Configuration management

- New versions of software systems are created as they change:
  - For different machines/OS;
  - Offering different functionality;
  - Tailored for particular user requirements.
- Configuration management is concerned with managing evolving software systems:
  - System change is a team activity;
  - CM aims to control the costs and effort involved in making changes to a system.

Frequent system building

- It is easier to find problems that stem from component interactions early in the process.
- This encourages thorough unit testing - developers are under pressure not to 'break the build'.
- A stringent change management process is required to keep track of problems that have been discovered and repaired.
Service-oriented architectures

- A means of developing distributed systems where the components are stand-alone services
- Services may execute on different computers from different service providers
- Standard protocols have been developed to support service communication and information exchange

Benefits of SOA

- Services can be provided locally or outsourced to external providers
- Services are language-independent
- Investment in legacy systems can be preserved
- Inter-organisational computing is facilitated through simplified information exchange

Key standards

- SOAP
  - A message exchange standard that supports service communication
- WSDL (Web Service Definition Language)
  - This standard allows a service interface and its bindings to be defined
- UDDI
  - Defines the components of a service specification that may be used to discover the existence of a service
- WS-BPEL
  - A standard for workflow languages used to define service composition

Services as reusable components

- A service can be defined as:
  - A loosely-coupled, reusable software component that encapsulates discrete functionality which may be distributed and programmatically accessed. A web service is a service that is accessed using standard Internet and XML-based protocols
  - A critical distinction between a service and a component as defined in CBSE is that services are independent
    - Services do not have a 'requires' interface
    - Services rely on message-based communication with messages expressed in XML

Service testing

- Testing is intended to find defects and demonstrate that a system meets its functional and non-functional requirements
- Service testing is difficult as (external) services are 'black-boxes'. Testing techniques that rely on the program source code cannot be used
Concerned with activities involved in ensuring that software is delivered on time and on schedule and in accordance with the requirements of the organisations developing and procuring the software.

Project management is needed because software development is always subject to budget and schedule constraints that are set by the organisation developing the software.

- The product is intangible.
- The product is uniquely flexible.
- Software engineering is not recognized as an engineering discipline with the same status as mechanical, electrical engineering, etc.
- The software development process is not standardised.
- Many software projects are 'one-off' projects.

Software project management

- Proposal writing.
- Project planning and scheduling.
- Project costing.
- Project monitoring and reviews.
- Personnel selection and evaluation.
- Report writing and presentations.

Management activities

- These activities are not peculiar to software management.
- Many techniques of engineering project management are equally applicable to software project management.
- Technically complex engineering systems tend to suffer from the same problems as software systems.

Management commonalities

- May not be possible to appoint the ideal people to work on a project
  - Project budget may not allow for the use of highly-paid staff;
  - Staff with the appropriate experience may not be available;
  - An organisation may wish to develop employee skills on a software project.
- Managers have to work within these constraints especially when there are shortages of trained staff.

Project staffing
### Project planning

- Probably the most time-consuming project management activity.
- Continuous activity from initial concept through to system delivery. Plans must be regularly revised as new information becomes available.
- Various different types of plan may be developed to support the main software project plan that is concerned with schedule and budget.