BUS 361: Project Management

A Course Overview

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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

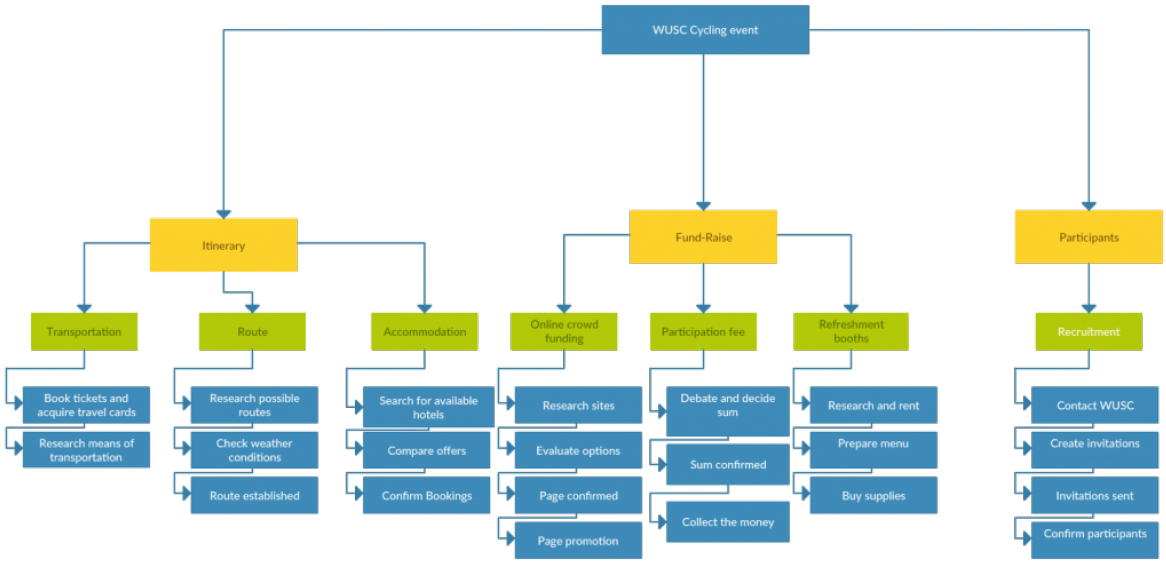
3 Planning

- 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)

Level	WBS Code	Element Name	Element Name
1	1	Foundations	All of the work necessary to build a foundation
2	1.1	Excavate	Create a hole ready for the foundation to be framed and poured
3	1.1.1	Dig	Dig a hole of the right shape and size in the correct location
3	1.1.2	Level	Level the hole so that is packed, even, and ready to receive the foundation
2	1.2	Frame	Frame the foundation including steel supports
2	1.3	Concrete	Acquire, transport, pour, and cure the concrete foundation
3	1.3.1	Pour	Pour, pack and level the foundation
3	1.3.2	Cure	All procedures necessary for the foundation to cure successfully
1	2	Exterior	All of the work necessary to complete the exterior of the house
1	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
  - **Fast tracking:** Allow parallel work
  - Overlap sequential tasks
- 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