Quality Management

Objectives

- To introduce the quality management process and key quality management activities
- To explain the role of standards in quality management
- To explain the concept of a software metric, predictor metrics and control metrics
- To explain how measurement may be used in assessing software quality and the limitations of software measurement

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
  - There is a 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.

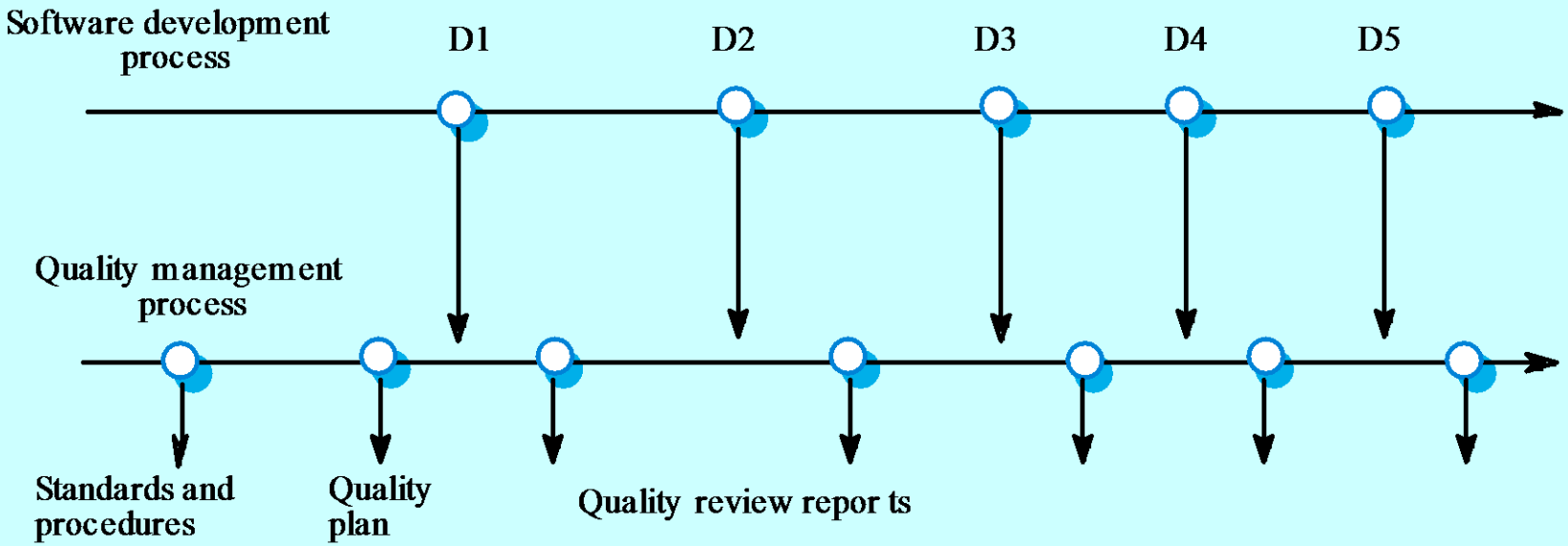
Scope of quality management

- Quality management is particularly important for large, complex systems. The quality documentation is a record of progress and supports continuity of development as the development team changes.
- For smaller systems, quality management needs less documentation and should focus on establishing a quality culture.

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.

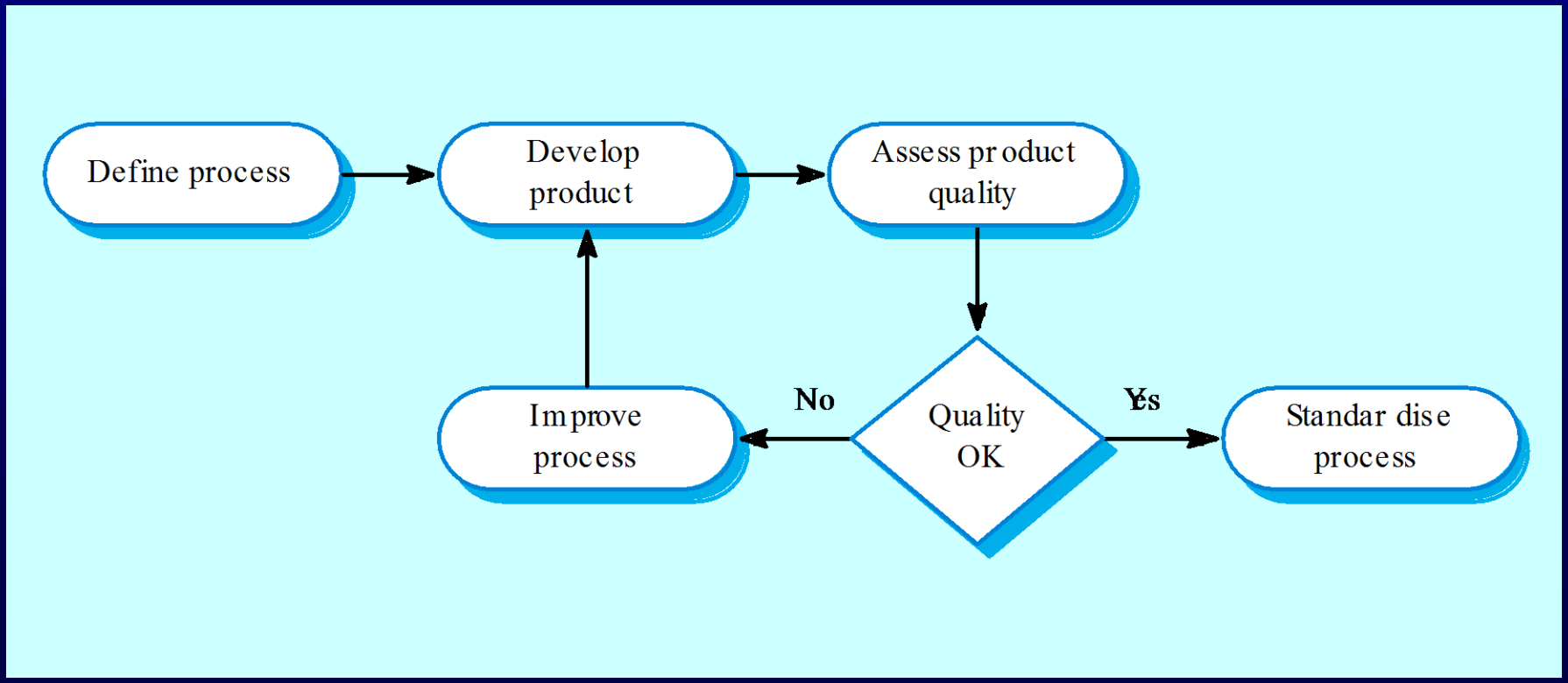
Quality management and software development



Process and product quality

- The quality of a developed product is influenced by the quality of the production process.
- This is 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



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.
- Don’t use inappropriate practices simply because standards have been established.

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.
- They are a framework for quality assurance processes - they involve checking compliance to standards.
- They provide continuity - new staff can understand the organisation by understanding the standards that are used.

Product and process standards

Product standards	Process standards
Design review form	Design review conduct
Requirements document structure	Submission of documents to CM
Method header format	Version release process
Java programming style	Project plan approval process
Project plan format	Change control process
Change request form	Test recording process

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.

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).

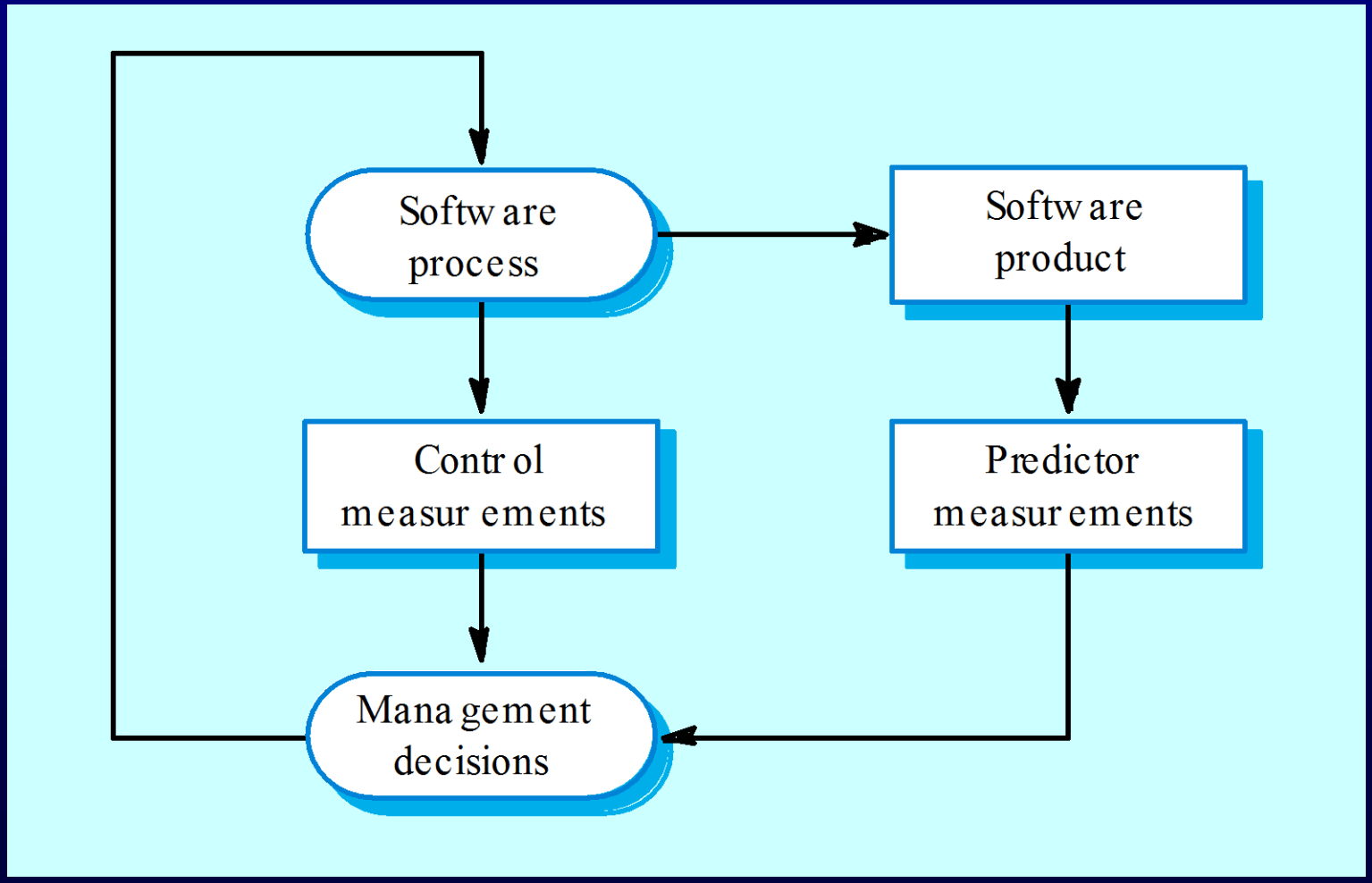
Software measurement and metrics

- Software measurement is concerned with deriving a numeric value for an attribute of a software product or process.
- This allows for objective comparisons between techniques and processes.
- Although some companies have introduced measurement programmes, most organisations still don’t make systematic use of software measurement.
- There are few established standards in this area.

Software metric

- Any type of measurement which relates to a software system, process or related documentation
  - Lines of code in a program, the Fog index, number of person-days required to develop a component.
- Allow the software and the software process to be quantified.
- May be used to predict product attributes or to control the software process.
- Product metrics can be used for general predictions or to identify anomalous components.

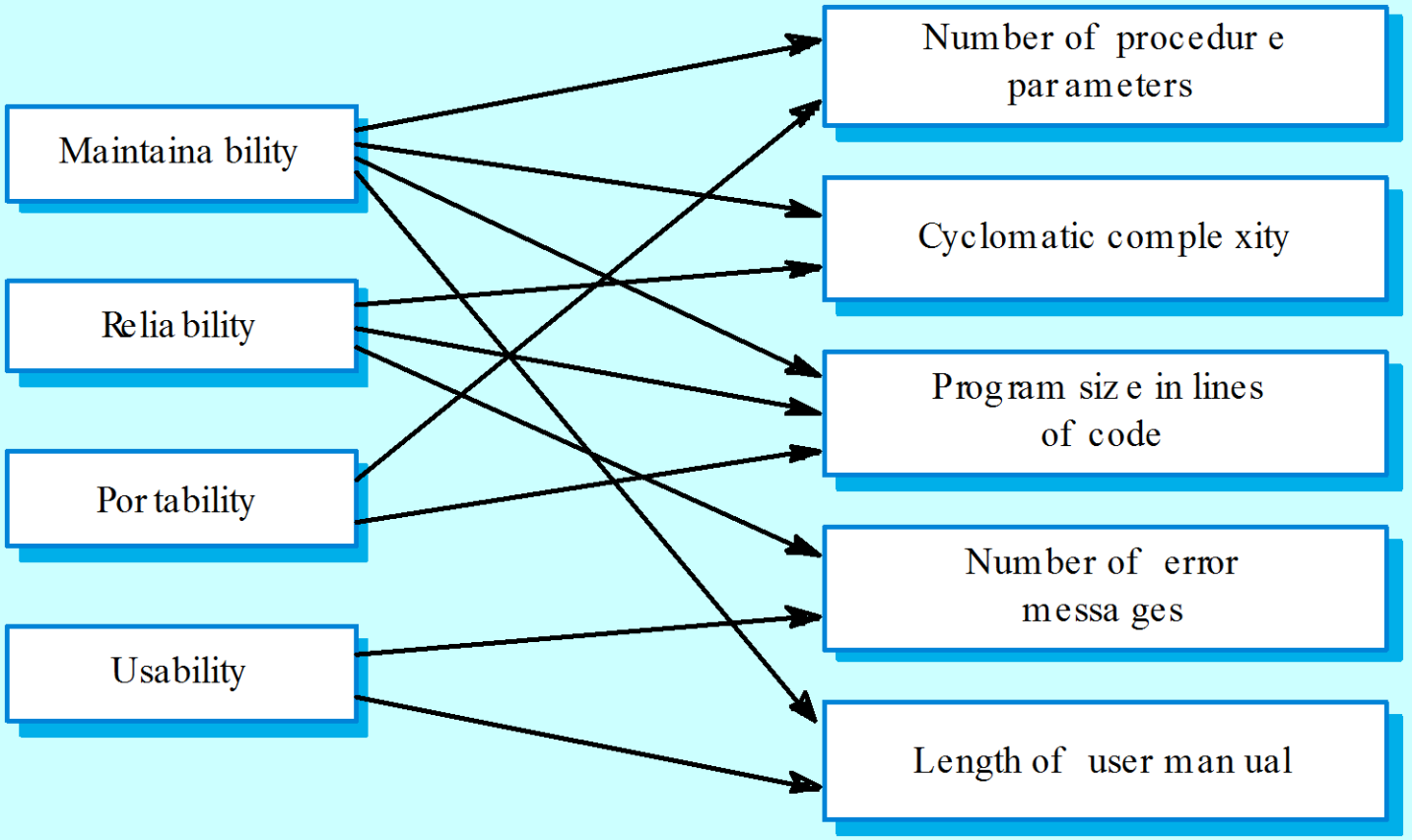
Predictor and control metrics



Metrics assumptions

- A software property can be measured.
- The relationship exists between what we can measure and what we want to know. We can only measure internal attributes but are often more interested in external software attributes.
- This relationship has been formalised and validated.
- It may be difficult to relate what can be measured to desirable external quality attributes.

Internal and external attributes



Measurement surprises

- Reducing the number of faults in a program leads to an increased number of help desk calls
  - The program is now thought of as more reliable and so has a wider more diverse market. The percentage of users who call the help desk may have decreased but the total may increase;
  - A more reliable system is used in a different way from a system where users work around the faults. This leads to more help desk calls.

Key points

- Software quality management is concerned with ensuring that software meets its required standards.
- Software standards are an encapsulation of best practice.
- Reviews are the most widely used approach for assessing software quality.
- Software measurement gathers information about both the software process and the software product.
- Product quality metrics should be used to identify potentially problematical components.