based checkpoint control

Reporting Status

- Be concise
  - 140 characters or less?
- Convey facts clearly (progress, issues, etc.)
  - Metrics, simple graphs, etc.
- Project optimism and control
  - It's all about the plan
- Be realistic
  - Inform, don't sell
- When necessary, raise the alarm loudly
  - Manage expectations
  - Obtain help

Contingency Plans

- Developed during risk planning
- Be prepared to obtain more effort, more time, more money, etc.
- Monitor risks closely, focus on triggers
- Change course if necessary, but do so with care
- Learn and improve next time

Multi-team Projects

- Collaboration and involvement of 2 or more teams
  - All project teams have multiple sub-teams
- Crossing “political” boundaries is risky
  - The 2-boss problem of the matrix
  - Internal cultural differences
  - Managing contractors is especially hard
- Command, control, communication
- PMs must delegate to (trusted) sub-team leads

Multi-team Keys for Success

- Communication
  - Proactive
  - Clear and concise
- EVM-based checkpoint control
- Risk management
  - Especially along the critical path
- Delegation
- Contracts!
  - Transfer and mitigate risk

Week 13
Agile and Extreme Project Management

Lesson Overview

- Agile and Extreme Project Management
- Reading: Chapter 10 and 11
- Objectives
  - Distinguish agile and extreme projects from traditional projects
  - Analyze the unique challenges of projects of these types and discuss ways to successfully overcome them

Agile and Extreme Project Management

Non-traditional Projects

- Agile projects
  - Goal is clearly understood
  - Exact solution is not at all clear
  - Periodic releases of working systems
- Extreme projects
  - Goal is idealistic
  - Solution is unknown or unrealistic
  - Do a little work, learn and evaluate
  - Project may end after any phase

Agile Project Management

- The Agile Manifesto (Fowler and Highsmith)
  - Individuals and interactions over processes and tools
  - Working products over comprehensive documentation
  - Customer collaboration over contract negotiations
  - Responding to change over following a plan
- Surface frequently
  - Co-located, small, agile project teams
  - Cross project dependencies
  - Partial solutions made visible periodically

The Iterative Model

- Iteration is used to explore, discover and learn while moving toward an acceptable level of completion
- Iterations produce increasingly complete prototypes to facilitate discovery of the complete solution
- Scope can be “refined” between each iteration

The Iterative Model Evaluated

- Strengths
  - Frequent opportunities for client review
  - Facilitates continual deepening of understanding of problem and solution
  - Suggested improvements vs. scope creep
  - Overall plan can be adapted with changing environment (e.g., market, technology, etc.)
- Weaknesses
  - Client can be too involved
  - Co-location may be impractical
  - Supporting interim “solutions” may be burdensome
  - Number of iterations required to “finish” is not known

The Adaptive Model

- The future is less certain
- Knowledge gained in one iteration will be used to direct the next iteration
  - Just-in-time planning
- The goal is convergence toward an acceptable solution
  - High-risk, high-reward?
- Partial solutions may be released at the discretion of the client

The Adaptive Model Evaluated

- Strengths
  - Very focused, only essential work is performed
  - Minimal change management overhead
  - Minimal uncertainty management
  - Frequent production of business value
- Weaknesses
  - Only works with significant, timely, meaningful client involvement
  - Commitment to more meaningful deliverables is all but impossible

Extreme Project Management

- Rapid and very visible progress toward a yet to be determined solution to a vague and evolving problem
- Capability and desire in search of a solution which in turn will search for a problem
- Change is a given since the next iteration is at best loosely defined until the current iteration is assessed
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Extreme PM Evaluated

- Strengths
  - Extremely engaging (creative problem solving)
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- Weaknesses
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  - Encourages play, not work
  - Drives sales and marketing crazy
  - Who’s paying for this?

Week 14
Enterprise Project Management

Sim Project Assessment Details

- Append 2 pages to your plan document
- Page 1 - EVM and supporting metrics
  - A single EVM graph (original PV line plus EV and AC lines)
  - 1 table of data (duration and cost at each milestone)
  - 1 table of metrics (SV, CV, SPI, and CPI at each milestone)
- Page 2 - Analysis
  - Explain the results of each milestone
  - Explain improvements you would make next time
- Appendix
  - Include a picture of your masterpiece
- Submit by 12/1/14

Lesson Overview

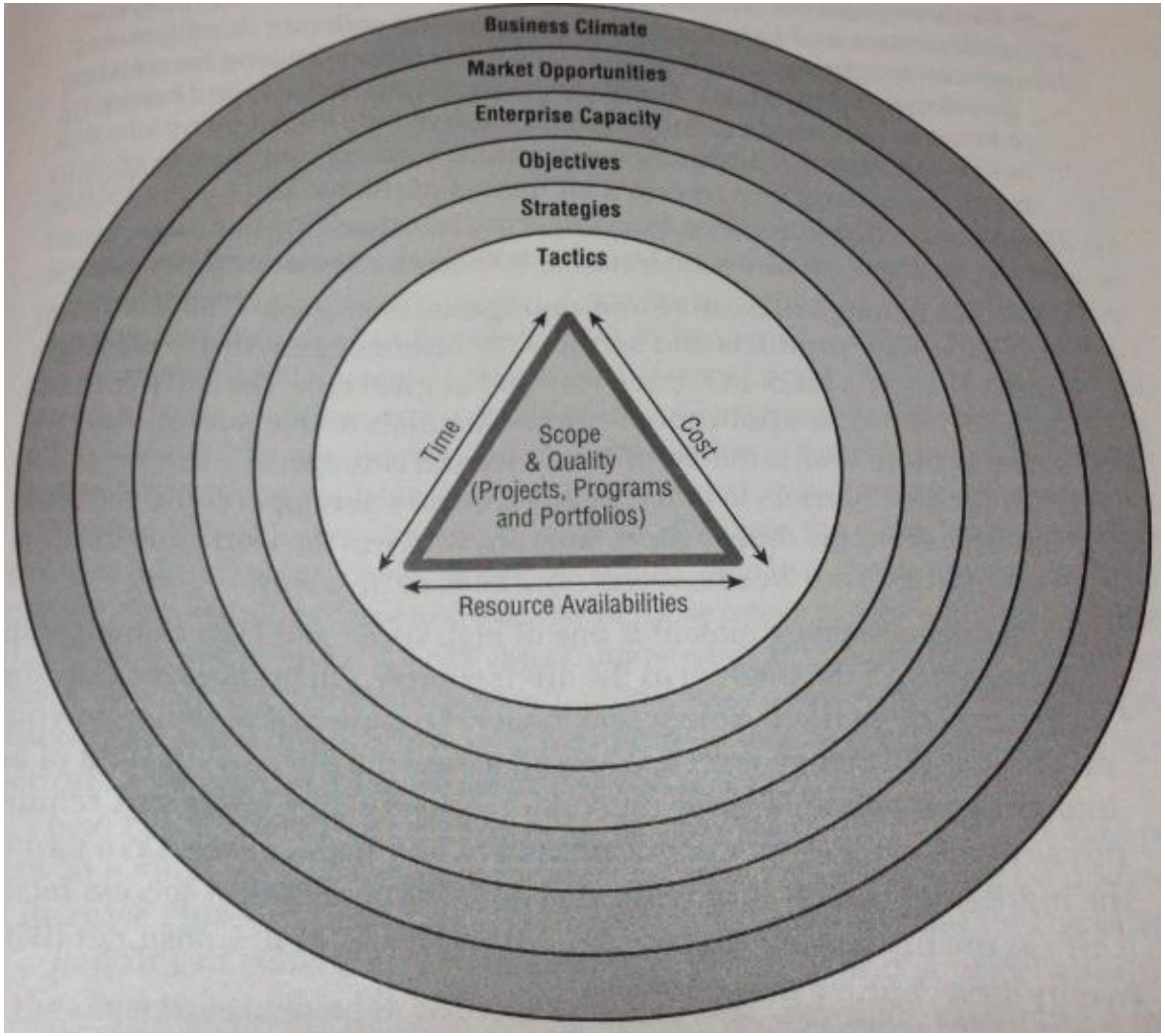
- Enterprise Project Management
- Reading: Chapter 18
- Objectives
  - Define the concept of enterprise organizations
  - Explore project management at the enterprise level
  - Discuss the business climate and how enterprise project management addresses strategy
  - Examine the process flow of enterprise project management

Enterprise Project Management

The Enterprise

- Spanning the organization
  - Work flows through an organization being processed at “stations” like an assembly line
- Business units and administrative functions coordinating efforts to realize strategic goals
  - “Silos” of commonality (development, sales, HR, manufacturing, etc.)
  - Organized to manage long-term command and control
- Portfolios of projects
  - Logically related tactical projects defined to address strategic goals

A View from the Top



Enterprise Project Management

- Start with the end in mind
  - Identify the big deliverable
  - Break it down into phased deliverables
- Manage as a collective
  - All phases must be completed to successfully complete the portfolio
  - Each phase is a project
  - Learn as you go, refine plans as necessary
- Portfolio perspectives
  - Progressing toward the strategy's finish line
  - A dedicated, finite set of resources

Enterprise PM Process Flow

- COLLECT ideas
- ANALYZE the ideas to develop a set of tactics
- SELECT tactics based on selection criteria
- INITIATE by developing plans
- EXECUTE the plans and monitor progress
- DEPLOY deliverables and support compliance