**QUALITY MANAGEMENT**

**video 1**

**quality:**

* the degree to which a set of inherent characteristics fulfils requirements-ISO (International Organisation for Standardisation)
* conformance to requirements: processes & products meet written specifications
* fitness to use: can be used as it was intended

**project quality management:**

ensure that project will satisfy the needs for which it was undertaken

* planning quality management:

identify which quality standards are relevant to project and how to satisfy them

* performing quality assurance:

periodically evaluate overall project performance to ensure the project will satisfy the relevant quality standards

* performing quality control:

monitor specific project results to ensure they comply with the relevant quality standards

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**Planning quality:**

The ability to anticipate situations and prepare actions to bring about the desired outcome

* prevent defects (any instance where product/service fails to meet customer requirements) by:
  + select proper materials
  + train and indoctrinate people in quality
  + plan a process that ensure the appropriate outcome
* design of experiments: a technique that helps identify which variables have the most influence on the overall outcome of a process

**scope aspects:**

* functionality: the degree to which a system performs its intended function
* performance: address how well a product/service performs the customer’s intended use
* reliability: the ability of a product/service to perform as expected under normal conditions
* maintainability: the ease of performing maintenance on a product
* features: system’s special characteristics that appeal to users
* system outputs: screens & reports the system generates

**video 2**

**performing quality assurance:**

take responsibility for quality throughout the project’s life cycle

* quality assurance: all activities related to satisfying the relevant quality standards for a project
* another goal: continuous quality improvement (Kaizen: improvements/changes)
* lean: evaluate processes to maximise customer value when minimising waste
* benchmark: generate ideas for quality improvements by comparing specific project practices or product characteristics to those of other projects/products within or outside the performing organisation
* quality audit: a structured review of specific quality management activities that help identify lessons learned that could improve performance on current or future projects

**modern quality management:**

* require customer satisfaction
* prefer prevention to inspection
* recognise management responsibility for quality

**ISO 9000:**

A quality system standard

* continuous cycle of planning, controlling & documenting quality in an organisation
* minimum requirements needed for an organisation to meet its quality certification standards
* help organisations reduce costs & improve customer satisfaction

ISO offer standards to provide a framework for the assessment of software processes

**Improving quality:**

* establish leadership that promotes quality
  + top management be quality-minded
  + large percentage of quality problems are associated with management
* understand the cost of quality

cost of conformance + cost of nonconformance

* conformance (一致性): delivering products that meet requirements and fitness for use
* cost of nonconformance: take responsibility for failures or not meeting quality expectations

5 cost categories related to quality:

* prevention cost: cost of planning and executing a project so it is error-free or within an acceptable error range
* appraisal cost: cost of evaluating processes and their outputs to ensure quality
* internal failure cost: cost incurred to correct an identified defect before the customer receives the product
* external failure cost: cost that relates to all errors not detected and correlated before delivery to the customer
* measurement & test equipment costs: capital cost of equipment used to perform prevention and appraisal activities
* focus on organisational influences and workplace factors that affect quality

a dedicated workspace and a quiet work environment: improve programmer productivity

* follow maturity models (frameworks for helping organisations improve the processes & systems)
  + software quality function deployment model: define user requirements & plan software projects
  + Software Engineering Institute’s capability maturity model integration (CMMI): process improvement approach that provides organisations with essential elements of effective processes

Levels: incomplete -> performed -> managed -> defined -> quantitatively managed -> optimising

* + PMI’s (Project Management Institute) maturity model:
  + Help organisations assess & improve their project management capabilities
  + Address standards for excellence in project, program and portfolio management best practices and explain capabilities necessary to achieve best practices

**video 3**

**controlling quality**

outputs:

* Acceptance decisions
* Rework
* Process adjustments: correct/prevent further quality problems based on quality control measurements

7 basic tools for quality:

* Cause-and-effect diagram
  + Fishbone/Ishikawa diagrams
  + Trace complaints about quality problems back to the responsible production operations
* Quality control chart:
  + A graphic display of data that illustrates the results of a process over time
  + Main use: prevent defects, not detect & reject them
  + Determine a process is in/out of control
    - In control:
      * any variations in results of the process are created by random events
      * No need to be adjusted
    - Out of control:
      * any variations in results of the process are created by non-random events
      * need to identify causes of the events and adjust the process to correct/eliminate them
  + seven run rule: if 7 data points in a row are all below the mean, above the mean or all increasing or decreasing, then the process needs to be examined for non-random problems
* Check sheet
* Tally sheet/ checklist
* Collect & analyse data
* Useful in improving the process for handling complaints
* Scatter diagram
  + Show if there is a relationship
  + Closer data points are to the “line of best fit”, the more closely the two variables are related
* Histogram
  + A bar graph of a distribution of variables
  + Each bar represents an attribute/characteristic of a problem situation
  + Height represents frequency
* Pareto chart
* A histogram that help identify and prioritise problem areas
* 80-20 rule: 80% problems are often due to 20% causes
* Stratification: a technique that shows data from a variety of sources to see if a pattern emerges
  + Flowchart
    - Graphic displays of the logic and flow of processes that help analyse how problems occur and how processes can be improved
    - Show activities, decision points and the order of how information is processed
  + Run chart
    - Display the history & pattern of variation of a process over time
    - Perform trend analysis & forecast future outcomes based on historical results
  + Statistical sampling: choose part of a population of interest for inspection

**Six sigma:**

A comprehensive and flexible system for achieving, sustaining & maximising business success

Sigma is uniquely driven by close understanding of:

* customer needs
* disciplined use of facts, data and statistical analysis
* diligent attention to managing, improving & reinventing business processes

target for perfection: <= 3.4 defects per million opportunities (DPMO)

follow 5-phase improvement process DMAIC:

a systematic, closed-loop process for continued improvement that is scientific and fact based

* Define: define problem/opportunity, process & customer requirements
* Measure: define measures then collect, compile and display data
* Analyse: scrutinise process details to find improvement opportunities
* Improve: generate solutions and ideas for improving the problem
* Control: track and verify the stability of the improvements and the predictability of the solution

**Six 9s of quality:**

* A measure of quality control
* Equal to 1 fault in 1 million opportunities
* Telecommunications industry: 99.9999% service availability (30s downtime a year)
* Target goal for the number of errors in a communications circuit, system failure or errors in lines of code

**Testing:**

Should be done during almost every phase of IT product development life cycle

* Unit testing: each individual component (often a program) to ensure it is as defect-free as possible
* Integration testing: functionally grouped components
* System testing: entire system as one entity
* User acceptance testing: independent test performed by end users prior to accepting the delivered system

**PROCUREMENT MANAGEMENT**

**video 4**

**procurement:** purchasing/outsourcing

acquiring goods and/or services from an outside source

* Access skills & technologies
* Reduce both fixed & recurrent costs
* Allow client organisation to focus on its core business
* Provide flexibility
* Increase accountability

**Project procurement management:**

Acquiring goods & services for a project from outside the performing organisation

* Planning procurement management: determine what to produce and when and how to do it
* Conducting procurements: obtain seller responses, select sellers and award contracts
* Controlling procurements: manage relationships with sellers, monitor contract performance and make changes as needed
* Closing procurements: complete and settle each contract/agreement, including resolving of any open items

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**Planning procurement management**

* Identify which project needs can best be met by using products/services outside the organisation
* Important decision: make or buy
* Procurement management plan:

Describe how procurement processes will be managed, from developing documentation for making outside purchase or acquisitions to contract closure

**Contract:**

A mutually binding agreement that obligates the seller to provide the specified products/services and obligates the buyer to pay for them

Can clarify responsibilities and sharpen focus on key deliverables of a project

More accountability for delivering the work as stated in the contract because contracts are legally binding

* Fixed price/lump sum contracts:
  + FFP (firm-fixed price)
  + FP-EPA (fixed price with economic price adjustment)
  + FPI (fixed-price incentive fee)
* Cost reimbursable contracts
  + CPAF (cost plus award fee)
  + CPIF (cost plus incentive fee)
  + CPFF (cost plus fixed fee)
  + CPPC (cost plus percentage of cost)
* Time and material contracts: hybrid of fixed price and cost reimbursable contracts
* Unit price contracts: buyer pay seller a predetermined amount per unit of service

**PTA (point of total assumption):**

The cost at which the contractor assumes total responsibility for each additional dollar of contract cost

PTA = (ceiling price – target price) / government share + target cost

**Tools & techniques for planning purchases & acquisitions:**

* Expert judgement
* Market research
* Make-or-buy analysis

**Statement of work (SOW):**

A description of the work required for the procurement

A type of scope statement

Contract SOW: SOW used as part of a contract to describe only the work required for the particular contract

**Procurement documents**

* Request for proposals (RFP): solicit proposals from prospective sellers

Proposal: a document prepared by a seller when there are different approaches for meeting buyer needs

* + SOW
  + Schedule information
* Requests for quotes (RFQ): solicit quotes/bids from prospective suppliers

Bid (tender/quote): a document prepared by sellers providing pricing for standard items that have been clearly defined by the buyer

**Source selection criteria:**

Evaluate proposals/bids from sellers, choosing the best one, negotiating the contract and awarding the contract

Prepare some form of evaluation criteria preferably before issuing formal RFP/RFQ

Beware of proposals that look good on paper, be sure to evaluate factors

Can require a technical presentation as part of a proposal

**Conducting procurements:**

* Organisations can advertise to procure goods & services by:
* Send appropriate documentation to potential sellers
* Obtain proposals/bids
* A bidders’ conference can help clarify the buyer’s expectations
* Shortlisted sellers may be asked to prepare a best and final offer (BAFO)
* Select a seller
* Award a contract

**Controlling procurements:**

* Ensure seller’s performance meet contractual requirements
* Contracts are legal relationships, so legal contracting professionals should be involved in writing and administering contracts
* PM and team members watch for constructive change orders (oral/written acts/omissions by someone with actual/apparent authority that can be construed to have the same effect as a written change order)

**Change control in contracts:**

* Changes to any part of the project need to be reviewed, approved and documented by the same people in the same way that the original part of the plan was approved
* Evaluation of any change should include an impact analysis
* Changes must be documented in writing
* PM and teams should stay closely involved to make sure the new system will meet business needs
* Have backup plans
* Use tools & techniques (eg. contract change control system, buyer-conducted performance reviews, inspections & audits)

**Closing procurements:**

Contract closure involves completing and setting contracts and resolving any open items

Project team should:

* Determine if all work was completed correctly and satisfactorily
* Update records to reflect final results
* Archive information for future use (record management system)
* Procurement audits identify lessons learned
* Contract should include requirements for formal acceptance and closure