INFO3333
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Module 3 Lecture:
Scope Management

based on slides by Dr Rabiul Hasan and Prof Alan Fekete

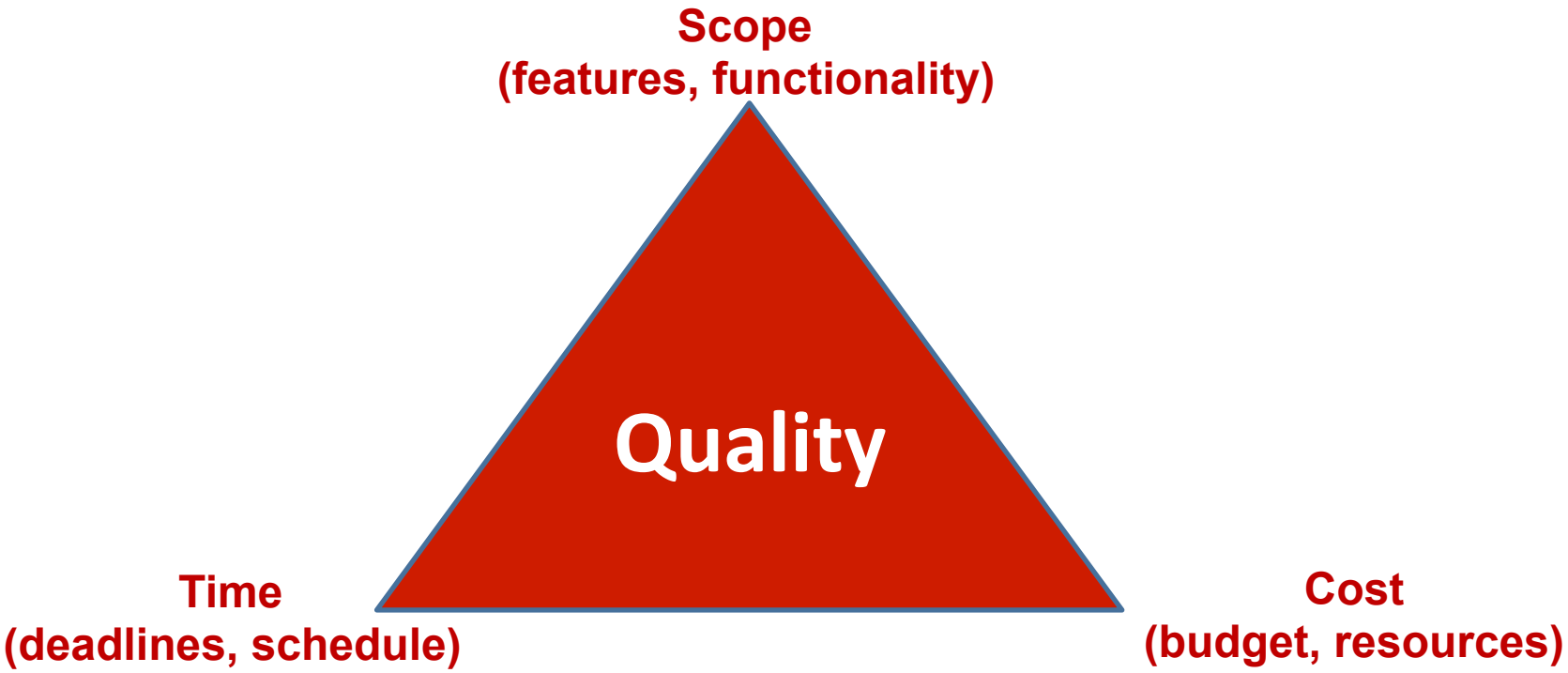
First: demonstration of active listening

Learning objectives

- Terminology
- PMBOK approach to scope management
- Agile approach to scope management
- Comparing PMBOK and Agile approaches

Recall: What makes projects hard?

- "Triple constraint"



Recall: goals, objectives

- Goal: long-term, strategic
- Objective: short-term, practical

Scope

- ""The work that needs to be accomplished to deliver a product, service, or result with the specified features and functions." [PMBOK]
- Decides what is included in the work that must be done as part of the project, and what is not included (either not done at all, or done by others)
  - Product scope: what the outcome (product, service etc) must be
  - Process scope: what activities are included in the project
- "You can't have it all" (without exceeding timelimit or budget) so decide what really matters

Importance of scope decisions

- Typically, work on a project is paid for by someone, and the scope sets out what they are getting for their money
  - it is a contract, and disagreements can end in court
- Dangers from poor scope decisions, or inadequate documentation of the decisions
  - scope creep: whether from customer requests or team excitement
  - staff could do wasted work

Scope issues specific for IT projects

- Compared to eg civil engineering, IT projects are more different/innovative (perhaps because IT is so “plastic”, more kinds of things can be done)
  - so customers have less clear sense of what they want
- In IT, features interact a lot (perhaps because computation is discrete, so small changes can have big effects)
  - describing how the system should behave, requires many more details

PMBOK approach to scope

- Six relevant processes:
  - Plan scope management
  - Collect requirements
  - Define scope
  - Create WBS
  - Validate scope
  - Control scope

PMBOK documents about scope

- Scope management plan
- Requirements management plan
- Requirements document
  - especially SRS for software development project
- Requirements traceability matrix
- Project scope statement
- WBS
- Change request

Requirement

- “A condition or capability that is necessary to be present in a product, service, or result to satisfy a business need” [PMBOK6]
- Enough detail to judge success

Requirements document

- Capture the potential requirements
- List one-by-one
  - each has an identifier

Specific for software

- Requirements for software are typically separated into
  - functional requirement
    - says something the system can do
  - non-functional requirement
    - describes a characteristic of how the system does things, concerning performance, security, availability, usability etc

SRS

- Software Requirements Specification
- A particular format for requirements document for a software development project
- International standards for content, arrangement etc
- Includes list of requirements, separated into functional and non-functional
  - each has identifier
- Also describes context of the project, and meaning of relevant terms from the application domain

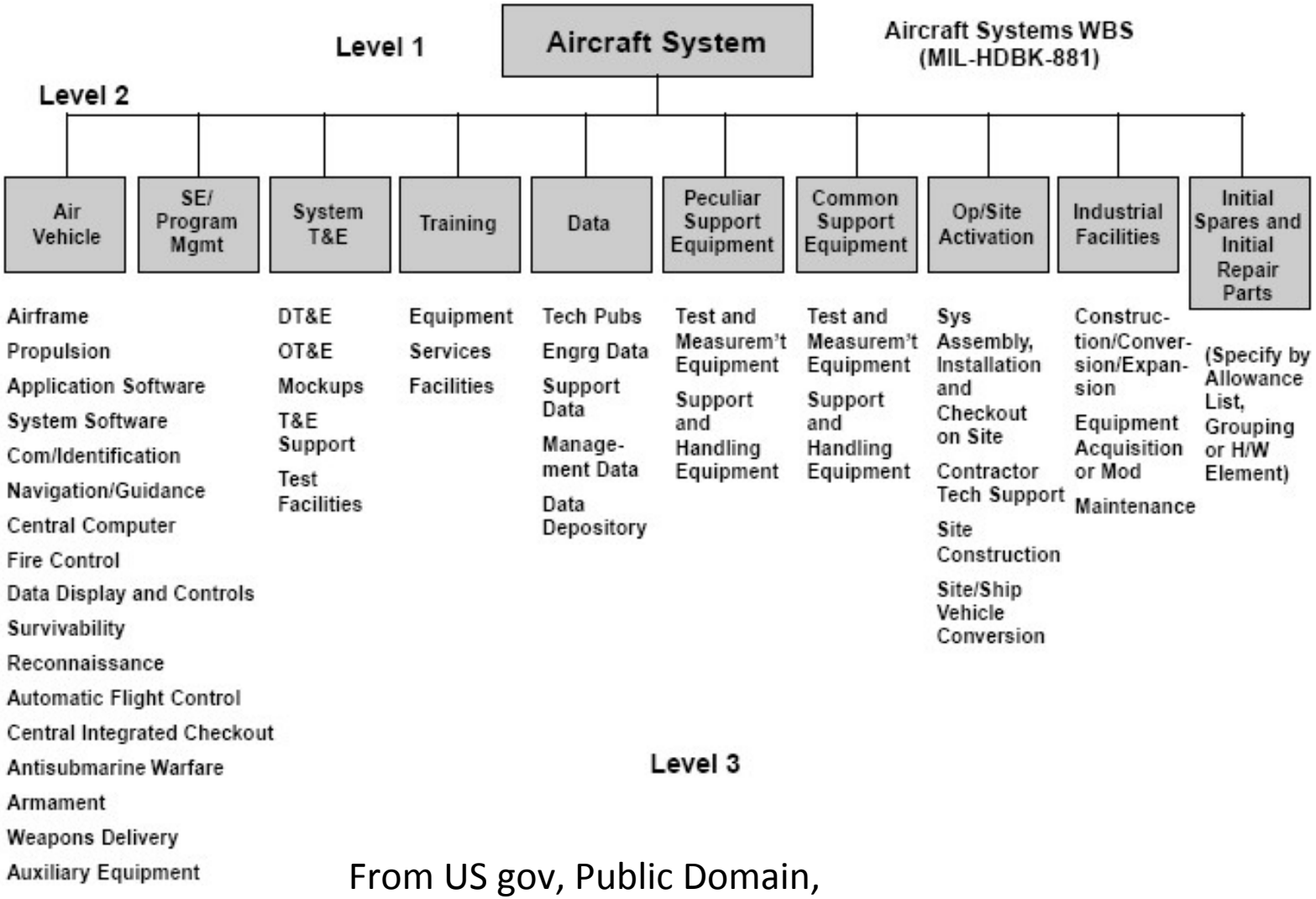
Requirements traceability

- Identifiers are used to link each requirement to the objective it supports, and also information such as who decided on this requirement, when they decided on it, how to test whether it has been achieved, etc
- Often presented as a matrix, with one row per requirement
- May be a separate document, or as section in the requirement document

WBS

- Work-breakdown structure
  - arranged as a tree
- Top level (level 1) is the whole project
- Then broken ("decomposed") into major pieces, and each piece is broken into subpieces
- "Work package" refers to a task that is not decomposed further (leaf of the tree structure)
  - Every activity must be placed somewhere, and not duplicated

WBS Example



From US gov, Public Domain,
https://commons.wikimedia.org/w/index.php?curid=4039635

WBS organization

- Different ways to have the breakdown structured
- Eg decompose one item into several at the next level, by product or component
- Or, decompose one item into several at the next level, by type of work involved
- Or mixed, different ways to decompose different items
- Recommended to name items with noun (what is produced in that item)

WBS presentation

- Diagram good for top levels
- Textual (list of items) better for full detail
- Tools have specific formats

WBS labels

- Dotted sequence of numbers showing hierarchy
  - each has prefix which is label of its parent item
- Eg from https://en.wikipedia.org/wiki/Work_breakdown_structure
- *1.0 Aircraft System*
  - *1.1 Air Vehicle*
    - *1.1.1 Airframe*
      - *1.1.1.1 Airframe Integration, Assembly, Test and Checkout*
      - *1.1.1.2 Fuselage*
      - *1.1.1.3 Wing*
      - *etc*
    - *1.1.2 Propulsion*
    - *1.1.3 Vehicle Subsystems*
    - *1.1.4 Avionics*
  - *1.2 System Engineering*
  - *1.3 Program Management*
  - *1.4 System Test and Evaluation*
  - *1.5 Training*
  - *etc*

PMBOK process: plan scope management

- Decide how to do the scope management for the project
  - what documents to produce
  - who produces each, when
  - who approves each, when
  - etc
- These decisions are captured in the scope management plan
  - often, separate plan describing how requirements will be managed
- Typically, organization has an established approach that is used in all projects
  - including MS Word templates for each document
- Note: the scope management plan doesn't say what the scope actually is, rather it says how the scope will (later) be decided and documented

PMBOK process: collect requirements

- This process is where one collects potential requirements and documents them
  - separate process will decide which of these will be in scope
- Done cooperatively, with engagement of both domain stakeholders and project people
  - neither can do it alone
  - “business analyst” role can try to bridge the gap
- Done iteratively
  - seek clarification when something is imprecise
  - look for edge cases, missing aspects
- Note: precision about requirements is especially hard in IT projects
- This process has output: requirements document

Methods for requirements collection

- It is common to look at a prior or similar system, and start with the way it works
  - add requirements that would improve user satisfaction
  - tackle gaps or pain points
  - eg when replacing paper processing by computerized, or replacing cebtralized by mobile/ distributed
- Or ask stakeholders to pretend a system exists, and say what they would expect to do

PMBOK process: Define scope

- Decide on which of the potential requirements to include in project scope, and which to leave out
- In doing so, often expand list be recognizing gaps
  - eg may be requirements for changing some entity, but forgot to have ways to create/initialize the entity, or to delete/finalize
- This process involves close interaction between domain stakeholders and project people
  - it will lead to a contract, and both sides must accept it
    - eg stakeholders must see the value from each included requirement, or they won't want to pay for it!
- This process has output: scope statement document

Sample Scope Statement Structure

Project Title: **Date:** **Prepared by:**
Project Justification/Needs:
Product Characteristics and Requirements:
Summary of Project Deliverables **Project management-related deliverables:** **Product-related deliverables:**
In Scope: **Out of Scope:**
Project Success Criteria:

PMBOK process: Create WBS

- This process takes the scope statement, and chooses some way to divide into manageable pieces, all the work that will later be done in the project (to actually deliver the results)
  - the output of this process is the WBS
- This is really hard to do well (or at all)
  - it is very like programming in an abstract sense

Approaches to develop a WBS

- Guidelines: some organizations (eg USA military) have rules to follow (eg separate level 2 for hardware, software, etc; specific lists of system components at level 3, etc)
- Analogy: look at WBS from similar previous projects, and then adjust as needed
- Top-down: decide on level 2, then decompose each item further etc
- Bottom-up: identify lots of separate work packages, and then arrange them in meaningful groups
- Mind-mapping: ideas proposed and discussed collaboratively, allowing re-arrangement and editing

WBS Dictionary

- Often the name of an item in WBS isn't enough to capture subtleties, knowledge of key aspects, etc
- So have an extra document (or section added to WBS document) where this textual explanatory material is recorded

Hints to make better WBS

- In the project, each item should be a responsibility assigned to one person
  - though many people may work on it
- Each unit of work must appear in exactly one place in WBS
- Structure of WBS will drive how project is performed, so it should fit with team structures and skills
  - get team engagement in the “create WBS” process
- Remember to record information in the WBS dictionary

PMBOK process: Validate scope

- This process is where one checks that the scope decisions are sensible, and gets them authorized (in the way described by the scope management plan)
  - typically done by “review” meetings
  - one should involve a variety of important senior people in reviews
- Recognize that scope decisions won’t be perfect, so changes will be needed afterwards
  - expressed as “change requests”

PMBOK process: Control scope

- This process is how we decide on changes to the scope, after it was initially agreed
  - while still respecting the project's business purpose
- There are many reasons for someone wanting to change the scope after it has been agreed
  - stakeholders recognize extra things they want
    - esp competitors introduce feature, so you want it too
  - change in environment
    - new regulations etc
  - as system is being built, issues are noticed where requirements are imprecise
  - delays may lead to request to reduce the scope

Change request

- A document, with defined format, to record the request for a change in some document of the project
  - here, we speak of a change request for a change in the scope statement
- Indicates what change is wanted, who wants it, why it is wanted
- Each change request has an indentifier

Agile approach to scope

- User story to express a requirement
- Close involvement of stakeholders in decisions
- Tackle a small number of user stories at any time
- Revisit list repeatedly (for every sprint)
  - Scope adjusts to what is feasible

User story

- As a [description of role], I want to [description of capability] in order to [description of benefit]
  - Eg “As a newly-enrolled double-degree student, I want to record the major I plan to follow in each degree in order to be able to check that future subject choices are appropriate”
- [description of capability] is similar to PMBOK-style functional requirement, perhaps with non-functional aspects as well
  - shared understanding is easier, with the extra information about who is doing it and why
- See https://en.wikipedia.org/wiki/User_story for more variants

Backlog

- In agile project, “backlog” refers to the collection of requirements that have been identified so far, but are not yet delivered
- Recall that in agile, requirements are identified gradually through the project, rather than being decided in advance
  - at any time, there are not so many that have been recorded but not yet done
  - perhaps it was not chosen for previous sprints
  - or perhaps it was chosen for a sprint, but the sprint failed to deliver the requirement

Comparisons

- (Notation for requirements)
- When scope decided
- Flexibility of scope
- Relationship with stakeholder

How to express requirements

- In fact, user stories (originally created for agile methodology) have been widely adopted to express the requirements in PMBOK projects too, as they help improve shared understanding

When to obtain and decide on requirements

- In PMBOK, requirements are gathered early, and the scope is decided early, before work is planned
- In agile, requirements are gathered through the project, with the incomplete (but working to deliver some value) system acting as the context to help focus attention on the most important additions

How to change requirements

- In PMBOK, change is a formal renegotiation of the scope contract, so it involves heavyweight process and senior people
- In agile, change happens all the time, with stakeholder representative embedded in the project team as they work

Involvement

- In PMBOK, the stakeholders are heavily involved in the discussions that lead to development of key documents eg scope statement, and then they formally sign off agreement to those documents
  - but they are not typically close to the actual work as it gets done
- In agile, stakeholder representatives are embedded in the project team, so involved in all aspects

Key knowledge (quiz, exam!)

- Definition and importance of scope
- Terminology
- PMBOK scope documents
- PMBOK scope processes
- Agile approach to scope
- Comparison of PMBOK and agile approaches