BUS 361: Project Management

A Course Overview

Jeffrey Leung
Simon Fraser University

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Contents

1 Introduction

- **Project:** Venture which is temporary with the goal of creating a unique product, service, or result
  - Must be unique, temporary, and uncertain; must have constraints, requirements, coordination, resources, stakeholders
  - **Scope:** Constraint on tasks to be completed and criteria for completion
  - **Operation:** Venture which is ongoing, repeated, within line organization, and certain (have known performance)
  - **Program:** Set of projects which operationalize strategies
- **Project life cycle (PLC):** Phase of a project from beginning to end
  - **Project management process groups:** Stage of a project within each life cycle phase, consisting of initialization, planning, execution, monitoring/controlling, and closing
- **Knowledge areas:** Scope, time, cost, quality, HR, communication, risk, procurement, stakeholders

2 Initiation

- **Vision:** Ideal aspirational organizational position in the future
- **Mission/mandate:** Action currently being taken to achieve the vision
- **Initiation Process Group:** Processes of identifying stakeholders and creating a project charter
  - **Stakeholder:** Entity which directly affects or is affected by the project, positively or negatively
    - E.g. Customers, team members, management, internal departments, sponsors/investors, suppliers, partners. regulatory bodies, political groups
    - Expectations and evaluations of success are important, and may change over the project
  - **Project charter:** Document which formally authorizes the project and contains the project description, objectives, key assumptions, high-level timeline, and stakeholders
    - Objectives may include overview, cost, design, quality, and schedule
      - **Specific, Measurable, Attainable, Relevant, and Time-based (SMART) objectives:** Appropriate goals of which the success can be evaluated in detailed and measurable ways
- Results:
  - Measurement is useful for:
    - Tracking resources usage
    - Tracking progress
    - Determining completion
    - Providing insight for future projects
  - Quality of results is a balance of scope, cost, and schedule

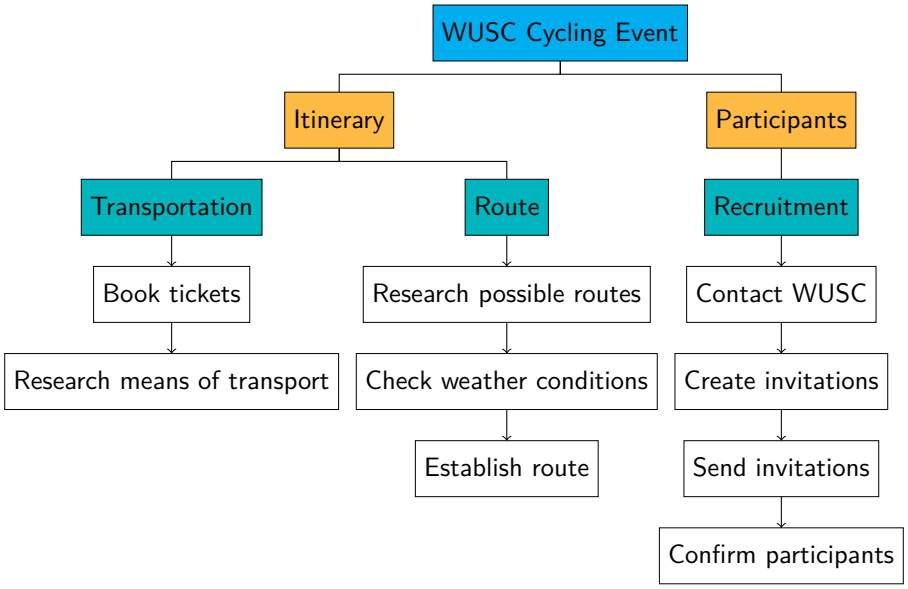
3 Planning

- To define a project:
  - Create an idea and core message
  - Create measures of performance
  - Define resources and tasks
  - Create budgets and schedule
- **Task definition:** Understanding of the quantification, assigning, tracking, completion, and evaluation of a task
- **Decomposition:** Breaking up a large project into manageable packages

3.1 Work Breakdown Structure

- **Work Breakdown Structure (WBS):** High-level breakdown of a project into cohesive, specific task descriptions
  - Purposes are to:
    - Simplify complexity
    - Assign responsibility
    - Demonstrate progress
    - Assist in developing schedule and resource estimates
  - Example: See figures 1 and 2

Figure 1: Work Breakdown Structure Example (Diagram)



  - **Work package:** Unit of work which can be estimated, is a package which can be outsourced or contracted out, and produces a measurable deliverable
    - Smallest unit of a WBS

Figure 2: Work Breakdown Structure Example (Hierarchy)

WBS Code	Name	Description
1	Foundations	All of the work necessary to build a foundation
1.1	Excavate	Create a hole ready for the foundation to be framed and poured
1.1.1	Dig	Dig a hole of the right shape and size in the correct location
1.1.2	Level	Level the hole so that it is packed and even
1.2	Frame	Frame the foundation including steel supports
1.3	Concrete	Acquire, transport, pour, and cure the concrete foundation
1.3.1	Pour	Pour, pack, and level the foundation
1.3.2	Cure	All procedures necessary for the foundation to cure successfully
2	Exterior	All of the work necessary to complete the exterior of the house
⋮	⋮	⋮
3	Interior	All of the work necessary to complete the interior of the house
⋮	⋮	⋮

    * 8/80 hour rule: No work package should be less than 8 hours or more than 80 hours
    * Single reporting period rule: No set of work should be less than the reporting period (e.g. 2 weeks)
    * Should be sufficiently detailed to allow for cost and schedule estimates

3.2 Network Diagram

- **Network diagram:** Visual flow of the order in which work package are dependent on each other
  - Conveys dependencies and chronological work order
  - Conveys constraints such as:
    * Technical/causal constraint: Relationship between tasks where one task relies on the technical completion of the other
    * Management/discretionary constraint: Relationship between tasks where one task provides approval for the other to begin
    * Inter-project/resource constraint: Relationship between two tasks which are from separate areas (should be decoupled when possible to reduce risk)
    * Date constraint

3.3 Estimations

- **Top-down estimate:** Resource requirement estimate created from the requirements of top management
  - Involves finish date, budget, resources, etc.
- **Bottom-up estimate:** Resource requirement estimate created from the analyses of the project manager and workers
- **Analogous estimate:** Resource requirement estimate created using a previous similar project

- **Parametric estimate:** Resource requirement estimate created using historical data with a multiplier for inflation, price increases, and other costs

- **Three Point Estimation:** Estimate generated from the weighted average of the most likely, pessimistic, and optimistic estimates

$$TPE = \frac{L + P + O}{3}$$
$$\text{where } L = \text{ most likely estimate}$$
$$P = \text{ pessimistic estimate}$$
$$O = \text{ optimistic estimate}$$

- Accuracy of estimates:
  - **Ballpark estimate:** Estimate created with little time or information, and little accuracy (within 30%)
  - **Definitive estimate:** Estimate created with defined scope (within 5%)

4 Cost and Resource Management

- **Effort:** Actual time invested in an activity (e.g. man hours)
- **Duration:** Time between activity start and finish
- Process to calculate resource cost:
  - Create a WBS document
  - Effort:
    - Create an estimate for total effort of all work packages
    - Multiply effort by resource cost
  - Cost:
    - Create an estimate for total cost of all work packages
    - Apply contingency to effort and cost
- Types of costs:
  - **Direct:** Costs which are clearly assigned to the output
    - E.g. Labor, materials, subcontractors, equipment, facilities, travel
  - **Indirect:** Costs from internal spending which indirectly translate to output
    - E.g. Overhead costs (utilities, taxes, insurance, maintenance, depreciation) or administration (advertising, salaries, sales, commissions)
  - **Fully loaded rate:** Labor costs which are calculated using an overhead multiplier
  - **Nonrecurring:** Charges which are applied once (e.g. preliminary analyses, training)
  - **Recurring:** Charges which continue over the timeline (e.g. labor, material)
  - **Fixed:** Charges which do not change with usage (e.g. leasing capital hardware)
  - **Variable:** Charges which increase with usage (e.g. equipment degradation)
  - **Normal:** Charges which are expected and agreed upon
  - **Expedited:** Charges which are unplanned and occur to speed up completion
- **Gantt chart:** Diagram of project schedule with start and finish dates of summary elements
  - Simple to create and read
  - Can be used for control
  - Does not display details, sequencing, path to completion
  - Does not provide information on efficient resources usage

4.1 Critical Path Method

- **Float/slack:** Amount of time an activity can be delayed without affecting the project
  - **Free float:** Amount of time an activity can be delayed without affecting the following activity
  - **Total float:** Amount of time an activity can be delayed without affecting project completion date
- **Critical path:** Sequence of activities which determines the shortest total duration of the project

  - Given possible sequences of precedence activities, the longest path has no float and is the critical path
- Critical path method:
  - Conduct a forward pass to determine earliest start/end activity times
  - Conduct a backward pass to determine latest start/end activity times
  - Calculate the possible slack for each item
- To shorten the critical path:
  - Eliminate tasks
  - **Crashing:** Speeding up a task to reduce project duration
    - Shorten all/early/long/easy tasks, or tasks which cost less to speed up
  - Overlap sequential tasks
    - **Fast tracking:** Allow parallel work
- Process to create a schedule:
  - Using the effort calculated, create duration estimates
  - Create a network diagram
  - Generate a critical path from the network diagram
  - Take the total duration from the critical path

5 Communications Management

- **Project plan:** Living document which describes the execution, monitoring, and control methods of the project
  - Directs and allows management of objectives
  - Built in collaboration with the team
- **Project communication:** Strategic management process for which the project manager is responsible
  - Can alter behaviour
  - Source of the communication is encoded into a message, conveyed in a medium, and decoded by the receiver
    - Can be altered by competing messages, noise, confusion, or other factors in between
  - Difficult to quantify in results
- **Communications plan:** Schedule of how and when to communicate with stakeholders
  - Methods of organization:
    - Events and times (e.g. milestones)
    - Documentation (e.g. charter, reports, closing document)
    - Stakeholders (see subsection 5.1)
      - Stakeholders section may include owner
- Defining the information exchange with a stakeholder:
  - Audience/target: Who is the stakeholder?
  - Document format/content: What information is needed?
  - Frequency/timing: When/how often will they need the information?
  - Channel: How will the information be conveyed?
  - Owner/contact: Who conveys the information?

5.1 Stakeholders

- **Stakeholder creep:** Phenomenon of people/organizations adding themselves to the group of stakeholders in order to be relevant
- Include those who:
  - Control the scope
  - Provide permission
  - Complete the work
  - Provide resources (e.g. supplies, people, time)
  - Benefit or detract from the results
- **RACI analysis:** Accountability plan which maps tasks to the roles of stakeholders
  - Conveys roles and responsibilities across organizational boundaries
  - **R - Responsible:** Person responsible for performing a task
    - Ideally one person

- **A** - **Accountable:** Person accountable for the results of a task
  - Ideally one person
  - Can be same person as R
- **C** - **Consulted:** Person who must know and/or provide information before the task begins
  - Minimize to limit dependencies and speed up processes
- **I** - **Informed:** Person who must be notified after the task ends
- Process:
  - Identify stakeholders
  - Define tasks
  - Create a matrix with stakeholders and tasks
  - Assign RACI roles
  - Analyze the matrix horizontally (through tasks) to ensure:
    - At least one person is Responsible
    - At least one person is Accountable
    - There are not too many people who must be Consulted
    - There are not too many people who must be Informed
  - Analyze the matrix vertically (through stakeholders) to ensure:
    - No one person has too many tasks for which they are Responsible
    - No one person has too many tasks for which they are Accountable

6 Risk Management

- **Risk:** Uncertain event or condition which affects a project objective positively or negatively
  - Often occurs when assumptions are made
  - Types of risk: Financial, technical, commercial success, execution, contractual/legal
- **Risk management:** Identification, analysis, response to, and monitoring of risk factors
  - Maximization of positive events, and minimizing likelihood and consequences of negative events
- Methods of identifying risk:
  - WBS analysis
  - Reviews of scope, stakeholders, and documents
  - SWOT analysis
  - Interviews and research
- Process of assessing risk:
  - Identify probability of occurrence and potential consequences (both on a scale of Low, Guarded, Moderate, High, or Extreme)
  - Equation: Event risk = Probability $\times$ Consequences
  - Subjective
  - **Probability/Likelihood Impact Matrix:** Organizational tool to graph the likelihood and consequences of risks for prioritization and comparison
- Responses to risk:
  - **Avoidance:** Eliminating or limiting a risk through modifying limitations
  - **Mitigation:** Eliminating or limiting a risk through limiting the probability or impact of a risk (e.g. simplifying processes, adding tests)
  - **Transfer:** Eliminating or limiting a risk through shifting ownership or responsibility of the risk to another entity (e.g. warranties, contracts with fixed cost pricing)
  - **Acceptance:** Eliminating or limiting a risk through being ready for the consequences (e.g. contingencies, fall-back plans, and workarounds)
  - May alter WBS, network diagram, budget, scope, contingency reserves, etc.
- Monitoring risk:
  - **Risk register:** Document which tracks risks, analyses, and response plans
  - Monitor and report regularly (at least once per month)
  - Stay updated on timelines for monitoring risks
  - Track higher risks more frequently/closely

7 Quality Management

7.1 Quality Standards and Control

- **Project quality:** Degree to which characteristics fulfill requirements
  - **Grade:** Classification of a product based on its technical characteristics
  - Low-grade may be acceptable; low-quality is unacceptable
- **Quality management process (PMBOK):** Ensuring that requirements are validated and met by customer
  - Steps:
    - Identification of relevant quality standards and how to satisfy them through:
      - Quality objectives (in Scope Document)
      - Stakeholder expectations
      - Product descriptions
      - Standards/regulations
      - Internal policies/objectives
    - Application and assurance of quality standards
    - Control and analyzing of quality using tools and techniques such as:
      - Audits
      - Adherence to guidelines
      - Statistical sampling
      - Inspection
      - Graphs (e.g. flowcharts, histograms, scatterplots, pareto charts, fishbone diagrams)
- Trade-offs between scope, quality, cost, and schedule to avoid:
  - Overwork resulting in mistakes and delays
  - Rushing quality inspections resulting in undetected errors
  - Exceeding quality objectives resulting in unbudgeted higher costs
- ISO Quality Management Framework:
  - Customer satisfaction: Extent to which customers' needs and expectations are fulfilled
    - Involves requirement fulfillment and functional/emotional benefits of use
  - Prevention over inspection: Concept of increasing cost over time to fix a lack of quality
  - Responsibility of management to support
  - Continuous improvement (Plan-Do-Check-Act cycle)

7.2 Team Management

- Structure project around meetings and events
- Holding meetings:
  - Decide who should attend

  - Set an agenda
  - Communicate progress, problems, frustrations, and solutions
  - Assign action items
  - Be brief
- Purposes of status reporting:
  - Raising issues
  - Resolving problems
  - Visibility of progress and work
  - Accountability of work
- Role of the project manager:
  - Manage human resources
  - Manage connections with third parties
  - Enforce task completion and ownership

8 Human Resources

- Planning resourcing:
  - Create positions with skills, requirements
  - Chart hierarchy
  - Procure and assign resources
- **Project team:** Group of two or more people who share goals, are interdependent, have complementary skills, and are mutually accountable
- Characteristics of effective teams:
  - Commitment to a goal or purpose
  - Morale, team spirit
  - Synergistic work
  - Complementary skills
  - Support
- **Tuckman's Team Development Stages:**
  - **Formation:** Stage of team development when the team gets to know each other with awkwardness and miscommunication
  - Agreed-upon points: Structure, goals, direction, roles
  - **Storming:** Stage of team development when the team disagrees and resolves conflicts about the abilities to meet the goal
  - **Norming:** Stage of team development when the team communicates well, resolves problems, becomes comfortable, and accepts teamwork
  - **Performing:** Stage of team development when the team works independently and adaptively, can solve problems well, and has high morale
  - **Adjourning:** Stage of team development when the team is recognized for achievements, says personal goodbyes
- Team development techniques:
  - Team building activities
  - Training
  - Delegation
  - Reward and recognition systems

8.1 Motivation

- **Motivation:** Intensity, direction, and persistence towards a goal
- **Extrinsic motivation:** Motivation based on earning a reward or avoiding a punishment
- **Intrinsic motivation:** Motivation based on a personal and internal reward
- **Maslow's Hierarchy of Needs:** Priorization of needs which must be fulfilled in the order of physiological, security, social, esteem, and self-actualization

- **McLelland's Three-Needs Theories:** Motivations are derived from aspirations toward achievement, power, or affiliation, one of which is primary
- **Theory X, Y:** X: People dislike work and responsibility and must be coerced, Y: People enjoy work, are creative, and want autonomy and responsibility
- **Expectancy Theory:** Motivation of effort results in increased performance which leads to higher value rewards/results
- **Adams' Equity Theory:** Motivation comes from perceived fairness, and inequities in input or output ratios will affect motivation
  - Social comparison processes skews perceptions of equity
- Conflict:
  - **Task conflict:** Conflict over project goals
  - **Process conflict:** Conflict over the process of how work is carried out
  - **Relationship conflict:** Conflict over interpersonal relationships
  - **Functional conflict:** Conflict which improves the team (e.g. low level of task/process conflict)
  - **Dysfunctional conflict:** Conflict which is harmful to the team (e.g. relationship conflict, high level of task/process conflict)

9 Controlling

- **Scope control:** Permitting only changes which are agreed upon
  - **Scope creep:** Uncontrolled changes to project scope
  - Change Control Process used to process requested scope changes and corrective actions
- **Schedule control:** Process of controlling project schedule changes
  - Determine current status, determine influencing factors of schedule changes, identify schedule changes, and manage changes
  - Tools: Progress reports, performance measurement, software
- **Cost control:** Process of controlling project cost changes
- Methods of project control:
  - **Project/activity log:** Document recording occurrences throughout the project
  - Progress/status report: Consistent recurring communication to stakeholders on project status
  - Measurements
    - **Earned Value:** Technique to analyze variance of project performance (technical/scope, schedule/time, and cost)
      - Budgeted Cost at Completion (BAC): Total budget for the project
      - **Planned Value (PV):** Total budgeted cost for an activity
      - **Actual Cost (AC):** Cost spent so far for an activity
      - **Earned Value (EV):** Value of the work performed so far for an activity, based on the total project budgeted cost
        - Equation: $EV = BAC \times \text{Percentage completed}$
      - **Cost Variance (CV):** Difference between Earned Value and Actual Cost
        - Equation: $CV = EV - AC$
      - **Schedule Variance (SV):** Difference between Earned Value and Planned Value
        - Equation: $SV = EV - PV$
      - **Cost Performance Index (CPI):** Ratio of Earned Value to Actual Cost
        - Equation: $CPI = \frac{EV}{AC}$
      - **Schedule Performance Index (SPI):** Ratio of Earned Value to Planned Value
        - Equation: $SPI = \frac{EV}{PV}$

10 Closeout

- Finish all deliverables
- Receive client sign-off/acceptance
- Conduct post-implementation audit
  - Often received by senior management
  - Contents:
    - Whether the goal was achieved
    - Whether the project was on time and on budget
    - Whether the client was satisfied
    - Whether the business value was realized
    - Lessons learnt - what should be done again, what should not be done
- Collect documentation
  - Includes charter, scope, design documents, status reports, meeting minutes, change requests, client acceptance, audit report
  - Used for:
    - Reference for future changes
    - Team performance evaluation
    - History of resource use (costs and duration)
    - History of issues
    - Training for other workers
    - Templates for future work
- Create final project report
  - Overall success and criteria
  - Organization and affiliations of project
  - Strengths and weaknesses
  - Recommendations from team

11 Flashcard Questions

- What does PMBOK stand for?
  - Project Management Body of Knowledge
- What are the 10 PMBOK knowledge areas?
  - Scope, time, cost, quality, human resources, communications, risk, procurement, stakeholder, integration
- What is the difference between projects and operations?
  - Project: Unique, temporary, uncertain
  - Operation: Repeated, ongoing, with known performance
- What is the greatest threat to project success?
  - Communication failure
- What is a project?
  - Temporary venture to create a unique result
- What are the 5 process groups in the project life cycle?
  - Initialization, planning, execution, monitoring/controlling, closing
- What is a stakeholder?
  - An entity which affects or is affected by the project
- Quality of results is a balance of:
  - Scope, cost, schedule
- What is the difference between duration and effort?
  - Duration: The length of time spent on an activity including breaks and other activities
  - Effort: The length of time spent on an activity not including breaks and other activities
- What three values does Three Point Estimation average?
  - Most likely, pessimistic, and optimistic estimates
- What is the difference between free float and total float?
  - Free float: The amount of time an activity can be delayed without affecting future activities
  - Total float: The amount of time an activity can be delayed without affecting project completion date
- What are the steps of risk management?
  - Identification, analysis, response, monitoring
- What are common responses to risk?
  - Avoidance, mitigation, transfer, acceptance
- What does RACI stand for?
  - Responsible, Accountable, Consulted, Informed
- What characteristics does Earned Value analyze?
  - Technical, schedule, cost

- What is the equation for Earned Value (EV)?
  - $EV = \text{Cost at completion} \times \text{Percentage completed}$
- What is the equation for Cost Variance (CV)?
  - $CV = EV - AC$ (actual cost so far)
- What is the equation for Cost Performance Index (CPI)?
  - $CPI = \frac{EV}{AC}$ (actual cost so far)
- What is the equation for Schedule Performance Index (SPI)?
  - $SPI = \frac{EV}{PV}$
- What are Tuckman's 5 Team Development Stages?
  - Forming, Storming, Norming, Performing, Adjourning
- Of task, process, and relationship conflict, which are the most likely to be functional conflict?
  - Task or process
- What is the best way to capture lessons learned?
  - Documenting lessons as they occur