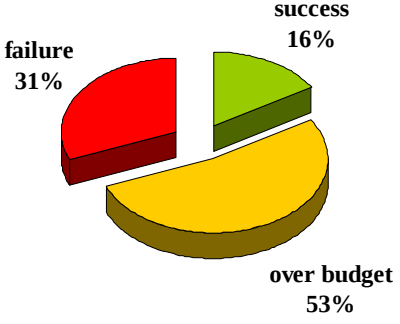
Software Project Management

The Evolving Role of Software

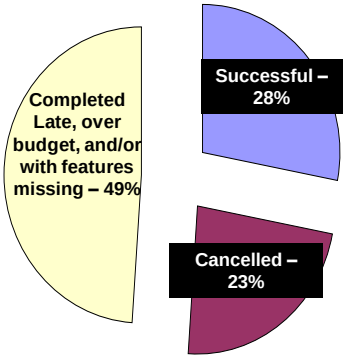
- Software industry is in Crisis!



Source: The Standish Group International, Inc. (CHAOS research)

The Evolving Role of Software

This is the SORRY state of Software Engineering Today!



- **Data on 28,000 projects completed in 2000**

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The Evolving Role of Software

As per the IBM report, "31%of the project get cancelled before they are completed, 53% over-run their cost estimates by an average of 189% and for every 100 projects, there are 94 restarts".

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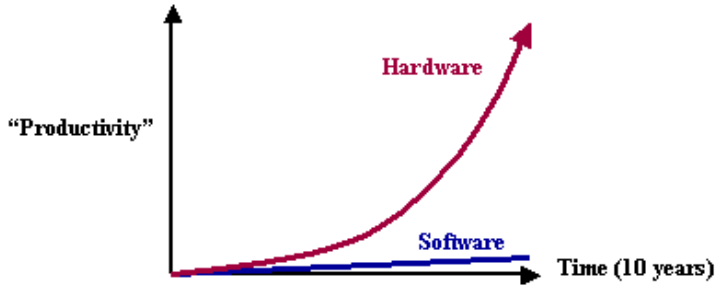
The Evolving Role of Software

- Unlike Hardware
  - Moore's law: processor speed/memory capacity doubles every two years



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The Evolving Role of Software

***Managers* and *Technical Persons* are asked:**

- ✓ Why does it take so long to get the program finished?
- ✓ Why are costs so high?
- ✓ Why can not we find all errors before release?
- ✓ Why do we have difficulty in measuring progress of software development?

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Factors Contributing to the Software Crisis

- Larger problems,
- Lack of adequate training in software engineering,
- Increasing skill shortage,
- Low productivity improvements.

Some Software failures

Ariane 5

It took the European Space Agency **10 years and $7 billion** to produce Ariane 5, a giant rocket capable of hurling a pair of three-ton satellites into orbit with each launch and intended to give Europe overwhelming supremacy in the commercial space business.

The rocket was destroyed after 39 seconds of its launch, at an altitude of two and a half miles along with its payload of four expensive and uninsured scientific satellites.

Some Software failures

When the guidance system's own computer tried to convert one piece of data the sideways velocity of the rocket from a 64 bit format to a 16 bit format; the number was too big, and an overflow error resulted after 36.7 seconds. When the guidance system shutdown, it passed control to an identical, redundant unit, which was there to provide backup in case of just such a failure. Unfortunately, the second unit, which had failed in the identical manner a few milliseconds before.

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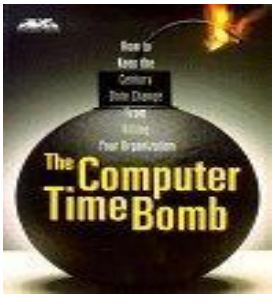
Some Software failures

Y2K problem:

It was simply the ignorance about the adequacy or otherwise of using only last two digits of the year.

The 4-digit date format, like 1964, was shortened to 2-digit format, like 64.



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Some Software failures

The Patriot Missile

- First time used in Gulf war
- Used as a defense from Iraqi Scud missiles
- Failed several times including one that killed 28 US soldiers in Dhahran, Saudi Arabia

Reasons:

A small timing error in the system's clock accumulated to the point that after 14 hours, the tracking system was no longer accurate. In the Dhahran attack, the system had been operating for more than 100 hours.

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Some Software failures

Financial Software

Many companies have experienced failures in their accounting system due to faults in the software itself. The failures range from producing the wrong information to the whole system crashing.

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Some Software failures

Windows XP

- Microsoft released Windows XP on October 25, 2001.
- On the same day company posted 18 MB of compatibility patches on the website for bug fixes, compatibility updates, and enhancements.
- Two patches fixed important security holes.

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"No Silver Bullet"

The hardware cost continues to decline drastically.

However, there are desperate cries for a silver bullet something to make software costs drop as rapidly as computer hardware costs do.

But as we look to the horizon of a decade, we see no silver bullet. There is no single development, either in technology or in management technique, that by itself promises even one order of magnitude improvement in productivity, in reliability and in simplicity.

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"No Silver Bullet"

The hard part of building software is the specification, design and testing of this conceptual construct, not the labour of representing it and testing the correctness of representation.

We still make syntax errors, to be sure, but they are trivial as compared to the conceptual errors (logic errors) in most systems. That is why, building software is always hard and there is inherently no silver bullet.

While there is no royal road, there is a path forward.

Is reusability (and open source) the new silver bullet?

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"No Silver Bullet"

The blame for software bugs belongs to:

- Software companies
- Software developers
- Legal system
- Universities

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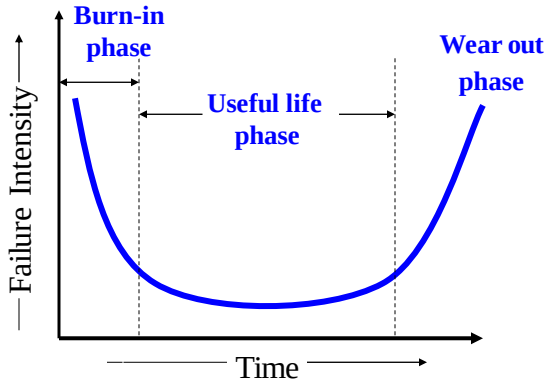
Software Characteristics:

✓Software does not wear out.



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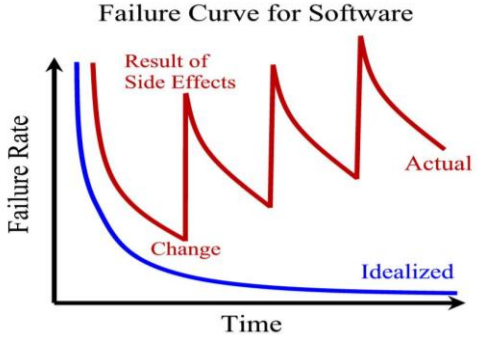
Software Characteristics:

- ✓ Software is not manufactured
- ✓ Reusability of components
- ✓ Software is flexible



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Software Characteristics:

Comparison of constructing a bridge vis-à-vis writing a program.

Sr. No	Constructing a bridge	Writing a program
1.	The problem is well understood	Only some parts of the problem are understood, others are not
2.	There are many existing bridges	Every program is different and designed for special applications.
3.	The requirement for a bridge typically do not change much during construction	Requirements typically change during all phases of development.
4.	The strength and stability of a bridge can be calculated with reasonable precision	Not possible to calculate correctness of a program with existing methods.
5.	When a bridge collapses, there is a detailed investigation and report	When a program fails, the reasons are often unavailable or even deliberately concealed.
6.	Engineers have been constructing bridges for thousands of years	Developers have been writing programs for 50 years or so.
7.	Materials (wood, stone,iron, steel) and techniques (making joints in wood, carving stone, casting iron) change slowly.	Hardware and software changes rapidly.

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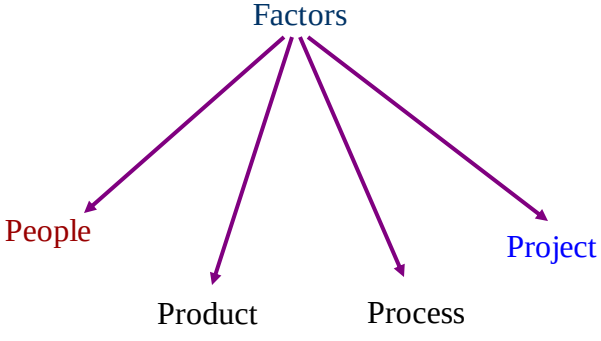
Role of Management in Software Development



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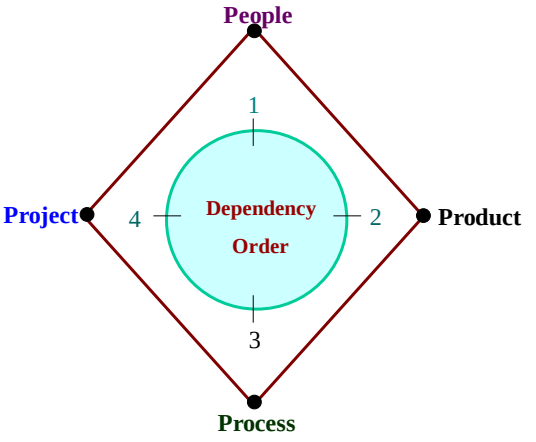
Role of Management in Software Development



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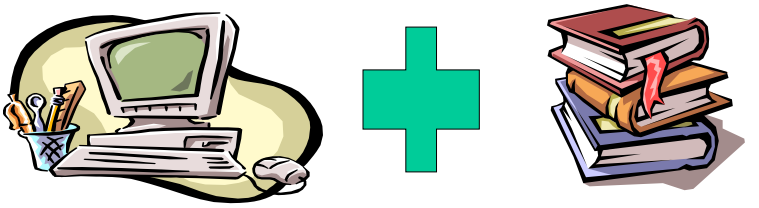
What is software?

- **Computer programs** and **associated documentation**



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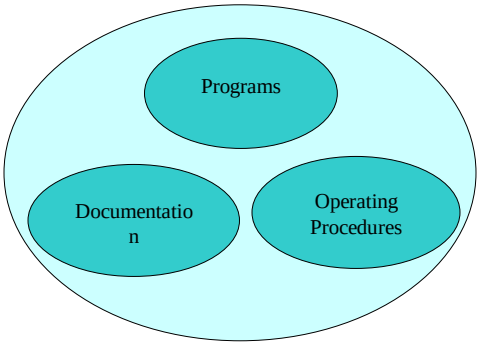
What is software?



Software=Program+Documentation+Operating Procedures

Components of software

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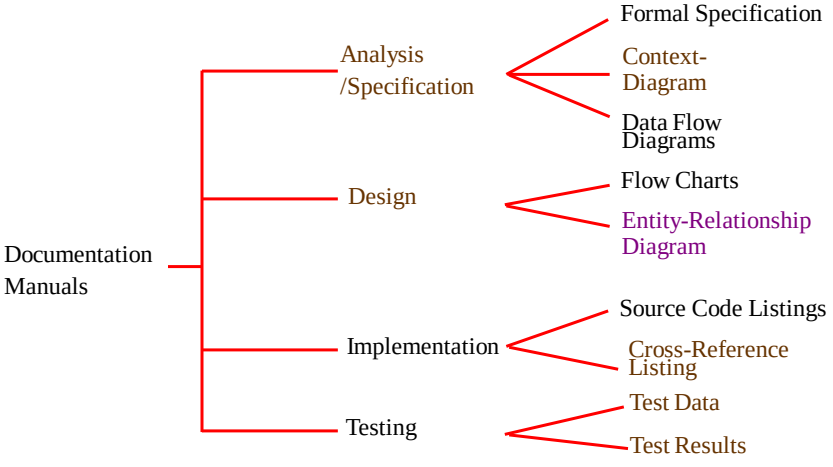
Documentation consists of different types of manuals are



List of documentation manuals

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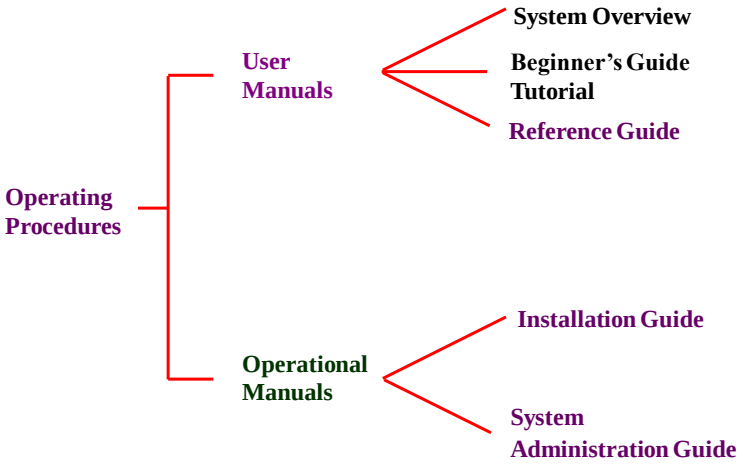
Documentation consists of different types of manuals are



List of operating procedure manuals.

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What is a Project?

Project is a planned activity.

Planning involves careful thinking before doing it.

The characteristics which distinguish projects can be summarised as follows:

- Non-routine tasks are involved.
- Planning is required.
- Specific objectives are to be met or a specified product is to be created.
- The project has a predetermined time span.
- Work is carried out for someone other than yourself

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What is a Project?

- Work involves several specialisms.
- Work is carried out in several phases.
- The resources that are available for use on the project are constrained.
- The project is large and complex.

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Software projects vs other types of project

- Invisibility
  - Progress is invisible in beginning
- Complexity
  - More complex than others
- Conformity
  - Have to conform on requirements given by human clients
- Flexibility
  - Subject to change

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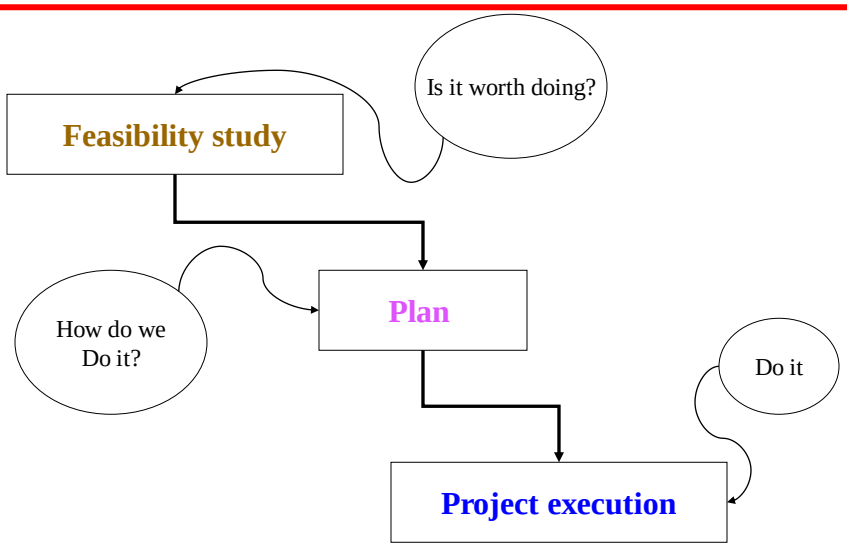
Software Project Management Activities



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Feasibility Study

Is cancellation of a project a bad news?

As per IBM report, “31% projects get cancelled before they are completed, 53% over-run their cost estimates by an average of 189% & for every 100 projects, there are 94 restarts.

How do we cancel a project with the least work?

➡ CONDUCT A FEASIBILTY STUDY

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Feasibility Study

Technical feasibility

- Is it technically feasible to provide direct communication connectivity through space from one location of globe to another location?

- Is it technically feasible to design a programming language using “Sanskrit”?

Feasibility Study

Feasibility depends upon non technical Issues like:

- Are the project’s cost and schedule assumption realistic?

- Does the business model realistic?

- Is there any market for the product?

Software Project Management Activities

- Planning
  - Conducted if positive results are given by feasibility study.
- Project execution
  - Includes design and implementation

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Plans, Methods and Methodologies

- A plan for an activity must be based on some idea of a method of work.
- While a method relates to a type of activity, a plan takes that method and converts it to real activities, identifying for each activity:
  - Its start and end dates
  - Who will carry it out
  - What tools and materials will be used

  Method → How will the plan be carried out?

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Plans, Methods and Methodologies

- Methodologies are collection of set of methods.

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Categories of Software project

Information versus embedded systems

- In information system, system interfaces with the organization. For example, stock control system
- In embedded system, system interfaces with a machine. For example, process control might control the air conditioning equipment in a building.

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What is Management?

- Planning – deciding what is to be done
- Organising – making arrangements
- Staffing – selecting the right people for the job
- Directing – giving instructions
- Monitoring – checking on progress
- Controlling – taking action to remedy hold-ups
- Innovating – coming up with new solutions
- Representing – liaising with clients, users, developers, suppliers and other stakeholders

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Problems with Software Projects

- Poor estimates and plans
- Lack of quality standards and measures
- Lack of guidance about making organisational decisions.
- Lack of techniques to make progress visible
- Poor role definition- Who does what?
- Incorrect success criteria

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Setting up of Objectives

- There is a need for well-defined objectives that are accepted by all these people.
- Objectives will need to be broken down into goals or sub objectives for the software developers to keep development costs within certain budget.

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Setting up of Objectives

Objectives must be:

- Specific
  - Objectives should be defined in such a way that it is obvious to all whether the project has been successful or not.
- Measurable
  - **There should be measures of effectiveness which tell us how successful the project has been.**

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Setting up of Objectives

Objectives must be:

- Achievable
  - It must be within the power of the individual or group to achieve the objective.
- Relevant
  - The objective must be relevant to the true purpose of the project.
- Time constrained
  - There should be a defined point in time by which the objective should have been achieved.

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Setting up of Objectives

Measures of effectiveness

- They provide practical methods of ascertaining whether an objective has been met.
- Example, mean time between failure, can be used to measure reliability.

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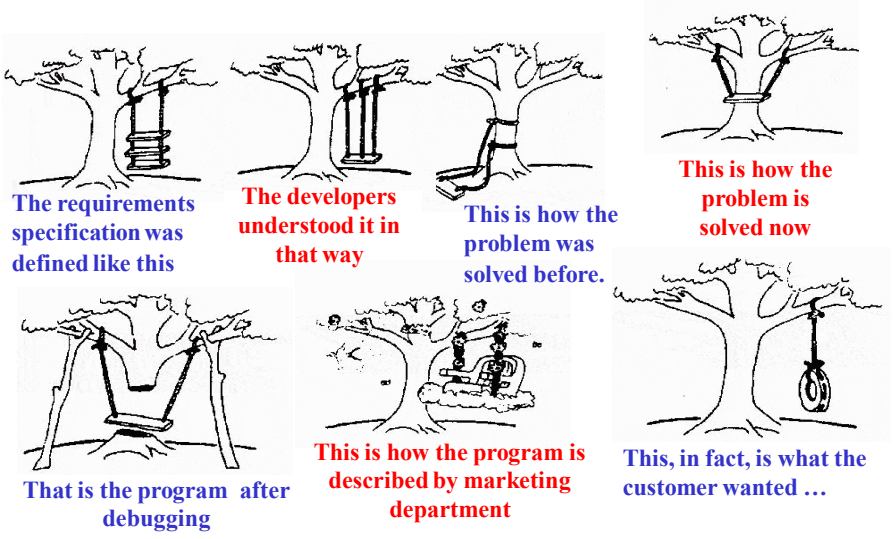
Stakeholders

- These are people who have a stake or interest in the project. Stakeholders may be:
  - Internal to the project
  - External to the project team
  - External to both the project team and the organisation

Status of Software Engineering



Types of Requirements

Functional requirements describe what the software has to do. They are often called product features.

Non Functional/quality requirements are mostly quality requirements. That stipulate how well the software does, what it has to do.

Availability
Reliability
Usability
Flexibility

} **For Users**

Maintainability
Portability
Testability

} **For Developers**

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