Chapter 10

Software Maintenance

Declaration

- These slides are made for UIT, BU students only. I am not holding any copy write of it as I had collected these study materials from different books and websites etc. I have not mentioned those to avoid complexity.

What is Software Maintenance?

- Software Maintenance is a very broad activity that includes error corrections, enhancements of capabilities, deletion of obsolete capabilities, and optimization.

Categories of Maintenance

- Corrective maintenance: This refer to modifications initiated by defects in the software.
- Adaptive maintenance: It includes modifying the software to match changes in the ever changing environment.
- Perfective maintenance: It means improving processing efficiency or performance, or restructuring the software to improve changeability. This may include enhancement of existing system functionality, improvement in computational efficiency etc.
- Other types of maintenance: There are long term effects of corrective, adaptive and perfective changes. This leads to increase in the complexity of the software, which reflect deteriorating structure. The work is required to be done to maintain it or to reduce it, if possible. This work may be named as preventive maintenance.

Categories of Maintenance

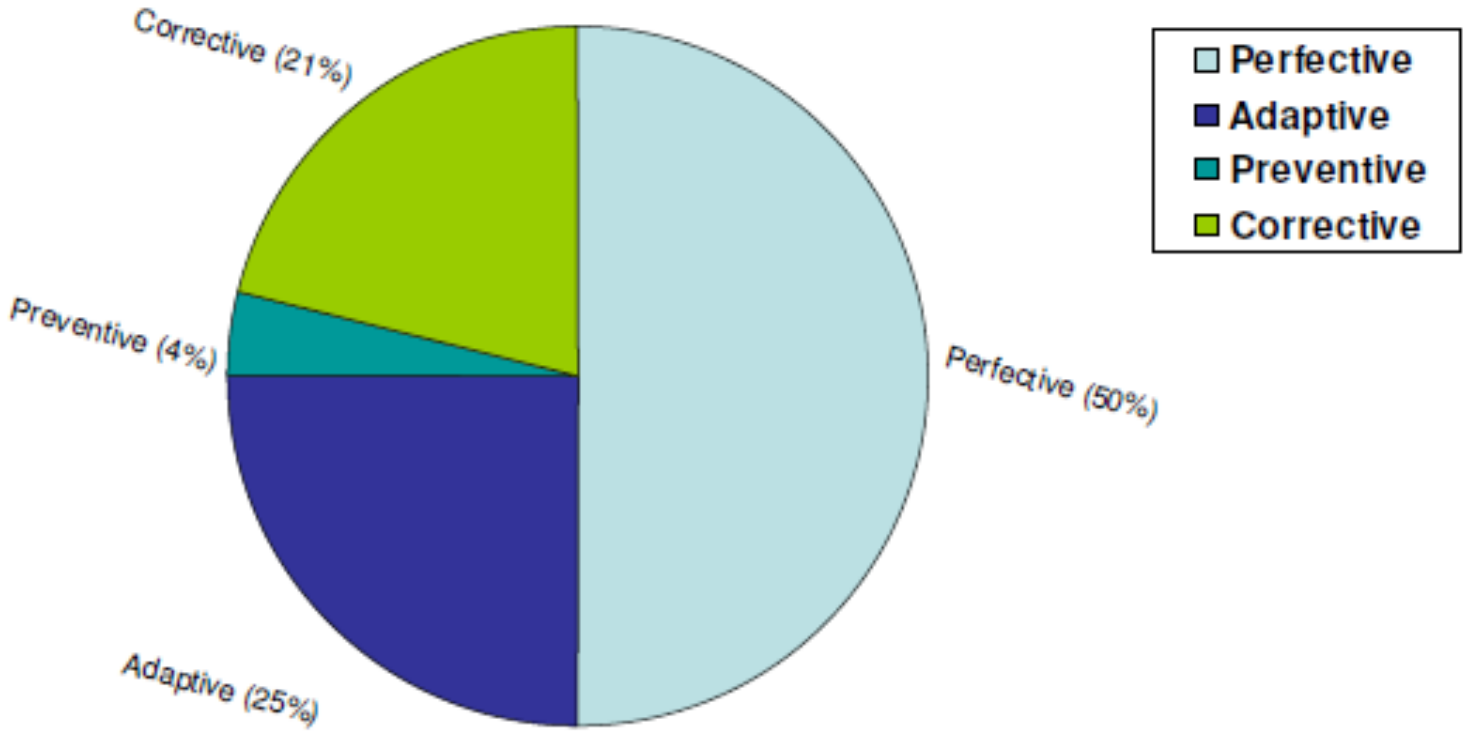


Fig. 1: Distribution of maintenance effort

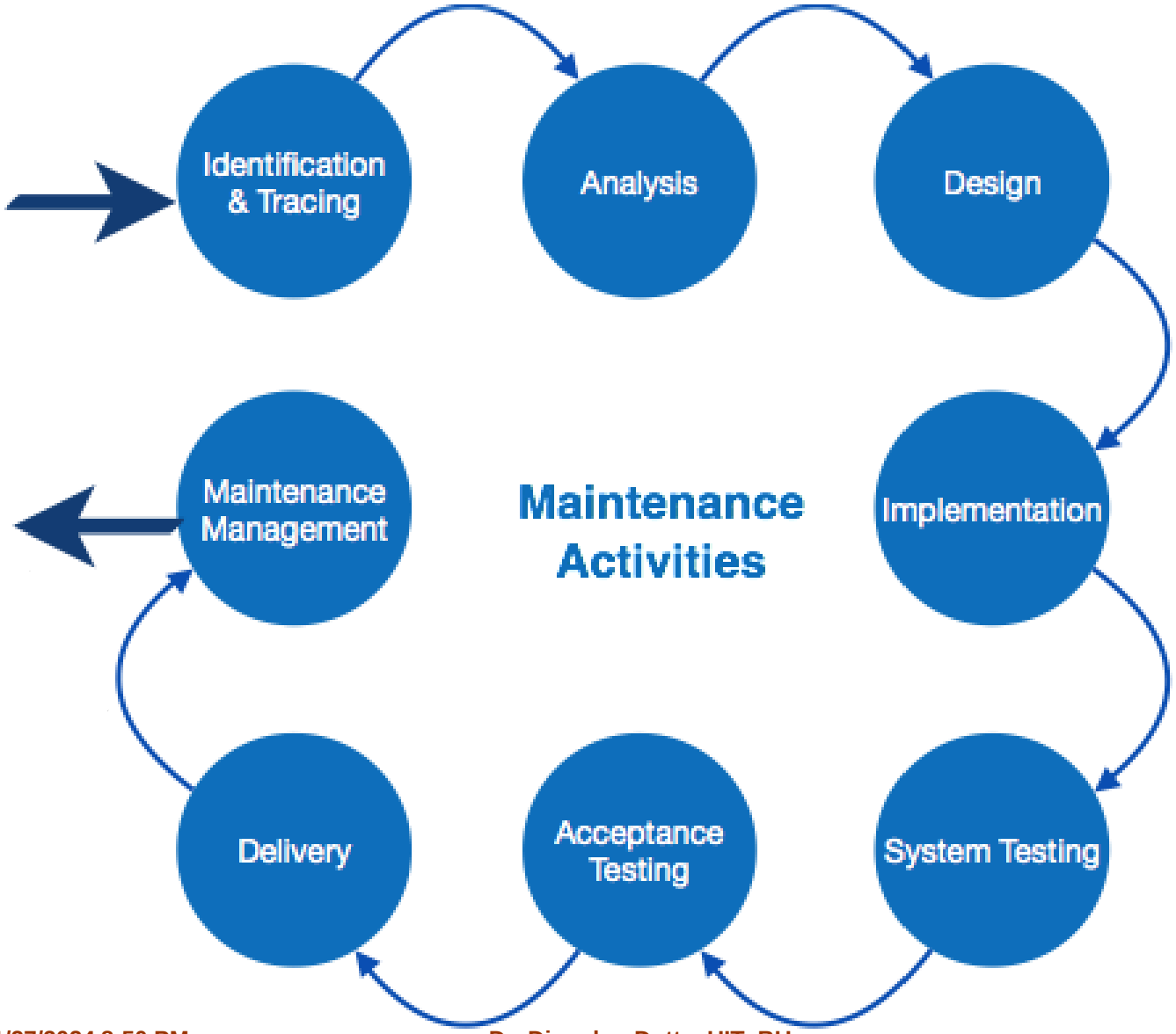
Problems During Maintenance

- Often the program is written by another person or group of persons.
- Often the program is changed by person who did not understand it clearly.
- Program listings are not structured.
- High staff turnover.
- Information gap.
- Systems are not designed for change.

Maintenance is Manageable

- A common misconception about maintenance is that it is not manageable.

Maintenance Activities



Maintenance Activities

- These activities go hand-in-hand with each of the following phase:
  - **Identification & Tracing** - It involves activities pertaining to identification of requirement of modification or maintenance. It is generated by user or system may itself report via logs or error messages. Here, the maintenance type is classified also.
  - **Analysis** - The modification is analyzed for its impact on the system including safety and security implications. If probable impact is severe, alternative solution is looked for. A set of required modifications is then materialized into requirement specifications. The cost of modification/maintenance is analyzed and estimation is concluded.
  - **Design** - New modules, which need to be replaced or modified, are designed against requirement specifications set in the previous stage. Test cases are created for validation and verification.

Maintenance Activities

- **Implementation** - The new modules are coded with the help of structured design created in the design step. Every programmer is expected to do unit testing in parallel.
- **System Testing** - Integration testing is done among newly created modules. Integration testing is also carried out between new modules and the system. Finally the system is tested as a whole, following regressive testing procedures.
- **Acceptance Testing** - After testing the system internally, it is tested for acceptance with the help of users. If at this state, user complaints some issues they are addressed or noted to address in next iteration.
- **Delivery** - After acceptance test, the system is deployed all over the organization either by small update package or fresh installation of the system. The final testing takes place at client end after the software is delivered.

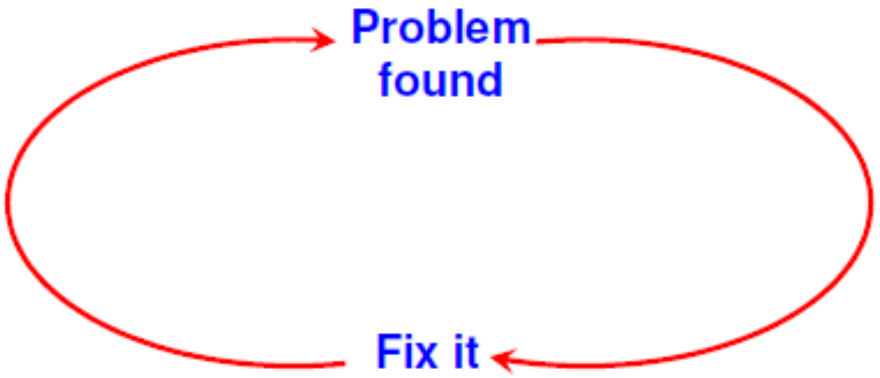
  Training facility is provided if required, in addition to the hard copy of user manual.

Maintenance Activities

- **Maintenance management** - Configuration management is an essential part of system maintenance. It is aided with version control tools to control versions, semi-version or patch management.

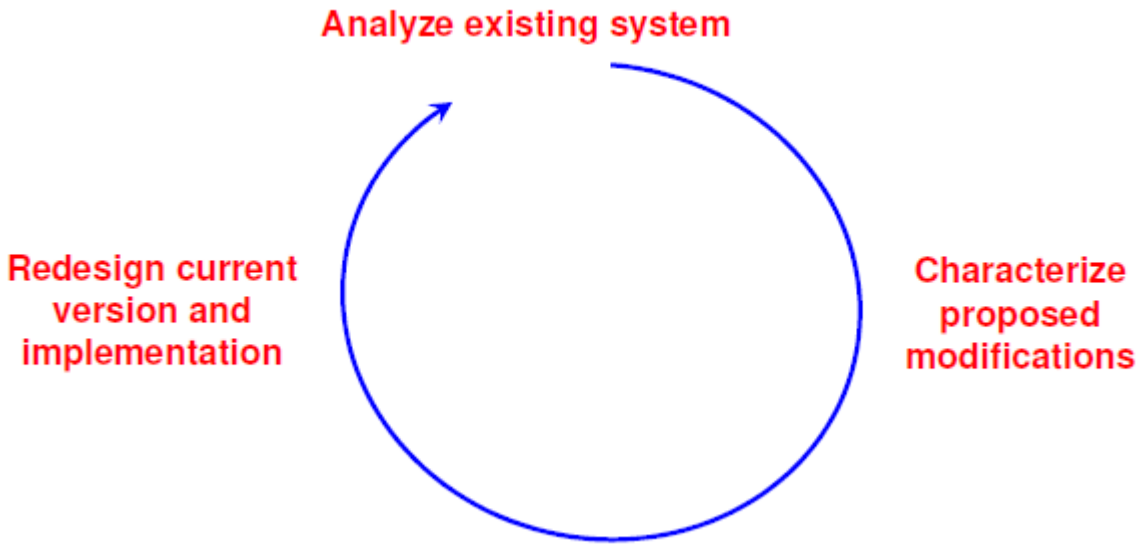
Maintenance models

- Quick-fix Model: This is basically an ad-hoc approach to maintaining software. It is a fire fighting approach, waiting for the problem to occur and then trying to fix it as quickly as possible.



Maintenance models

- Iterative Enhancement Model:
  - Analysis
  - Characterization of proposed modifications
  - Redesign and implementation



Maintenance models

- Reuse Oriented Model
  1. Identification of the parts of the old system that are candidates for reuse.
  2. Understanding these system parts.
  3. Modification of the old system parts appropriate to the new requirements.
  4. Integration of the modified parts into the new system.

Maintenance models

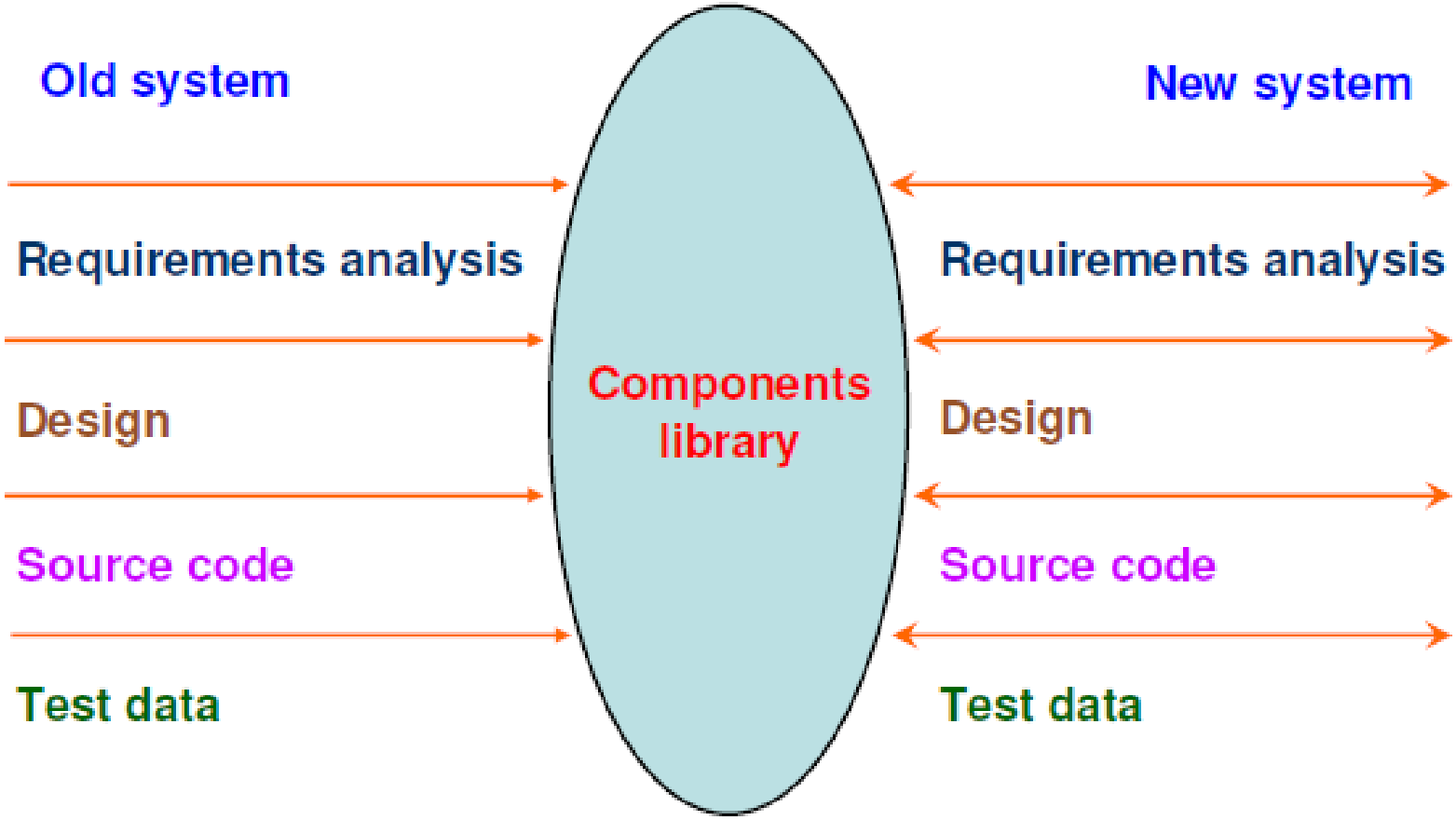


Fig. 5: The reuse model

Maintenance models

- Boehm's Model:
  - Boehm proposed a model for the maintenance process based upon the economic models and principles.
  - Boehm represent the maintenance process as a closed loop cycle.
  - Boehm sees the maintenance manager's task as one of balancing the pursuit the objectives of maintenance against the constraints imposed by the environment in which maintenance work is carried out. Thus the maintenance process is driven by the maintenance manager's decisions, which are based on the balancing of objectives against the constraints.

Maintenance models

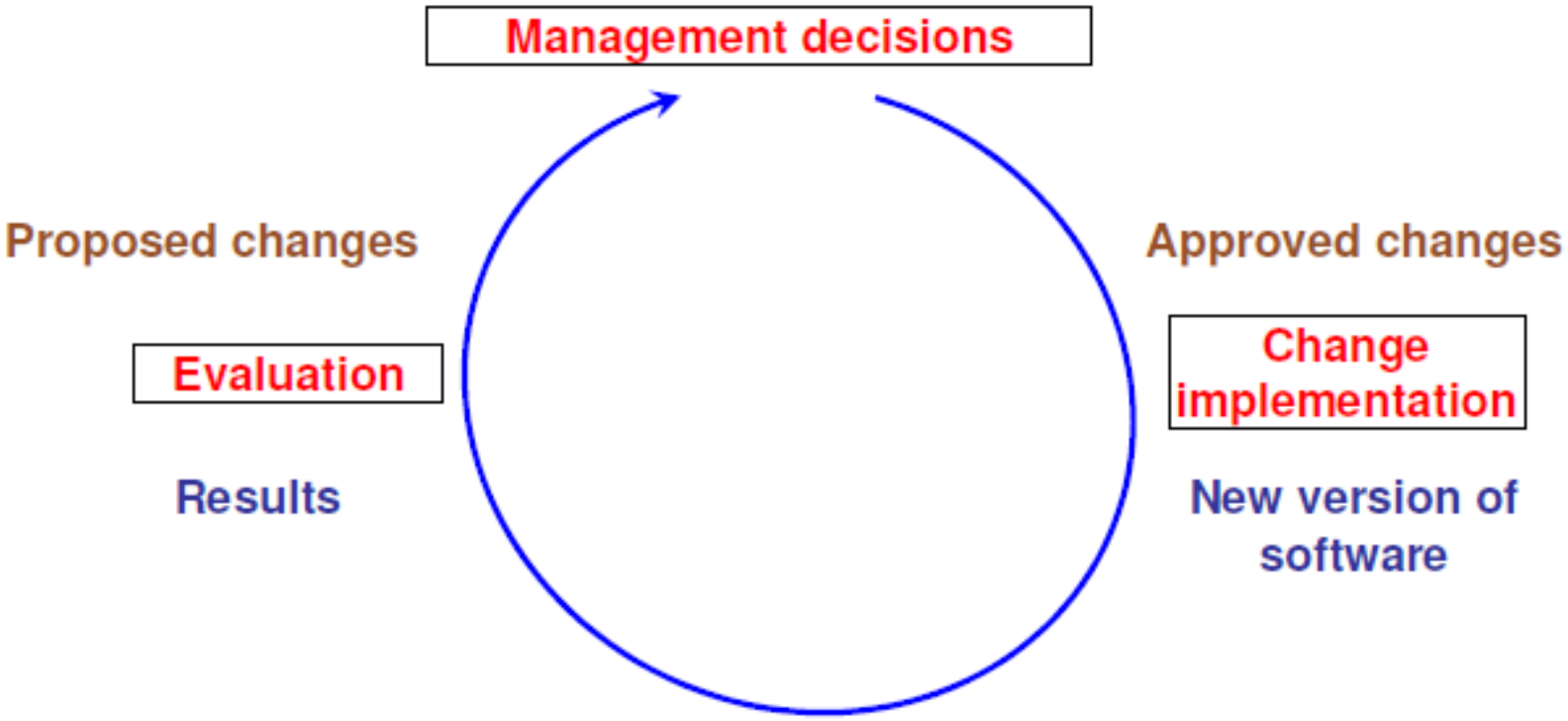
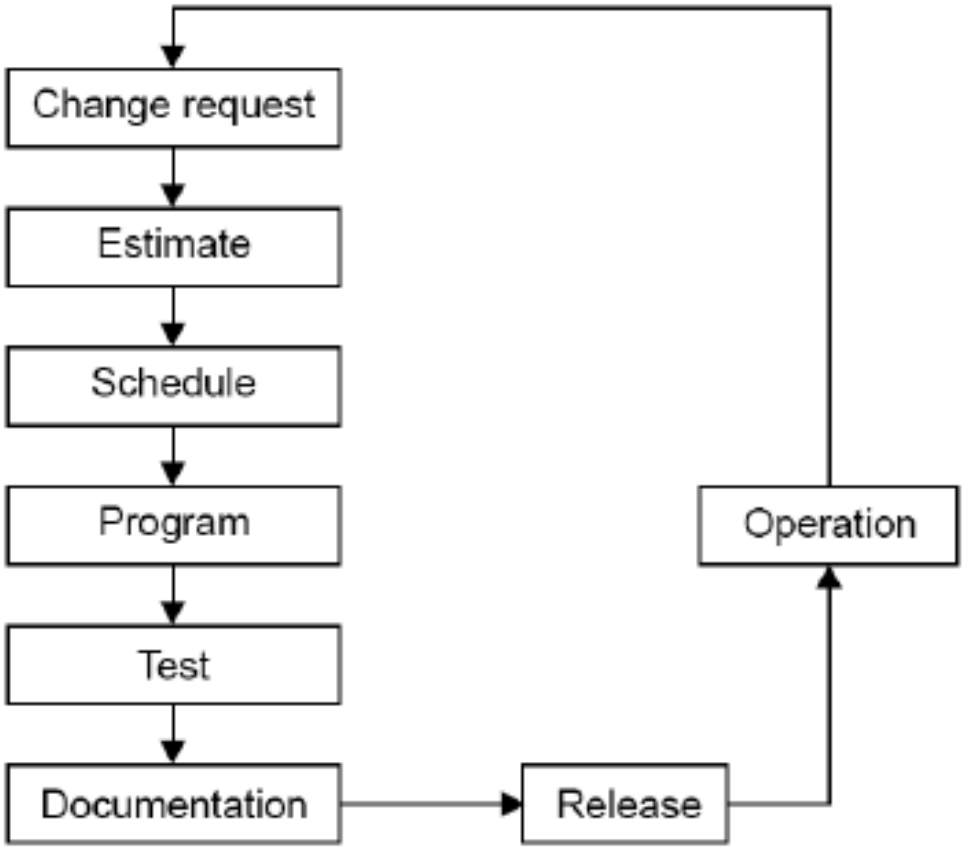


Fig. 6: Boehm's model

Maintenance models

- Taute Maintenance Model:
  - It is a typical maintenance model and has eight phases in cycle fashion.



End of Chapter 10

Questions?