ISO 9000

- An international set of standards for quality management.

- Applicable to a range of organisations from manufacturing to service industries.

- ISO 9001 applicable to organisations which design, develop and maintain products.

- ISO 9001 is a generic model of the quality process that must be instantiated for each organisation using the standard.

ISO 9001

Management responsibility	Quality system
Control of non-conforming products	Design control
Handling, storage, packaging and delivery	Purchasing
Purchaser-supplied products	Product identification and traceability
Process control	Inspection and testing
Inspection and test equipment	Inspection and test status
Contract review	Corrective action
Document control	Quality records
Internal quality audits	Training
Servicing	Statistical techniques

ISO 9000 certification

- Quality standards and procedures should be documented in an organisational quality manual.

- An external body may certify that an organisation's quality manual conforms to ISO 9000 standards.

- Some customers require suppliers to be ISO 9000 certified although the need for flexibility here is increasingly recognised.

ISO 9000 and quality management
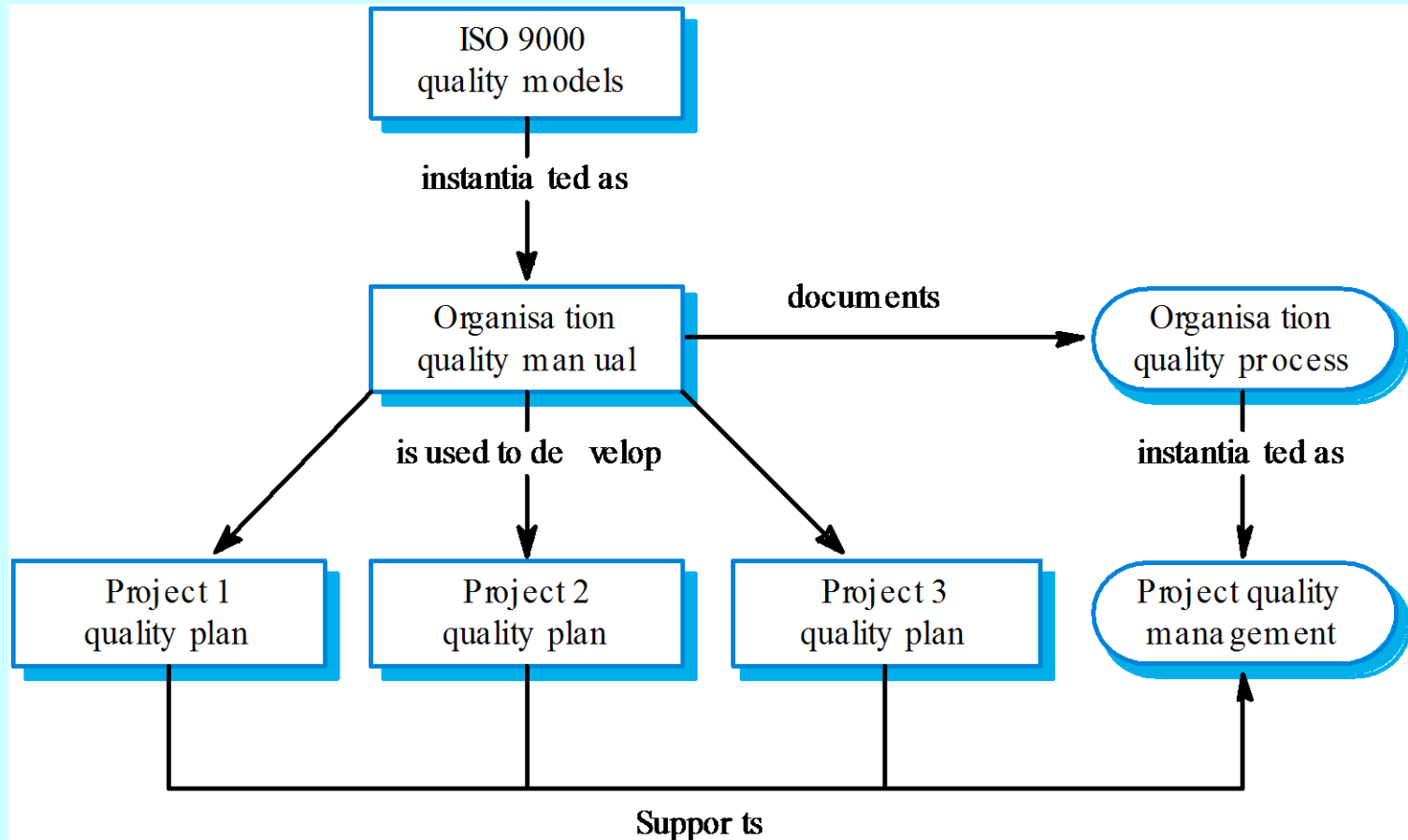
Documentation standards

- Particularly important - documents are the tangible manifestation of the software.

- Documentation process standards
  - Concerned with how documents should be developed, validated and maintained.

- Document standards
  - Concerned with document contents, structure, and appearance.

- Document interchange standards
  - Concerned with the compatibility of electronic documents.

Documentation process
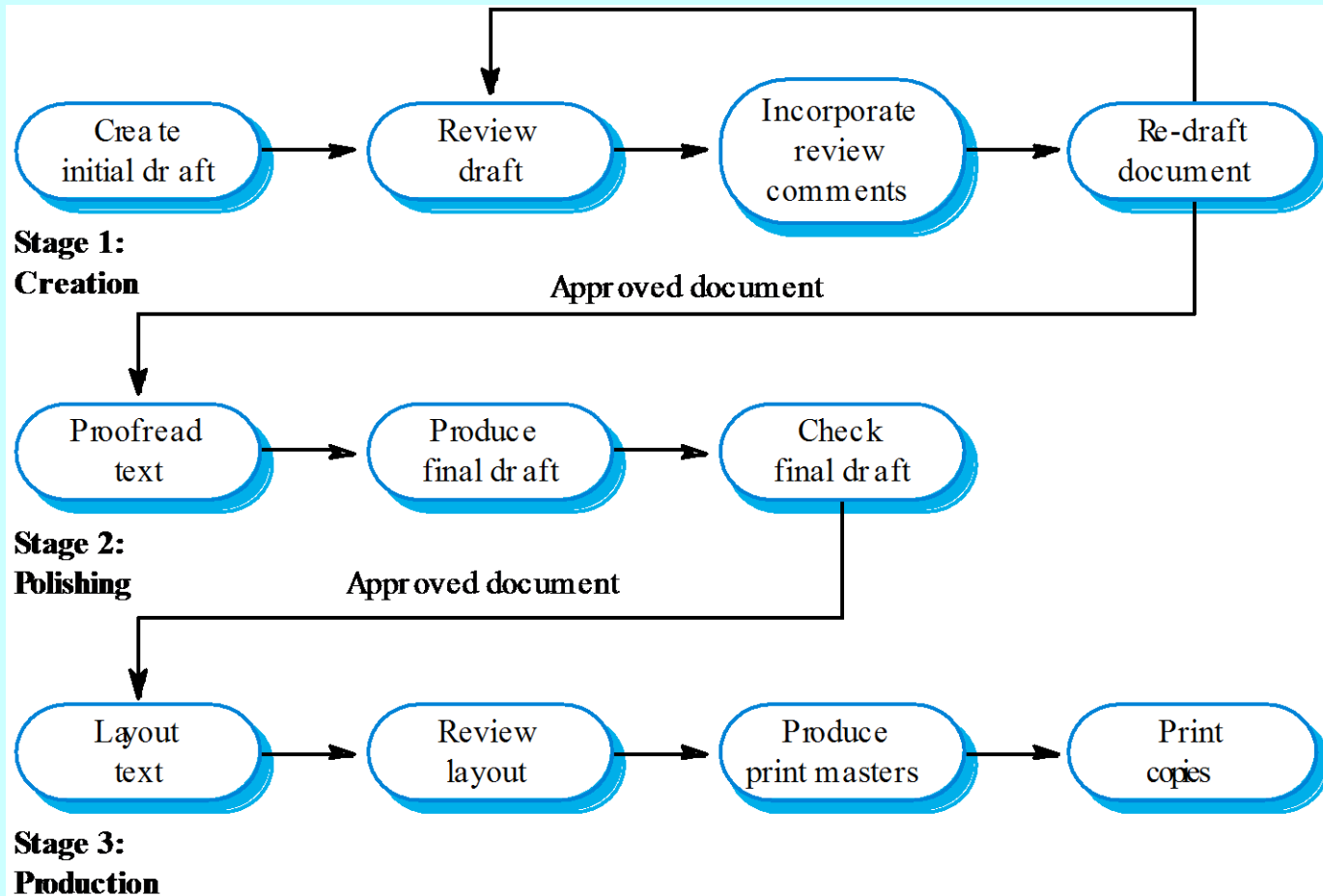
Document standards

- Document identification standards
    - How documents are uniquely identified.
- Document structure standards
    - Standard structure for project documents.
- Document presentation standards
    - Define fonts and styles, use of logos, etc.
- Document update standards
    - Define how changes from previous versions are reflected in a document.

Document interchange standards

- Interchange standards allow electronic documents to be exchanged, mailed, etc.

- Documents are produced using different systems and on different computers. Even when standard tools are used, standards are needed to define conventions for their use e.g. use of style sheets and macros.

- Need for archiving. The lifetime of word processing systems may be much less than the lifetime of the software being documented. An archiving standard may be defined to ensure that the document can be accessed in future.

Quality planning

- A quality plan sets out the desired product qualities and how these are assessed and defines the most significant quality attributes.

- The quality plan should define the quality assessment process.

- It should set out which organisational standards should be applied and, where necessary, define new standards to be used.

Quality plans

- Quality plan structure
  - Product introduction;
  - Product plans;
  - Process descriptions;
  - Quality goals;
  - Risks and risk management.
- Quality plans should be short, succinct documents
  - If they are too long, no-one will read them.

Software quality attributes

Safety	Understandability	Portability
Security	Testability	Usability
Reliability	Adaptability	Reusability
Resilience	Modularity	Efficiency
Robustness	Complexity	Learnability

Quality control

- This involves checking the software development process to ensure that procedures and standards are being followed.

- There are two approaches to quality control
  - Quality reviews;
  - Automated software assessment and software measurement.

Quality reviews

- This is the principal method of validating the quality of a process or of a product.

- A group examines part or all of a process or system and its documentation to find potential problems.

- There are different types of review with different objectives
  - Inspections for defect removal (product);
  - Reviews for progress assessment (product and process);
  - Quality reviews (product and standards).

Types of review

Review type	Principal purpose
Design or program inspections	To detect detailed errors in the requirements, design or code. A checklist of possible errors should drive the review.
Progress reviews	To provide information for management about the overall progress of the project. This is both a process and a product review and is concerned with costs, plans and schedules.
Quality reviews	To carry out a technical analysis of product components or documentation to find mismatches between the specification and the component design, code or documentation and to ensure that defined quality standards have been followed.

Quality reviews

- A group of people carefully examine part or all of a software system and its associated documentation.

- Code, designs, specifications, test plans, standards, etc. can all be reviewed.

- Software or documents may be 'signed off' at a review which signifies that progress to the next development stage has been approved by management.

Review functions

- Quality function - they are part of the general quality management process.

- Project management function - they provide information for project managers.

- Training and communication function - product knowledge is passed between development team members.

Quality reviews

- The objective is the discovery of system defects and inconsistencies.

- Any documents produced in the process may be reviewed.

- Review teams should be relatively small and reviews should be fairly short.

- Records should always be maintained of quality reviews.

Review results

- Comments made during the review should be classified

  - No action. No change to the software or documentation is required;

  - Refer for repair. Designer or programmer should correct an identified fault;

  - Reconsider overall design. The problem identified in the review impacts other parts of the design. Some overall judgement must be made about the most cost-effective way of solving the problem;

- Requirements and specification errors may have to be referred to the client.