

Software quality management

- Concerned with ensuring that the required level of quality is achieved in a software product
- Involves defining appropriate quality standards and procedures and ensuring that these are followed
- Should aim to develop a 'quality culture' where quality is seen as everyone's responsibility

What is quality?

- Quality, simplistically, means that a product should **meet its specification**
- This is problematical for software systems
 - Tension between **customer quality requirements** (efficiency, reliability, etc.) and **developer quality requirements** (maintainability, reusability, etc.)
 - Some quality **requirements are difficult** to specify in an unambiguous way
 - **Software specifications** are **usually incomplete** and often inconsistent

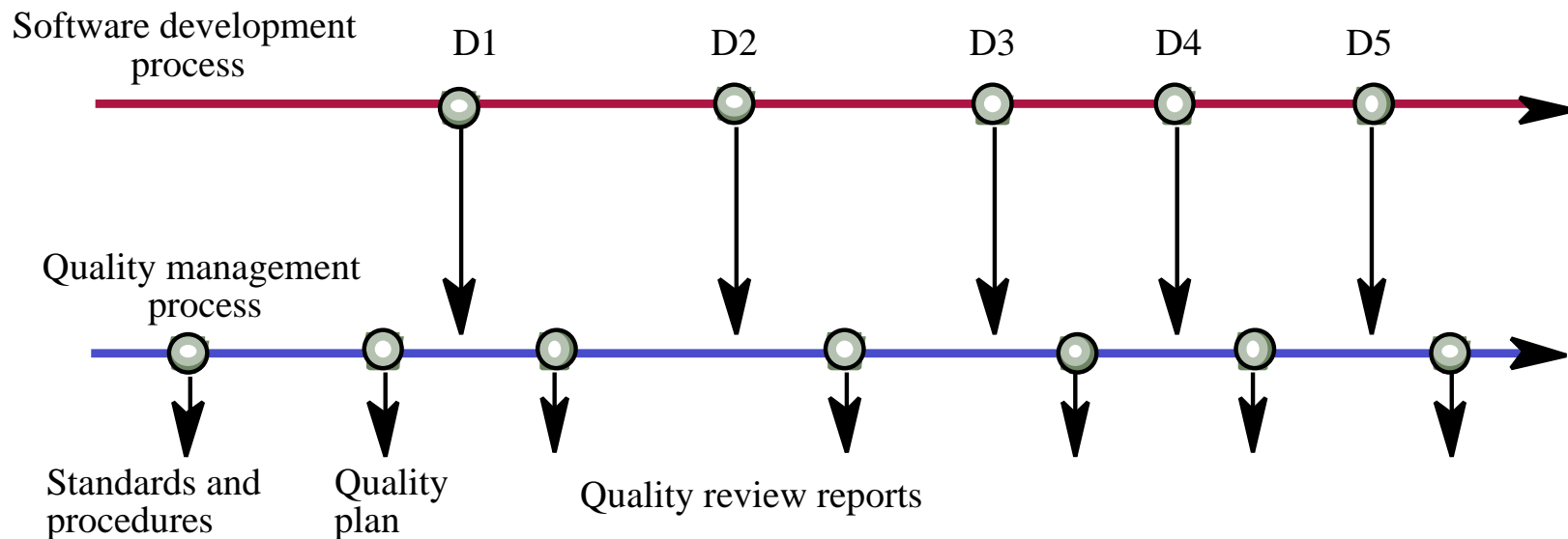
The quality compromise

- We cannot wait for specifications to improve before paying attention to quality management
- Must put procedures into place to improve quality in spite of imperfect specification
- Quality management is therefore not just concerned with reducing defects but also with other product qualities

Quality management activities

- Quality assurance
 - Establish organisational procedures and standards for quality
- Quality planning
 - Select applicable procedures and standards for a particular project and modify these as required
- Quality control
 - Ensure that procedures and standards are followed by the software development team
- Quality management should be separate from project management to ensure independence

Quality management and software development



ISO 9000

- 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 Must be instantiated for each organisation

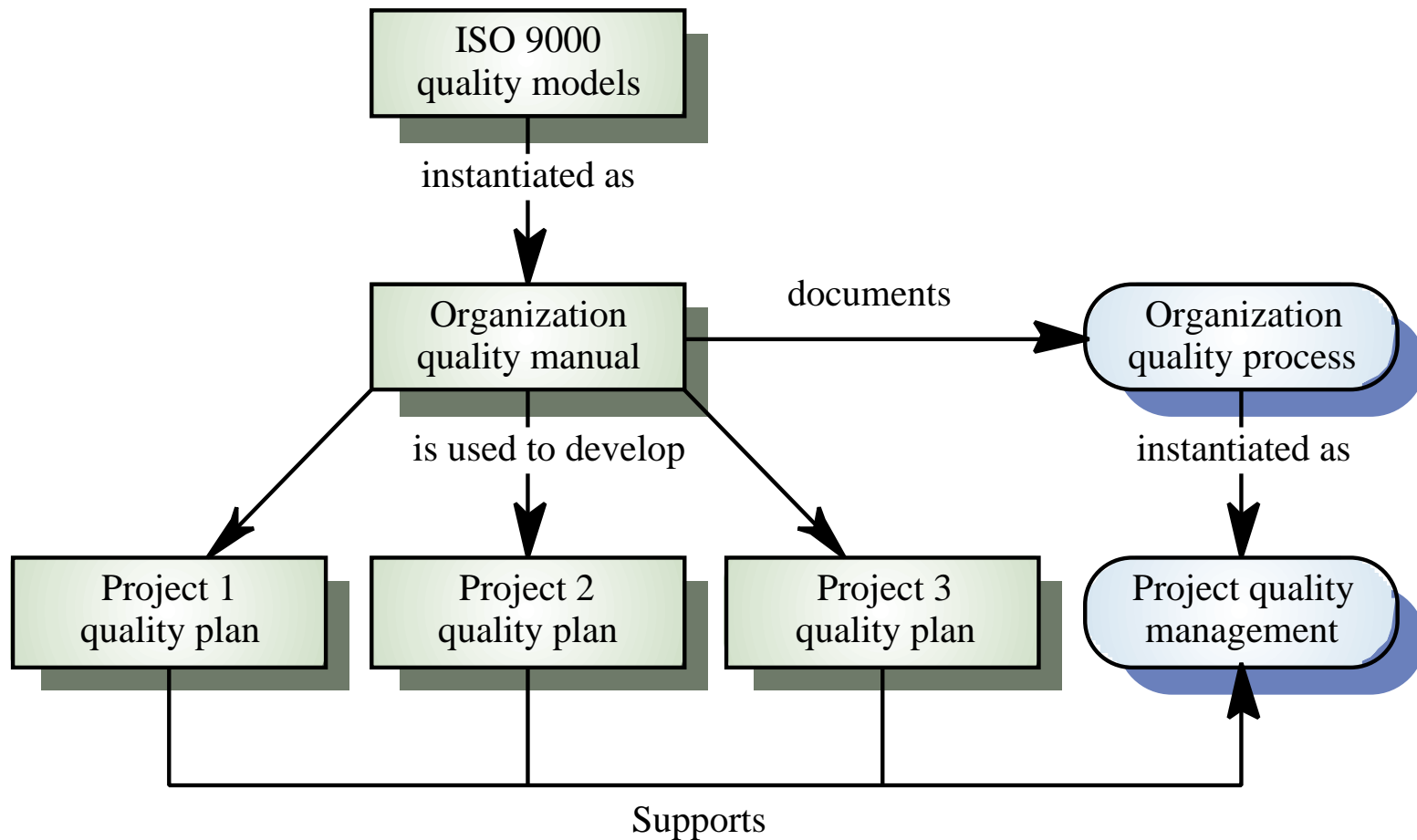
ISO 9001

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
- External body may certify that an organisation's quality manual conforms to ISO 9000 standards
- Customers are, increasingly, demanding that suppliers are ISO 9000 certified

ISO 9000 and quality management



Quality assurance and standards

- Standards are the key to effective quality management
- They may be international, national, organizational or project standards
- Product standards define characteristics that all components should exhibit e.g. a common programming style
- Process standards define how the software process should be enacted

Importance of standards

- Encapsulation of best practice- avoids repetition of past mistakes
- Framework for quality assurance process - it involves checking standard compliance
- Provide continuity - new staff can understand the organisation by understand the standards applied

Product and process standards

Product standards	Process standards
Design review form	Design review conduct
Document naming standards	Submission of documents to CM
Procedure header format	Version release process
Ada programming style standard	Project plan approval process
Project plan format	Change control process
Change request form	Test recording process

Problems with standards

- Not seen as relevant and up-to-date by software engineers
- Involve too much bureaucratic form filling
- Unsupported by software tools so tedious manual work is involved to maintain standards

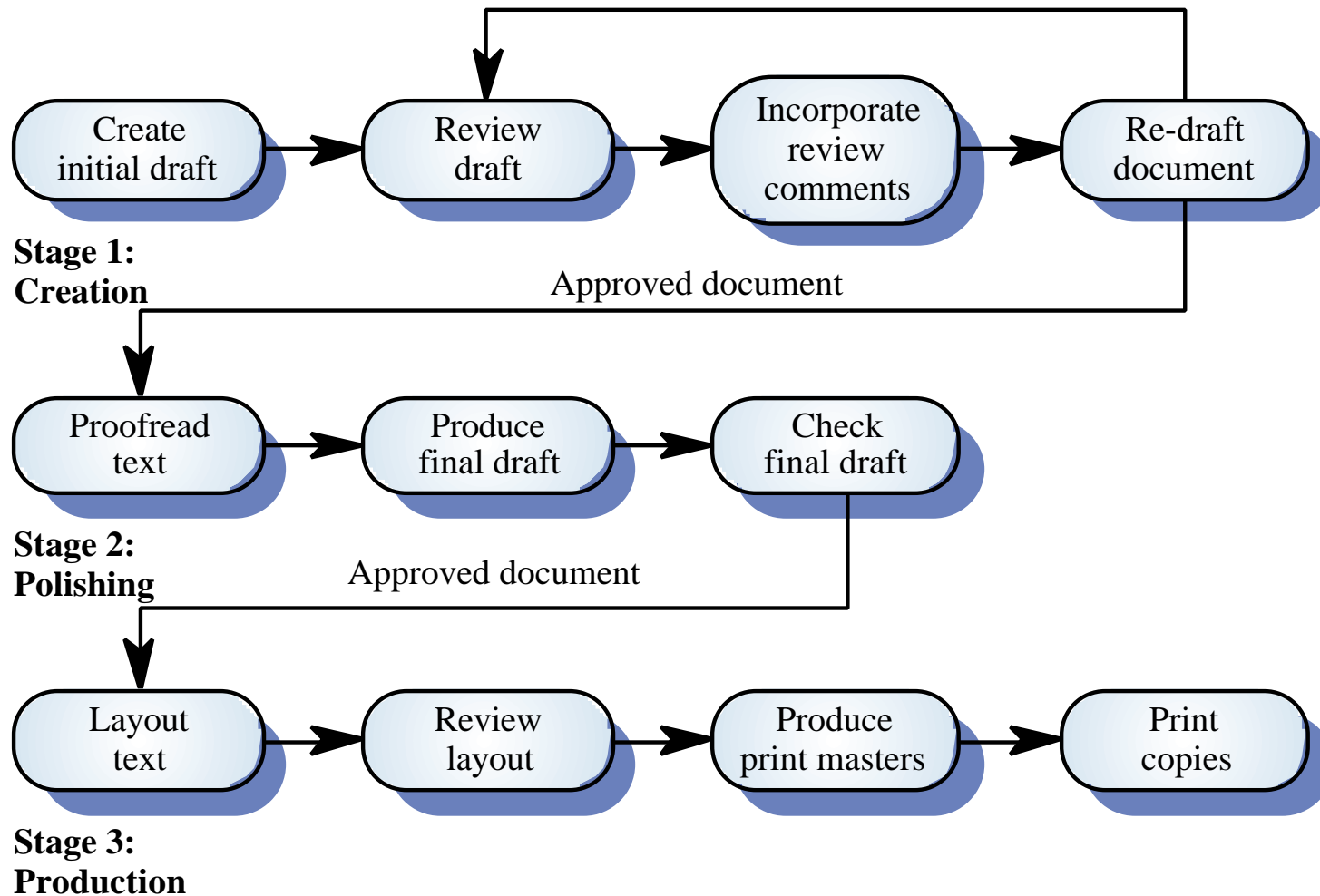
Standards development

- Involve practitioners in development. Engineers should understand the rationale underlying a standard
- Review standards and their usage regularly. Standards can quickly become outdated and this reduces their credibility amongst practitioners
- Detailed standards should have associated tool support. Excessive clerical work is the most significant complaint against standards

Documentation standards

- Particularly important - documents are the tangible manifestation of the software
- Documentation process standards
 - How documents should be developed, validated and maintained
- Document standards
 - Concerned with document contents, structure, and appearance
- Document interchange standards
 - How documents are stored and interchanged between different documentation systems

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

- Documents are produced using different systems and on different computers
- Interchange standards allow electronic documents to be exchanged, mailed, etc.
- Need for archiving. The lifetime of word processing systems may be much less than the lifetime of the software being documented
- XML is an emerging standard for document interchange which will be widely supported in future

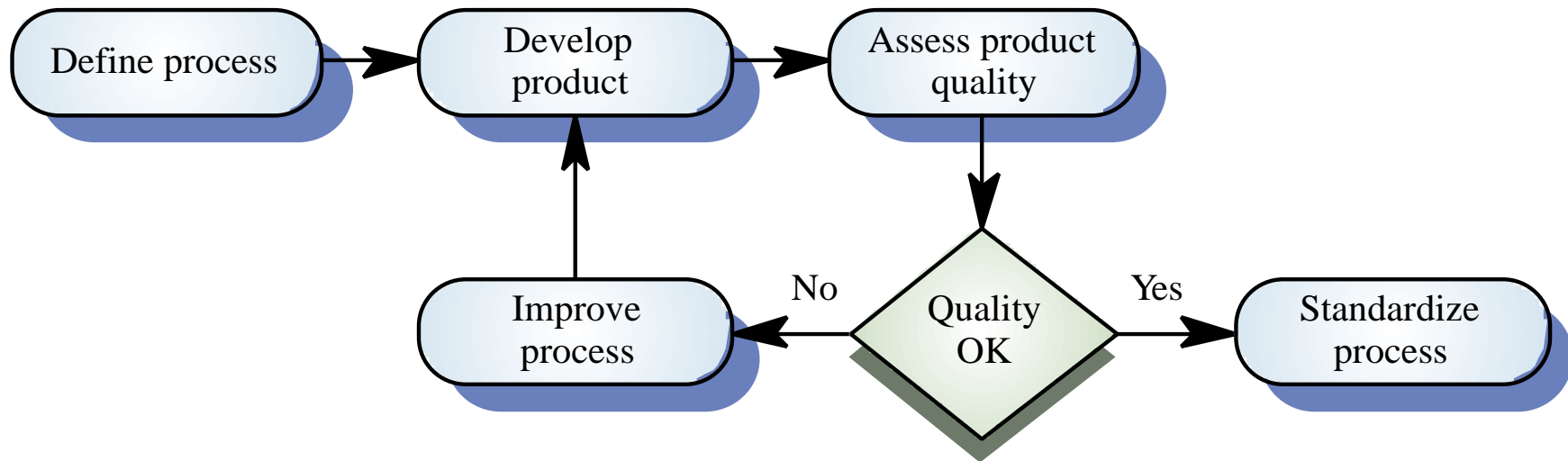
Process and product quality

- The quality of a developed product is influenced by the quality of the production process
- Particularly important in software development as some product quality attributes are hard to assess
- However, there is a very complex and poorly understood relationship between software processes and product quality

Process-based quality

- **Straightforward link** between process and product in manufactured goods
- More complex for software because:
 - The application of **individual skills and experience** is particularly important in software development
 - External factors such as the **novelty** of an application or the need for an **accelerated development schedule** may **impair product quality**
- Care must be **taken** not to impose **inappropriate process standards**

Process-based quality



Practical process quality

- Define process standards such as how reviews should be conducted, configuration management, etc.
- Monitor the development process to ensure that standards are being followed
- Report on the process to project management and software procurer